COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN I)
Northern and Central California, Nevada, and Utah
Contract Number N62474-88-D-5086
Contract Task Order No. 0283

Prepared For

DEPARTMENT OF THE NAVY
Roy Santana, Remedial Project Manager
Engineering Field Activity West
Naval Facilities Engineering Command
San Bruno, California

FINAL REPORT
RCRA FACILITY ASSESSMENT
CONFIRMATION STUDY
NAVAL WEAPONS STATION CONCORD, CALIFORNIA

August 8, 1997

VOLUME 1 OF 2

Prepared By

PRC ENVIRONMENTAL MANAGEMENT, INC.
135 Main Street, Suite 1800
San Francisco, California 94105
(415) 543-4880

John Bosche
John Bosche, Project Manager

CONTENTS

Section **Page**

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

FIGURES

Figure

FIGURES (Continued)

Figure

TABLES

Table **Number of Pages**

TABLES (Continued)

ABBREVIATIONS AND ACRONYMS

AWQC	Ambient Water Quality Criteria
bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Chain-of-Custody
COPC	Chemicals of Potential Concern
CTO	Contract Task Order
DTSC	State of California Department of Toxic Substances Control
EFA	Engineering Field Activity
EPA	U.S. Environmental Protection Agency
FFSRA	Federal Facility Site Remediation Agreement
FSAP	Field Sampling and Analysis Plan
µg/L	Micrograms per Liter
mg/kg	Milligrams per Kilogram
msl	Mean Sea Level
O&G	Oil and grease
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PRC	PRC Environmental Management, Inc.
PRG	Preliminary Remediation Goals
RCRA	Resource Conservation and Recovery Act
RES	Riedel Environmental Services, Inc.
RI	Remedial Investigation
RFA	RCRA Facility Assessment
RI/FS	Remedial Investigation and Feasibility Study
RWQCB	San Francisco Bay Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
STLC	Soluble Threshold Limit Concentration
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TBT	Tributyltin
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TOG	Total Oil and Grease
TPH	Total Petroleum Hydrocarbons
TPHd	Total Petroleum Hydrocarbons as Diesel
TPHg	Total Petroleum Hydrocarbons as Gasoline
TPHmo	Total Petroleum Hydrocarbons as Motor Oil

ABBREVIATIONS AND ACRONYMS (Continued)

TRPH	Total Recoverable Petroleum Hydrocarbons
TTLC	Total Threshold Limit Concentration
USC	United States Code
USGS	U.S. Geological Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WET	Waste Extraction Test

EXECUTIVE SUMMARY

In June 1992, the State of California Department of Toxic Substances Control (DTSC) performed a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) at Naval Weapons Station (Naval Weapons Station Concord, California) Concord. The RFA was performed to evaluate the potential release of hazardous substances from 24 solid waste management units (SWMU). Recently, the Navy performed an RFA confirmation study to further evaluate the State's RFA findings. This RFA confirmation study report summarizes the results of the evaluation and provides recommendations for either no further action or for additional investigation of the 24 SWMUs at Naval Weapons Station Concord, California.

The RFA confirmation study included performing the activities outlined in the field sampling and analysis plan as appropriate at each SWMU site and included collection of soil, surface water, groundwater, and septic tank samples; laboratory analysis of the samples; and evaluation of the analytical results.

Based on the RFA confirmation study results, all of the 24 SWMU sites are appropriate for no further action under the RCRA corrective action program. Most of these sites (SWMUs 12/20, 14, 15, 17, 22, 23, 24, 25, 37, 44, 51, 52, 53, and 54) are appropriate for no further action because hazardous soil and groundwater conditions were not discovered. Three sites (SWMU 13, 16, and 40) were cleaned up and are now appropriate for no further action status. Three other sites (SWMU 1, 7, and 50) are appropriate for transfer to the Navy's underground storage tank (UST) program because USTs containing petroleum hydrocarbons are or were present. Four of the SWMU sites (SWMU 2, 5, 7, and 18) are recommended for future investigation as installation restoration sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to evaluate the extent and source of groundwater contamination.

SWMU 13, including the septic tank leach field and storm drain outfall, has been sampled and evaluated. A RCRA interim corrective measure was completed at SWMU 13 to remove the hazardous waste septic tank contents. While this SWMU is recommended for no further action and closure under RCRA, Building IA-25, located adjacent to SWMU 13, has been identified as an area of potential environmental risk requiring further evaluation. Therefore, a CERCLA evaluation or investigation of Building IA-25 is recommended.

Phenol was consistently detected at low concentrations at half of the SWMU sites (SWMUs 13, 14, 17, 22, 23, 24, 25, 44, 51, 52, 53, and 54). At these sites, phenol was detected in 57 samples at a concentrations ranging from 0.1 to 4 milligrams per kilogram (mg/kg). The average detectable concentration was 0.5 mg/kg. The source of phenol at these sites has not been determined. The U.S. Environmental Protection Agency (EPA) publishes preliminary remediation goals (PRG) as a screening criteria for preliminary evaluation of toxic contaminants in soil. Comparison of the concentration of a potential contaminant in soil to the EPA PRG provides conservative method for preliminary evaluation of the potential threat to human health. The residential PRG is the most conservative PRG and assumes long-term human exposure to the site soils that might occur during residential occupation of the site. The EPA residential PRG for phenol is 39,000 mg/kg. Phenol is not considered a chemical of potential concern (COPC) at the SWMU sites with maximum concentrations of up to 4 mg/kg.

- SWMU sites, site usage, findings, conclusions, and recommended actions are summarized in Table ES-1.

TABLE ES-1
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
1 Inland Area	Former UST site and possible site of hazardous materials discharge to grounds.	Hydrocarbons were detected in soil and groundwater samples. There is no evidence of any nonpetroleum hazardous constituents in soil. Volatile Organic Compounds (VOCs) have been detected in groundwater in all wells including those from upgradient and crossgradient locations and there is no on-site source for VOCs in groundwater. (See Section 5.1.3)	The site has been removed from the RCRA corrective action program because hazardous constituents were not detected in soil and there is no evidence of a release of hazardous materials from the site. Petroleum hydrocarbon contamination at the site has been addressed under the Navy's UST program. A CERCLA process investigation is recommended at SWMUs 2, 5, 7, and 18 to determine the source of VOCs detected in groundwater at SWMU 1 and to evaluate remedial alternatives for the entire area. (See Section 5.1.4)
2 Inland Area	Former burn area.	Hydrocarbons were detected sporadically in soil samples (to concentrations of up to 3,400 mg/kg) and were also detected in groundwater samples (to concentrations up to 130 micrograms per liter [μg/L]). However, the hydrocarbons in groundwater are not related to soils containing hydrocarbons at this SWMU site because hydrocarbons in soil have not been found extending to groundwater. The source of hydrocarbons in groundwater has not been determined. (See Section 5.2.3)	Remediation of sporadic detections of hydrocarbons in soil is unnecessary because the hydrocarbons were not detected at concentrations that threaten human health or the environment. The site conditions at SWMU 2 should be investigated under a CERCLA process investigation of SWMUs 2, 5, 7, and 18 to determine the source of chemicals in groundwater and to evaluate remedial alternatives. (See Section 5.2.4)
5 Inland Area	Locomotive maintenance shop.	Hydrocarbons were detected sporadically in soil samples. Hydrocarbons and low concentration VOCs were detected in groundwater. (See Section 5.3.3)	The site should be investigated under a CERCLA process investigation to determine the source of contamination in chemicals in groundwater and to evaluate remedial alternatives (See Section 5.3.4).

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
7 Inland Area	Paint storage/disposal and USTs.	Hydrocarbons were consistently detected in the soil samples collected in the vicinity of the USTs. Chemicals were not detected in soil at concentrations suggesting a potential spill or release of paints to the soil and groundwater in the vicinity of the paint storage and handling areas. Hydrocarbons and VOCs were detected in groundwater. There was no hazardous soil contamination detected and no detected relationship between the site paint handling operations and constituents in groundwater. (See Section 5.4.3)	The USTs should be removed under the Navy's UST program (including soil and groundwater remediation as necessary). Because there is no evidence of hazardous materials affecting soils at SWMU 7, the site is recommended for no further action under the RCRA corrective action program. The VOC contamination of groundwater should be investigated under a CERCLA process investigation of SWMUs 2, 5, 7, and 18 to determine the source of chemicals in groundwater and to evaluate remedial alternatives. (See Section 5.4.4)
12/20 Inland Area	Septic tank and leach field.	The septic tank and leach field at SWMU 12/20 is located in the vicinity of IR site 17. Low concentrations of VOCs (0.004 to 0.005 mg/kg) were detected in samples at depths of 10 to 15 feet. Potentially significant concentrations (that exceed PRGs) of metals (manganese concentration of 12,100 mg/kg and thallium concentration of 15.6 mg/kg) were detected in one soil sample at a depth of 15 feet. (See Section 5.5.3)	Manganese and thallium detected in soils exceeding PRGs are limited in lateral extent and were deeply buried. There is no pathway for human or environmental exposure for these constituents. Elevated concentrations of manganese and thallium were not detected in soil samples collected at IR site 17. The concentrations of VOCs were low and did not exceed PRGs (when applicable). Because hazardous constituents are not a threat at the site, and because there is no known source for these constituents, the SWMU site is recommended for no further action under the RCRA corrective action program. (See Section 5.5.4)

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
13 Inland Area	Septic tank and leach field site.	Surface soil located in the vicinity of a storm drain outfall contained oil and grease (920 mg/kg) and a trace concentration of endosulfan II (0.004 mg/kg). A hazardous waste concentration of trichloroethene (TCE) was detected in the septic tank. (See Section 5.6.3)	The hazardous waste present in the septic tank was removed under an interim RCRA corrective action in March 1997. Since the septic tank waste was removed, potentially harmful concentrations of hazardous materials are not present at the site. The SWMU site will not pose significant threat to human health or the environment and the SWMU site is recommended for no further action under the RCRA corrective action program. However, the nearby Building IA-25 was investigated previously and was not sampled or analyzed during this investigation. Due to potential threats to human health, the site condition at Building IA-25 is recommended for further evaluation under CERCLA. (See Sections 5.6.4 and 5.6.5)
14 Inland Area	Septic tank and leach field.	Nickel was detected in soil (164 and 256 mg/kg) above the estimated ambient limit concentration and residential PRG (150 mg/kg) in two soil samples at depths of 10.5 and 16 feet. Nickel was also detected in a sample of the septic tank sewer water. (See Section 5.7.3)	The nickel detected in soil is deeply buried and generally does not exceed the PRG by a significant amount. As such, the SWMU site poses no threat to human health and the environment; however, the septic tank sewer water might have contributed to the elevated concentration of nickel in soil. As a result, the septic tank sewer water was removed for off-site disposal. The SWMU site is recommended for no further action under the RCRA corrective action program. (See Section 5.7.4)

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
15 Inland Area	Possible former paint storage area.	Several metals were detected in one soil sample at potentially elevated concentrations (barium concentration of 1,520 mg/kg, manganese concentration of 9,090 mg/kg, and thallium concentration of 11.0 mg/kg). This soil sample was collected below a concrete slab at a depth of 4 feet. Elevated concentrations of metals were not detected in other soil samples. Because the metals were detected in only one soil sample, a very limited quantity of the site soils is likely affected. (See Section 5.8.3)	There is no pathway for human or environmental exposure to the metals detected in soil because of the depth and surface cover. The small volume of soil material containing elevated metals further limits the possibility of exposure. The SWMU site presents no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.8.4)
16 Inland Area	Fluorescent tube crushing, asbestos handling, and pesticide storage and mixing.	High concentrations of pesticides were detected in the soils. Pesticide-contaminated soils have been cleaned up under an interim RCRA corrective action and confirmation soil samples were taken at the limits of the excavation area. (See Section 5.9.3)	An interim RCRA corrective action has been completed. The site is recommended for no further action under the RCRA corrective action program. (See Sections 5.9.4 and 5.9.5)
17 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.10.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.10.4)

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
18 Inland Area	Former steam cleaning area and locomotive turntable.	The site is entirely covered with asphalt. The underlying soil is sporadically contaminated with hydrocarbons to concentrations of up to 9,700 mg/kg. Hydrocarbons were also detected in groundwater samples to concentrations of 740 μg/L. Although hydrocarbons were detected in near surface soils, the field investigation consistently did not detect deeper soil samples containing hydrocarbons. (See Section 5.11.3)	The hydrocarbons in groundwater do not appear related to the hydrocarbons detected in soil because soil contamination was not found extending to groundwater. Because of the asphalt covering of the site, there is no exposure pathway for human and ecological receptors. A CERCLA process investigation should be conducted in the vicinity of SWMUs 2, 5, 7, and 18 to evaluate the source of constituents detected in groundwater and evaluate possible remedial alternatives. (See Section 5.11.4)
22 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.12.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.12.4)
23 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.13.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.13.4)
24 Inland Area	Septic tank and leach field.	A trace concentration of chloroform (0.002 mg/kg) was detected in one soil sample. Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.14.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA SWMU corrective action program. (See Section 5.14.4)
25 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.15.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.15.4)

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
37 Tidal Area	Waste wood and treated wood storage area.	This site is located in the vicinity of IR Site 11. Potentially harmful concentrations of hazardous materials were not detected in soil or filtered samples of groundwater. (See Section 5.16.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.16.4)
40 Tidal Area	Former polychlorinated biphenyl PCB-containing electrical transformer.	Soil samples contained trace concentrations of PCBs and pesticides. The Navy has conducted an interim RCRA corrective action, including a limited site excavation and capping of PCB- and pesticide-contaminated soil with an impervious surface. (See Section 5.17.3)	The interim RCRA corrective action cleanup has been completed and the SWMU site is recommended for no further action under the RCRA corrective action program. (See Sections 5.17.4 and 5.17.5)
44 Tidal Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.18.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.18.4)
50 Tidal Area	Former UST.	Hydrocarbons were detected in soil and groundwater. (See Section 5.19.3)	The SWMU site was transferred to the Navy's UST program and removed from the RCRA corrective action program. (See Section 5.19.4)
51 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected.(See Section 5.20.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.20.4)

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

SWMU SITE	SITE USE	FINDINGS	CONCLUSIONS AND RECOMMENDATIONS
52 Inland Area	Septic tank and leach field.	The septic tank and leach field at SWMU 52 is located in the vicinity of IR Site 22. Arsenic (65.4 mg/kg) and lead (165 mg/kg) were detected in surface soil samples. (See Section 5.21.3)	Arsenic and lead did not originate from the SWMU septic tank because the surface soils are located above the septic tank leach field and because the surface soils containing arsenic are widely distributed at the site. The potential hazards associated with arsenic and lead at the site are more fully evaluated in the RI of IR Site 22. The septic tank and leach field system at SWMU 52 poses no threat to human health and the environment. Because potentially harmful concentrations of hazardous materials were not detected, the SWMU site is recommended for no further action under the RCRA corrective action program. (See Section 5.21.4)
53 Inland Area	Septic tank and leach field.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.22.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.22.4)
54 Inland Area	Septic tank and leach field containing two septic tanks and two leach fields.	Potentially harmful concentrations of hazardous materials were not detected. (See Section 5.23.3)	The SWMU site poses no threat to human health and the environment and is recommended for no further action under the RCRA corrective action program. (See Section 5.23.4)

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

IR = Installation Restoration

mg/kg = milligrams per kilogram

PCB = polychlorinated biphenyls

TABLE ES-1 (Continued)
SUMMARY OF SWMU SITE USES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS
NAVAL WEAPONS STATION CONCORD

PRG	=	Preliminary Remediation Goal
RCRA	=	Resource Conservation and Recovery Act
RI	=	Remedial Investigation
SVOC	=	semivolatile organic compounds
SWMU	=	solid waste management unit
UST	=	underground storage tank
VOC	=	volatile organic compounds
μg/L	=	micrograms per liter

1.0 INTRODUCTION

The Department of the Navy, Naval Facilities Engineering Command, Engineering Field Activity West (EFA WEST) authorized PRC Environmental Management, Inc. (PRC) under Comprehensive Long-term Environmental Action Navy Contract No. N62474-88-D-5086 (CLEAN I), Contract Task Order (CTO) No. 0283, to investigate and further evaluate the findings of a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) prepared by the State of California Department of Toxic Substances Control (DTSC) in June 1992 (DTSC 1992). The RFA was prepared to evaluate the potential release of hazardous substances from solid waste management units (SWMU) at Naval Weapons Station Concord, California. This RFA confirmation study report summarizes the results of PRC's investigation and provides recommendations for closure or further investigation of 24 SWMUs in the Inland Area and Tidal Area of Naval Weapons Station Concord, California.

This RFA Confirmation Study was first issued in draft form on November 4, 1996 to the State of California Environmental Protection Agency Regional Water Quality Control Board (RWQCB) and Department of Toxic Substances Control (DTSC), the U. S. Environmental Protection Agency (EPA), and the Naval Weapons Station Restoration Advisory Board (RAB). The RWQCB and EPA prepared written comments on the draft report dated February 24, 1997 and February 5, 1997, respectively. The Navy responded to these agencies in writing on May 27, 1997. A teleconference was held on June 18, 1997 to discuss the Navy's responses to the agencies and to verify that all comments had been addressed and that the proposed revisions to the draft report were appropriate. On the basis of the June 18, 1997 teleconference, the Navy's responses to agency comments were revised. The revised Navy responses to agency comments are presented in Appendix A and B, attached to this report. Where appropriate, agency comments are addressed in this final report.

1.1 HISTORY OF THE SOLID WASTE MANAGEMENT UNIT PROGRAM

DTSC conducted the RFA (DTSC 1992) to evaluate the potential for release of hazardous materials to the environment as a result of past disposal practices at 49 SWMUs at Naval Weapons Station Concord. As part of the RFA, DTSC conducted a visual site inspection on September 4 and 10, 1991, to look for evidence of releases for selected SWMUs. Interviews were also conducted with Naval Weapons Station Concord personnel to gather additional information regarding potential releases. In addition, DTSC reviewed inspection reports, permit applications, and files at other regulatory agencies. No samples were collected or analyzed as part of the RFA.

The RFA also included sites where non-RCRA regulated wastes (for example, asbestos and waste oil) are managed; however, the RFA did not evaluate sites being addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA sites have already been identified as potentially contaminated, and investigations under CERCLA are being conducted by the Navy in coordination with the U. S. Environmental Protection Agency (EPA), DTSC, and the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB).

The 49 sites investigated under the RFA included 33 Inland Area sites, 15 Tidal Area sites, and a site located at the Radiographic Facility in Pittsburg, California. Of the 49 SWMUs, 25 were recommended for no further action and 24 were recommended for further action. Naval Weapons Station Concord is required under the RCRA Hazardous Waste Facility Permit (effective July 31, 1993), Section V.A.2, to further investigate these 24 SWMUs.

Naval Weapons Station Concord is also required under its Hazardous Waste Facility Permit (Section V.F.) to notify DTSC of any newly identified SWMU. One such SWMU (SWMU 50) was added in March 1994 after petroleum hydrocarbons were detected in soils during a construction project. Four additional SWMUs were identified in April 1994 after it was discovered that they contained septic tanks that were not addressed in the RFA. Because hazardous waste may have been dumped into the septic tank system, these SWMUs were included in this RFA confirmation study and are designated SWMUs 51, 52, 53, and 54. With the addition of SWMUs 50 through 54, a total of 29 SWMUs were recommended for further action. Of the 29 SWMUs, 5 are addressed under separate programs and are not included in this report. Twenty-four SWMUs are addressed in this report. The 5 SWMUs not included in this report that are recommended for further action, and that are being investigated under separate programs, are listed as follows:

- SWMU 8 (Building IA-20) is being investigated under the Installation Restoration (IR) Program as IR Site 20 (CLEAN I, CTO 303).
- SWMU 26 (Building 178) has undergone investigation and remediation under CLEAN I, CTOs 109 and 238. Groundwater monitoring is currently being performed under Contract No. N62474-94-D-7609 (CLEAN II), CTO 89.

- SWMU 30 (UNOCAL Corp.) has undergone investigation and remediation. It awaits closure approval from the Contra Costa County Environmental Health Division.

- SWMU 33 (site 6LC98) has been investigated by Naval Weapons Station Concord. It awaits closure approval from the Contra Costa County Environmental Health Division.

- SWMU 46 (site E-111) has been investigated under CLEAN I, CTO 240 and investigation is being conducted under Clean II, CTO 101.

A description of the 24 remaining SWMU sites and the RFA confirmation study results are presented in Sections 5.1 through 5.23 of this report. SWMU 12 and 20 are located adjacent to each other and were investigated together; therefore, SWMU 12 and 20 are jointly discussed in this report.

1.2 PROJECT OBJECTIVES

The specific objectives of the RFA confirmation study for the 24 SWMUs are as follows:

- Characterize site conditions underlying the SWMU.

- Identify potential sources at the SWMUs that have released hazardous constituents to the environment.

- Evaluate the extent of hazardous chemicals present in groundwater, soil, surface water, and sediment.

- Determine which SWMUs are appropriate for closure without further action and which SWMUs require further investigation or remedial activities.

1.3 PROJECT APPROACH

This RFA confirmation study addresses 24 separate SWMUs, each with different operational histories, environmental conditions, types of chemicals potentially present, and potential exposure pathways and receptors. The quantity, quality, and completeness of the preexisting RFA data were insufficient to estimate the nature and extent of hazardous materials in environmental media at these SWMUs.

Additional data collection activities were carried out at each SWMU site, including field investigations; collection of soil, surface water, groundwater, and septic tank samples; laboratory analysis of the samples; evaluation of the analytical results; and preparation of this report. Descriptions of the site conditions, evaluation, and conclusions and recommendations for each SWMU are presented in Section 5.0 of this report.

All data have been assessed to determine which of the following categories of recommended actions are appropriate for each site:

- SWMU is appropriate for no further investigation under the RCRA corrective action program.
- SWMU is appropriate for further investigation or remediation under the Navy's underground storage tank (UST) program. SWMU sites that are transferred to the Navy's UST program are appropriate for no further action under the RCRA corrective action program.
- SWMU is appropriate for interim RCRA corrective actions, to minimize a release or threat of a release that may pose a threat to human health or the environment.
- SWMU is appropriate for a CERCLA investigation to further evaluate the contamination.

2.0 ENVIRONMENTAL SETTING

The following sections describe the location, land use, climate, physiography and topography, geology, and hydrology of Naval Weapons Station Concord.

2.1 LOCATION

Naval Weapons Station Concord is the major naval munitions transshipment facility on the West Coast and is located in the north-central portion of Contra Costa County, California, approximately 30 miles northeast of San Francisco (Figure 1). The facility, which encompasses approximately 13,000 acres, is bounded by Suisun Bay to the north and by the city of Concord to the south and west. Currently, the facility contains two primary land holdings: the Tidal Area and the Inland Area.

Naval Weapons Station Concord property north of Los Medanos Hills has been designated the Tidal Area. The Tidal Area includes 6,077 acres of mainland and six islands (including Ryer Island) in Suisun Bay that total 1,571 acres. The Inland Area is located to the south of the Tidal Area and encompasses approximately 5,100 acres between Los Medanos Hills and the city of Concord. Three public roads cross the Inland Area: State Route 4, Willow Pass Road, and Bailey Road.

The SWMUs investigated during this RFA Confirmation study include SWMUs 1, 2, 5, 7, 12/20, 13, 14,15, 16, 17, 18, 22, 23, 24, 25, 37, 40, 44, 50, 51, 52, 53, and 54. These SWMUs are located in the Inland and Tidal Areas and are illustrated on Figures 2 and 3.

2.2 LAND USE

Land use in the vicinity of Naval Weapons Station Concord is diverse, characterized by a mixture of industrial, residential, agricultural, and open space zones (Figure 4). Naval Weapons Station Concord is bordered on the south by residential sections of the city of Concord. In addition, seven public schools and several parks parallel the Navy property line. Steep slopes and access problems have prevented extensive development along Kirker Pass Road and in the hills northeast of Naval Weapons Station Concord. These areas are currently zoned for open space and agricultural land use. The Concord Pavilion, a public entertainment facility, is constructed on Kirker Pass Road near the station's boundary.

Land to the north of State Route 4 and to the west of Naval Weapons Station Concord is zoned for industrial development. Several firms have located here, particularly along Port Chicago Highway near the main gate of Naval Weapons Station Concord. Phillips Petroleum Company and Monsanto Chemical Company maintain facilities along Solano Way near Waterfront Road. Los Medanos Hills separate the Tidal and Inland Areas and are the site of the Los Medanos underground gas storage field.

The majority of Naval Weapons Station Concord operations take place in the Inland Area. Ammunition storage, which constitutes the largest single land use at Naval Weapons Station Concord, is maintained in five magazine groups and two groups of barricaded railroad sidings. Various production facilities for the inspection and maintenance of ordnance are located throughout the Inland Area.

The majority of the facilities located in the greater Tidal Area are dedicated to ordnance operations and are located on the original property of the Naval Magazine, Port Chicago, acquired by the Navy in 1942. Within the 17,000 linear feet of waterfront in the Tidal Area are three explosives-handling piers, a barge pier, lighter moorings, and a tug basin. Barricaded rail car sidings, rail car classification yards, and a large holding lot for trucks are inland from the waterfront area and approximately 1,000 feet east of the Tidal Area Landfill site. Several open inert storage and parking aprons are associated with the piers and support activities.

2.3 CLIMATE

Contra Costa County normally experiences dry, warm summers and moderately rainy winters. The wind blows from southwest to west-northwest at a mean wind speed of 12 miles per hour 65 percent of the time. The average local temperature varies from 45° F in January to 75° F in August.

The mean annual precipitation for Naval Weapons Station Concord is 14 inches (Ecology and Environment, Inc. 1983). As in most of northern California, about 84 percent of the rainfall occurs from November through March.

2.4 PHYSIOGRAPHY AND TOPOGRAPHY

The physiography and topography of the Tidal Area are shown on Figure 5. Originally, the Tidal Area consisted of three distinct land formations: salt wetlands along the shore of Suisun Bay, the upland colluvial slope, and the sandstone hills farthest from the water. A large section of the wetlands was modified when the original weapons station was constructed by the addition of large amounts of fill material. Almost all existing naval facilities in the Tidal Area were built in these filled areas (IT 1992). The colluvial slope is the most suitable for development because of its higher elevation and gentler grade. The area south of the Contra Costa Canal is characterized by steeply sloping terrain, beginning at a 100-foot mean sea level (msl) elevation and rising to more than 600 feet.

The physiography and topography of the Inland Area are shown in Figure 6. Most of the western half of the Inland Area is characterized by gently sloping land designated as colluvial slope. Steeply sloping terrain, beginning at 100 feet msl and rising to more than 800 feet msl, forms the northeast boundary of the Inland Area.

2.5 GEOLOGY

The regional geologic features are a reflection of several northwest-trending fault systems that divide Contra Costa County into large blocks of rocks. Up-thrown blocks form the hills, and down-thrown blocks form broad lowlands floored with thick, unconsolidated Pleistocene-age alluvial sediments eroded from the up-thrown blocks. Figure 7 is a geologic map of Naval Weapons Station Concord showing a cross section of the major geologic formations. The uplifted bedrock feature that topographically separates the Inland and Tidal Areas is typical of the geology of Contra Costa County.

Figure 7 shows the two major faults known to exist in the Naval Weapons Station Concord area: the Concord and Clayton Faults. The Concord Fault passes through the city of Concord approximately 2 miles from Naval Weapons Station Concord. The Concord Fault is classified as active and is a right-lateral, strike-slip fault. The main trace of the Clayton Fault lies at the base of Los Medanos Hills as it passes through Naval Weapons Station Concord. The Clayton Fault is classified as active or potentially active.

Tidal Area geology is dominated by Pleistocene and Holocene geomorphology. Subsurface geology is best described as a zone of interfingering alluvial and estuarine depositional environments. The Tidal Area can be divided into three distinct landforms, all of Quaternary age: footslopes, floodplains, and marsh or wetland areas.

Alluvium in the Inland Area consists of beds of sandy, silty, and clayey soils. Silty soils appear to predominate. A 3-foot-thick layer of dark brown or gray, clayey soil is consistently present on the alluvium throughout the region.

Soils in the north-central portions of Naval Weapons Station Concord are clay-rich alluvium derived from nearby hills. They are well sorted, pebbly alluvium from upstream areas of Mt. Diablo Creek. Soils in the central area tend to be coarser at shallow depths but grade comparatively finer than do soils in the north-central area.

The surface geology of the Inland Area sites is divided into two alluvial areas. The first is alluvial formations derived from erosion products associated with the geologic units of Los Medanos Hills. To the southwest are some low and gently sloped hills composed of a quaternary age sedimentary formation and alluvial byproducts. These two geologic areas are separated by the approximate alignment of Seal Creek.

2.6 HYDROLOGY

The hydrology of the region can be separated into surface water and groundwater. Surface water hydrology concerns streams, lakes, bays, and estuaries.

2.6.1 Surface Water

Naval Weapons Station Concord is located in the Sacramento-San Joaquin Delta area. Three natural surface water bodies are located within or adjacent to the Tidal Area at Naval Weapons Station Concord: Suisun Bay, Hasting Slough, and Belloma Slough (Figure 5). A drainage canal known as Otter Sluice has been constructed within the west side of the Tidal Area.

Naval Weapons Station Concord lies within the Mt. Diablo-Seal Creek Watershed, which drains an area of about 36 square miles. The watershed is bounded on the south by the north peak of Mt. Diablo and on the north by Suisun Bay. Streams that drain the watershed have their headwaters on the slopes of Mt. Diablo and flow by way of Mt. Diablo Creek through Clayton Valley and Naval Weapons Station Concord to the outlet at Suisun Bay. Mt. Diablo Creek is referred to as Seal Creek where it enters Naval Weapons Station Concord.

2.6.2 Groundwater

Groundwater beneath the Tidal Area generally flows to the west/southwest with a gradient of approximately 0.002 to 0.003 feet per feet. In November 1991, rising head aquifer tests (slug tests) were performed on several selected Tidal Area monitoring wells. Results from the slug tests indicate that the Tidal Area as a whole has an average hydraulic conductivity of 1.86×10^{-5} centimeters per second, with the highest conductivity occurring at well FTW-5 (1.16×10^{-4} centimeters per second) at IR Site 9 (the Froid and Taylor Roads site) and the lowest at well RDW-5 (2.05×10^{-6} centimeters per second) at IR Site 2 (the R Area Disposal site) (IT 1992).

Most of the Bay Area's water is supplied by treated surface water sources, although some wells in the vicinity of the Mallard Reservoir (Figure 8) are still used for water supply. Groundwater is available beneath the Inland Area in the unconsolidated formations and the bedrock. North of State Route 4, the water table ranges from 30 to 40 feet below ground surface (bgs) in low surface elevation areas and at deeper depths as ground surface rises. In the main industrial complex of the Inland Area, groundwater is present at a depth of approximately 20 feet bgs.

3.0 INVESTIGATION ACTIVITIES

The RFA confirmation study at Naval Weapons Station Concord included the following activities: (1) surface and subsurface soil sampling using hand sampling equipment, test pits, drilled borings, and Geoprobe sampling equipment, (2) sampling of existing groundwater monitoring wells, (3) groundwater sampling, (4) monitoring well installation and sampling, (5) surface water sampling, and (6) sampling of sewage sludge and sewer water from septic tanks. This section presents an overview of the sampling equipment used and the procedures followed during the field activities. A detailed description of the investigation conducted and procedures used in the field is presented in the SWMU Site Investigation Draft Final Field Sampling Plan (FSAP)(PRC 1994b). On February 27, 1995, the Navy met with the EPA, DTSC, and RWQCB to discuss modification of the field investigation and laboratory analysis effort due to budget limitations (Navy 1995). The extent of the field variance was later documented in a letter to the DTSC and other regulatory agencies on May 8, 1995 (PRC 1995c). Field sampling activities of the SWMU sites at Naval Weapons Station Concord were conducted in two phases. The first phase was conducted from February to May 1995 and the second was conducted in October 1995.

3.1 SOIL INVESTIGATION AND SAMPLING

Hollow-stem auger, Geoprobe, and hand-auger drilling methods were used in the soil investigation at Naval Weapons Station Concord. One test pit was excavated as part of the investigation at SWMU 2 (Fire Station) in the Inland Area.

3.2 SURFACE WATER AND GROUNDWATER SAMPLING

Two monitoring wells were installed at Tidal Area SWMU 50 to support geologic, hydrogeologic, and contaminant characterization efforts. Groundwater samples were obtained from existing and new monitoring wells at SWMUs 1 and 50. Groundwater samples were collected using HydroPunch or Geoprobe sampling methods at SWMUs 2, 5, 7, 18, and 37. A surface water sample was collected at SWMU 52.

3.3 SEPTIC TANK INVESTIGATION

Septic tank sewer water was sampled from 15 septic tanks at 13 SWMU sites (SWMUs 12, 13, 14, 17, 22 [2 tanks], 23, 24, 25, 44, 51, 52, 53, and 54 [2 tanks]). Because of the small diameter of the access ports to some of the septic tanks, attempts to collect a sewage sludge sample with sludge sampling equipment were unsuccessful. At other sites, only a thin layer of sludge was present in the tanks and a sufficient volume of sludge could not be collected for analysis. Three sludge samples were collected for analysis at three of the SWMU sites (SWMUs 13, 14, and 44). When necessary, the septic tanks were first uncovered by using a backhoe to remove overlying soil. When exposed, the septic tank manhole cover was then removed. In some cases, the septic tanks were sampled through an open access port.

3.4 SITE SURVEYING

The elevation (vertical control) for the natural ground surface for all monitoring wells was surveyed to within plus or minus 0.1 foot using the National Geodetic Vertical Datum of 1929. The north side of the uncapped well casing was surveyed to within plus or minus 0.01 foot. The surveyed point on the north side of the monitoring well casing was marked with a small notch cut into the casing. The notch was used as a reference point when water level elevations were measured.

The locations of most borings were surveyed horizontally relative to the Naval Weapons Station Concord system to an accuracy of plus or minus 1 foot. Borings not surveyed were accurately measured by tape from established landmarks. The ground surface elevation of the borings was measured to within plus or minus 0.1 foot using the National Geodetic Vertical Datum of 1929.

4.0 SWMU SITE ANALYTICAL RESULTS AND EVALUATION

This section presents a summary of the general methodology for evaluating organic and inorganic constituents that was applied to each SWMU site. Section 4.1 presents the methodology used to screen the organic analytical results for each SWMU and Section 4.2 presents the methodology for screening the inorganic analytical results for each SWMU where metals analyses were performed.

A list of the soil samples collected and analyses performed for all SWMU sites is presented in Table 1. A list of the groundwater samples collected and groundwater analyses performed for all SWMU sites is presented in Table 2. As noted previously, only one surface water sample was collected, at SWMU 52. Table 3 provides a list of all septic tank sewage sludge samples collected and analyses performed. Table 4 provides a list of all septic tank sewer water samples collected and analyses performed. Tables 5 through 27 present a summary of analytical results of soil, surface water, and groundwater samples for each individual SWMU. Table 28 presents the analytical results of the septic tank sewage sludge samples, and Table 29 presents the analytical results of the septic tank water samples. Table 30 presents a statistical summary of the analytical results for all soil samples analyzed for inorganic constituents during this investigation.

4.1 EVALUATION OF ORGANIC CONSTITUENTS IN SOIL

Organic analyses were compared to U.S. Environmental Protection Agency (EPA) Region IX preliminary remediation goals (PRG), when available. Although Naval Weapons Station Concord is an industrial facility, and this designation is not expected to change, the residential PRGs were used in this report rather than industrial PRGs as a conservative screening mechanism. Where residential PRGs were exceeded, the analytical results were also screened against industrial PRGs.

4.2 INORGANIC CONSTITUENTS IN SOIL

A statistical summary of the inorganic analytical results is presented in Table 30. Table 30 lists the following information: (1) the number of samples in which the analyte was detected; (2) a preliminary evaluation of the data set distribution (normal, lognormal, or nonparametric); (3) the maximum, minimum, and average concentrations of detected compounds; (4) the maximum and minimum sample quantitation limits; and (5) the residential and industrial PRGs for each metal.

The evaluation of inorganic constituents at the SWMU sites involved classifying the analytical results into one of three categories: (1) inorganic constituents without EPA PRGs; (2) analytical results that do not exceed residential PRGs; and (3) analytical results that exceed residential or industrial PRGs. Analytical results that fall into the first two categories are of no concern to human receptors; however, analytical results that fall into the third category indicate sites that are potentially hazardous to human health. These categories are discussed in the following subsections.

4.2.1 Inorganic Constituents without Calculated PRGs

Calcium, iron, magnesium, potassium, and sodium are essential nutrients and no EPA Region IX PRGs (EPA 1995) exist for these metals. Essential nutrients are not normally considered contaminants and are therefore not typically carried through the evaluation process. These constituents are not proposed for further evaluation.

4.2.2 Inorganic Constituents That Do Not Exceed Residential PRGs

Concentrations of metals that did not exceed residential PRGs in any soil samples collected at the SWMU sites include aluminum, antimony, barium, cadmium, total chromium, cobalt, copper, mercury, molybdenum, selenium, silver, vanadium, and zinc. The maximum detected concentrations of these constituents at Naval Weapons Station Concord are from 2.3 to 340 times lower than the respective residential PRGs. Therefore, these constituents are not considered a threat to human health at the SWMU sites and are not proposed for further evaluation.

4.2.3 Inorganic Constituents That Exceed PRGs

Inorganic constituents that exceed PRGs are screened against estimated ambient limit concentrations. Ambient concentrations of inorganic constituents are defined as those concentrations of metals that occur due to the natural composition of the soil plus anthropogenic sources that are not related to contamination from the site under consideration. Ambient concentrations of metals in soil samples from areas that have not been affected by site-specific human (industrial or agricultural) activities exhibit a range of metals concentrations. Any concentration of metals detected in soil less than the upper bound of the range does not imply site-related contamination. The upper bound of the ambient range is determined by soil sampling, metals analysis, and statistical evaluation the resulting data set. The upper bound is termed the estimated ambient limit concentration and is defined as the upper 95th percentile of the data associated with a lower confidence limit of 80 percent. In most cases, the PRGs are lower than the estimated ambient limit concentrations that exist at Naval Weapons Station Concord. Therefore, a release of contaminants to the environment has not necessarily occurred in every instance where a PRG is exceeded. Potentially harmful site-related contamination by inorganic constituents is generally not suspected when estimated ambient limit concentrations are not exceeded. Consequently, the inorganic constituents that fall into the third category were also screened against estimated ambient limit concentrations, which have been developed during the Tidal Area and Inland Area RIs for three separate areas of Naval Weapons Station Concord: the Tidal Area; the Inland Area underlain by the sandstone of Los Medanos Hills; and the Inland Area underlain by quaternary age alluvial deposits (PRC 1997 and PRC 1996). The estimated ambient limit concentrations for inorganic compounds at the Tidal Area of Naval Weapons Station Concord are currently under review by state and federal regulatory agencies. These estimated concentrations could be modified based on agency review comments. As a result, the estimated ambient limit concentrations for the Tidal Area should be considered proposed. The estimated ambient limit concentrations for the Inland Area were issued in draft form with the Inland Area Remedial Investigation (PRC 1996). Agency review has not resulted in comments that will revise the estimated ambient limit concentrations for the Inland Area. The estimated ambient limit concentrations are scheduled to be included without modification in the final Remedial Investigation for the Inland Area and should therefore be applied as final values. A summary of the estimated ambient limit concentrations for each area is presented in Table 31. A complete explanation of the derivation of the estimated ambient limit concentrations for the Tidal and Inland Areas is presented in Appendices C and D.

For this RFA confirmation study, all sample results for each metal exceeding residential or industrial PRGs were plotted on a histogram to visually compare the analytical results to the estimated ambient limit concentrations. In all cases, the comparison of the histogram plots to the estimated ambient limit concentrations suggests that these values are an appropriate criteria for the screening of the inorganic data for this study.

The following evaluation screens the analytical results where residential or industrial PRGs were exceeded in addition to the estimated ambient limit concentrations developed during the RI. Metals that exceeded PRGs and estimated ambient limit concentrations are arsenic, beryllium, lead, manganese, nickel, and thallium. Each of these are discussed below.

Arsenic

The range of detected arsenic concentrations was typically uniform, varying from 1.4 to 65.4 mg/kg in 193 samples where arsenic was detected.

Arsenic generally did not exceed the estimated ambient limit concentrations. The estimated ambient limit concentration for arsenic in the Tidal Area (SWMUs 37, 40, 44, and 50) of Naval Weapons Station Concord is 24 mg/kg. For sites located on the sedimentary hills formation alluvial deposits (SWMUs 13, 15, 17, 24, 51, 52, and 53), the estimated ambient limit concentration is 15 mg/kg. For sites on deposits related to the Los Medanos Hills formation (SWMUs 1, 2, 5, 7, 12/20, 14, 16, 18, 22, 23, 25, and 54) the estimated ambient limit concentration for arsenic is 7.3 mg/kg. Results for seven samples at four of the SWMUs exceed these estimated ambient limit concentrations, as shown on the following table.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND INDUSTRIAL PRG FOR ARSENIC

SWMU	Location (and Geologic Setting)	Boring I.D.	Sample Depth (feet)	Arsenic (mg/kg)	Estimated Ambient Limit Concentration for Geologic Setting (mg/kg)
2	Inland Area (Los Medanos Hills)	02-06	0.3 - 0.9	14.3	7.3
16	Inland Area (Los Medanos Hills)	16-04	0.5 - 1.5	8.3	7.3
		16-06	0.5 - 1.5	23.7	
23	Inland Area (Los Medanos Hills)	23-01	5.0 - 6.0	8.8	7.3
52	Inland Area (Sedimentary Hills)	52-03	0 - 0.5	65.4	15
		52-04	0 - 0.5	38.0	
		52-03	3.5 - 4.0	20.7	

The residential PRG for arsenic is 0.38 mg/kg. All analytical results for arsenic exceeded the residential PRG, and most also exceeded the industrial PRG (2.4 mg/kg). Each of these sample results exceeding estimated ambient limits are evaluated further in each applicable SWMU site section.

Beryllium

The estimated ambient limit concentration for beryllium in samples from the Tidal Area of Naval Weapons Station Concord (SWMUs 37, 40, 44, and 50) is 0.12 mg/kg. For sites located on deposits related to sedimentary formations (SWMUs 13, 15, 51, 52, and 53), the estimated ambient limit concentration is 0.12 mg/kg. For sites on deposits related to the Los Medanos Hills formation (SWMUs 1, 2, 5, 7, 12/20, 14, 16, 18, 22, 23, 25, and 54), the estimated ambient limit concentration is 0.56 mg/kg. Results for soil samples that contain beryllium exceeding the estimated ambient limit concentration and residential PRG are shown in the following table.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND RESIDENTIAL PRG FOR BERYLLIUM

SWMU	Location (and Geologic Setting)	Boring I.D.	Sample Depth (ft)	Beryllium (mg/kg)	Estimated Ambient Concentration for Geologic Setting (mg/kg)
24	Inland Area (Sedimentary Hills)	24-02	15.5-16.5	0.22	0.12
37	Tidal Area	37-07	0.0-1.0	0.36	0.12
		37-08	5.0-6.0	0.25	
44	Tidal Area	44-02	5.5-6.0	0.28	0.12
		44-02	10.5-11.0	0.25	
51	Inland Area (Sedimentary Hills)	51-02	5.0-6.0	0.41	0.12

The concentration of beryllium in the samples listed above are not necessarily representative of site contamination since the exceedance over the estimated ambient limit concentration is minimal (less than 0.3 mg/kg), the distribution of samples exceeding the estimated ambient limit is random, and there are no known uses of beryllium at the sites.

Empirical evaluation of the sample results, rather than a rigorous evaluation process, is used to evaluate the exceedence of the estimated ambient limit concentration criteria. As such, the evaluation relies on: (1) comparison of the concentration of the constituent relative to the estimated ambient concentration, (2) the location of the samples exceeding the criteria, (3) the concentration of the constituent in nearby samples, (4) the known current or former operations at the SWMU site, and (5) an evaluation of the concentration of the constituent in the nearby septic tank water, if applicable.

The residential PRG for beryllium is 0.14 mg/kg, and the industrial PRG is 1.1 mg/kg. Of the 203 samples analyzed, beryllium was detected in 20 samples. The industrial PRG was not exceeded in any sample. The maximum concentration of beryllium detected was 0.52 mg/kg. (The sample containing 0.52 mg/kg of beryllium was taken from SWMU 09 where the estimated ambient limit concentration is 0.56 mg/kg; the above table lists only samples exceeding the estimated ambient limit concentrations and the PRG). The sample quantitation limit varied from 0.02 to 0.38 mg/kg, while the detected concentrations varied from 0.22 to 0.52 mg/kg.

Because of the low concentrations detected and because industrial PRGs are not exceeded, beryllium is not proposed for further evaluation and is therefore not discussed in the SWMU site evaluation section.

Lead

Analytical results for three soil samples at SWMU sites exceeded the State of California modified residential PRG for lead (130 mg/kg). No samples exceeded EPA's industrial PRG for lead (1,000 mg/kg). The estimated ambient limit concentrations for lead, ranging from 18 mg/kg in the Inland Area to 61 mg/kg in the Tidal Area, are below the residential PRG. A list of sample results that exceed the residential PRG for lead are presented below.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND RESIDENTIAL PRG FOR LEAD

SWMU	Location (and Geologic Setting)	Boring	Sample Depth (feet)	Lead (mg/kg)	Estimated Ambient Limit Concentration for Geologic Setting (mg/kg)
2	Inland Area (Los Medanos Hills)	02-06	0.3 - 0.9	334	18
7	Inland Area (Los Medanos Hills)	07-01	4.5 - 5.0	375	18
52	Inland Area (Sedimentary Hills)	52-03	0 - 0.5	165	32

Each of these sample results is evaluated further in each applicable SWMU site section.

Manganese

EPA recently revised the oral reference dose for manganese (EPA 1996), but the PRGs were not recalculated by the EPA. Using the same equations that EPA Region IX uses to derive the listed PRGs and the revised oral reference dose, the PRGs were recalculated by PRC. The revised residential PRG is 3,200 mg/kg and the industrial PRG is 8,300 mg/kg. Two samples containing manganese exceeded the residential PRG (3,200 mg/kg) and also exceeded the industrial PRG (8,300 mg/kg). The range of detected concentrations was typically uniform, varying from 75.1 to 12,100 mg/kg in 203 samples where manganese was detected.

The estimated ambient limit concentration for manganese in the Tidal Area of Naval Weapons Station Concord (SWMUs 37, 40, 44, and 50) is 840 mg/kg. For sites located on deposits related to sedimentary formations (SWMUs 13, 15, 17, 24, 51, 52, and 53), the estimated ambient limit concentration is 1,300 mg/kg. For sites on deposits related to the Los Medanos Hills formation (SWMUs 1, 2, 5, 7, 12/20, 14, 16, 18, 22, 23, 25, and 54), the estimated ambient limit concentration for manganese is 870 mg/kg. The samples listed in the following table may represent site contamination as they exceed these estimated ambient limit concentrations and the residential PRG.

Manganese concentrations in seven samples exceed the estimated ambient limit concentration; however, only two of these sample results simultaneously exceeded the residential PRG for manganese. Concentrations in all other samples ranged from 75.1 to 1,600 mg/kg. A list of sample results that exceed the PRG and estimated ambient limit concentrations for manganese are presented below.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND RESIDENTIAL PRG FOR MANGANESE

SWMU	Location (and Geologic Setting)	Boring	Sample Depth (feet)	Manganese (mg/kg)	Estimated Ambient Limit Concentration for Geologic Setting (mg/kg)
12/20	Inland Area (Los Medanos Hills)	12-03	15.0 - 16.0	12,100	870
15	Inland Area (Sedimentary Hills)	15-03	4.0 - 4.5	9,090	1,300

Each of these sample results is evaluated further in the applicable SWMU site section.

Nickel

The concentration of nickel ranged from 6.3 mg/kg to 2,160 mg/kg in 197 samples where nickel was detected. The State of California modified residential PRG for nickel is 150 mg/kg. Nickel concentrations in six samples exceeded this PRG; however, none of the sample results exceeded the industrial PRG (34,000 mg/kg). The estimated ambient limit concentrations for nickel in the Tidal Area and Inland Areas of Naval Weapons Station Concord are lower than the residential PRG. A list of sample results that exceed the residential PRG is presented below. Each of these sample results is evaluated further in each applicable SWMU site section.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND RESIDENTIAL PRG FOR NICKEL

SWMU	Location (and Geologic Setting)	Boring	Sample Depth (feet)	Nickel (mg/kg)	Estimated Ambient Limit Concentration for Geologic Setting (mg/kg)
7	Inland Area (Los Medanos Hills)	07-01	4.5 - 5.0	2,160	86
12/20	Inland Area (Los Medanos Hills)	12-02	5.0 - 6.0	165	86
14	Inland Area (Los Medanos Hills)	14-02	10.5 - 11.0	164	86
		14-02	16.0 - 16.5	256	
15	Inland Area (Sedimentary Hills)	15-03	4.0 - 4.5	196	100
24	Inland Area (Los Medanos Hills)	24-01	16.0 - 16.5	195	100

Thallium

EPA Region 9 lists PRGs for various thallium salts, but not for thallium as a metal. Because the soil analytical data are reported for thallium as a metal, a PRG for the metal was calculated. A reference dose (RfD) for thallium was first calculated from the RfD for thallium sulfate, using a molecular weight conversion factor. Using the same equations EPA Region 9 used for the derivation of its listed PRGs and the thallium RfD (0.0007 mg/kg per day), the PRG for metallic thallium was calculated at 5.4 mg/kg and the industrial PRG is 120 mg/kg. The residential PRG was exceeded in two samples, but the industrial PRG was not exceeded in any sample. The concentration of thallium ranged from 0.57 to 15.6 mg/kg in 38 samples where thallium was detected.

The estimated ambient limit concentrations for thallium in the Tidal and Inland Areas of Naval Weapons Station Concord ranged from the analytical method detection limits to 1.4 mg/kg.

The two sample results that exceed the residential PRG for thallic oxide are presented below.

SOIL SAMPLE RESULTS EXCEEDING ESTIMATED AMBIENT LIMIT CONCENTRATIONS AND RESIDENTIAL PRG FOR THALLIUM

SWMU	Location (and Geologic Setting)	Boring	Sample Depth (feet)	Thallium (mg/kg)	Estimated Ambient Limit Concentration for Geologic Setting (mg/kg)
12/20	Inland Area (Los Medanos Hills)	12-03	15.0 - 16.0	15.6	Detection Limit
15	Inland Area (Sedimentary Hills)	15-03	4.0 - 4.5	11.0	Detection Limit

Each of these sample results is further evaluated in each applicable SWMU site section.

5.0 SWMU SITE DESCRIPTIONS, CONCLUSIONS, AND RECOMMENDATIONS

This section presents detailed descriptions of the site background, sampling performed, investigation results, and conclusions and recommendations for each of the 24 SWMU sites. SWMU 12 is combined with SWMU 20 because of the close proximity of the two.

The location of each SWMU is shown on a detailed site plan (refer to Figures 10 through 35). A standard legend for all of the detailed site plans appears on Figure 9. These site plans illustrate the pertinent site details such as locations of all soil borings and wells, and summaries of the analytical results for all soil and groundwater samples collected for this investigation.

5.1 SWMU 1 - BUILDING IA-6

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 1. A site plan of SWMU 1 is presented on Figure 10.

5.1.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 1.

Site Description

Building IA-6 was constructed in the 1940s and is located approximately 0.75 miles east of the main entrance and on the south side of Kinne Boulevard. The building is a boiler house that supplies heat to several structures in the Inland Area. It houses three steam boilers used for heating administrative and shop buildings. Two of the three boilers were configured to burn natural gas; the third boiler was configured to burn diesel fuel oil in case of loss of natural gas supply. The UST located about 15 feet south of Building IA-6 was removed in 1989.

The ground surface in the vicinity of Building IA-6 generally slopes to the southwest, and has an elevation of approximately 48 feet msl. Seal Creek, an intermittent stream, runs southwest of the site. The area south and west of Building IA-6 is generally bordered by unpaved open space, with the exception of Building IA-4 and the electric substation. The area to the east is a paved driveway and parking area. A gravel driveway that intersects Kinne Boulevard is located along the south and west sides of Building IA-6.

Groundwater flow is in a northwest direction, approximately paralleling Kinne Boulevard.

Along the west side of the building, a boiler purge water holding tank serves as a grease and sand trap and prevents oil and debris from entering the sanitary sewer system. This trap is inspected and cleaned every 3 months as required by the wastewater discharge permit from the Contra Costa County Sanitary District.

A 6-inch-diameter pipe was noted at the bottom of a 1-foot-deep hole in the ground located about 4 feet north of the purge water holding tank grease and sand trap. An area approximately 10 by 20 feet was saturated, and ponded water was noted adjacent to the purge water holding tank and to the east of the gravel road that crosses the west side of Building IA-6. The date and source of this observation of ponded water is unknown. A visit to the SWMU on April 13, 1994, revealed that grass was not growing well in the area that had been saturated. The source of the ponded water is believed to be boiler purge water that leaked from a broken line leading to a purge water holding tank located near the western corner of Building 1A-6. While being operated, the boilers were purged after each shift. The boilers were removed from service during 1994.

Previous Investigations

In September 1987, water entered the UST through an open access portal while the lid was being removed for repairs, causing the UST to overflow. An estimated 1,900 gallons of diesel fuel was reportedly released from the UST. Following the fuel release, Riedel Environmental Services, Inc. (RES) conducted an environmental assessment. Trenches were excavated in December 1987 to explore the extent of soil contamination. In April 1988, RES installed monitoring well MW-1 approximately 20 feet west of the UST. Most trenches were excavated to the west of MW-1 and south of the former UST. None of the soil or water samples collected from the trenches contained detectable total petroleum hydrocarbons (TPH) reported as diesel (TPHd) (RES 1988).

RES removed the UST in June 1989. About 80 cubic yards of contaminated soil was excavated. At the time of UST removal, a soil sample collected from the west side of the UST excavation pit indicated the presence of TPHd. However, TPHd was not detected in a sample collected from the east side of the UST excavation pit (Fugro-McClelland 1993). Diesel fuel was detected in a groundwater sample collected from the bottom of the excavation.

After the UST was removed, monitoring wells MW-2 and MW-3 were installed, located 100 feet southeast and 100 feet south of Building 1A-4, in July 1989. In August 1989, RES measured 0.40 feet of floating product in well MW-01. RES suspected that the measured product was not representative of product floating on groundwater. RES bailed the well and remeasured a product thickness of 0.01 feet on August 29 and August 31. In September 1990, PRC installed monitoring well MW-4, located approximately 120 feet northwest of the former UST. On September 16, 1990, PRC collected groundwater samples from monitoring wells MW-1, MW-2, MW-3, and MW-4. Floating product 1.5 inches thick was measured in well MW-1. TPHd was detected in the water from monitoring wells MW-2 and MW-4. PRC sampled the four wells again on November 15, 1990. TPHd was detected in a sample from well MW-1, and no petroleum hydrocarbons were detected in samples from well MW-2, MW-3, or MW-4. Fugro-McClelland sampled the four monitoring wells on August 12, 1992 and observed floating product in well MW-1. No TPHd or TPHg was detected in samples from any of the other three monitoring wells. Fugro-McClelland sampled all of the monitoring wells again on April 4, 1993 except for well MW-1 which was not accessible. Analytical results of groundwater samples did not indicate TPHd or benzene, toluene, ethylbenzene, and xylenes (BTEX). Analytical results confirmed the presence of halogenated volatile organic compounds (VOC) in groundwater samples collected from each of the monitoring wells.

On September 2 and 3, 1993, Fugro-McClelland installed wells MW-5 and MW-6 and collected groundwater samples from monitoring wells MW-2, MW-3, MW-4, MW-5, and MW-6. Groundwater in monitoring well MW-1 was not sampled because a thin film of floating product was observed. No TPHd or BTEX was detected in samples from any of the monitoring wells that were sampled. Tetrachloroethene (PCE) was detected in all monitoring wells. At monitoring well MW-5, chloroform, 1,1-dichloroethene, and trichloroethene were detected.

In 1996, Naval Weapons Station Concord hired CAL Inc. to excavate contaminated soil surrounding the location of the former UST. Shoring was installed to enable the excavation of contaminated soil in close proximity to Building IA-G. Approximately 180 cubic yards were exported from the site for off-site landfill disposal. During the excavation, MW-1 was abandoned to enable the removal of the contaminated soils surrounding it. Confirmation samples were obtained at the excavation sidewalls. Of the six samples analyzed from the excavation sidewall, three contained detectable concentrations of TPHd. Of these, only one sample collected adjacent to Building IA-6 contained TPHd at a concentration exceeding the cleanup criteria established for the job (100 mg/kg). The sample SW-2 contained 380 mg/kg TPHd. Additional excavation could not be completed without significant risk or expense in the vicinity of sample SW-2 due to the proximity of Building IA-6. The other two sidewall soil samples contained TPHd at 52 and 69 mg/kg, respectively. None of the soil samples analyzed contained BTEX constituents. Upon receipt of the confirmation sample results, the excavation was backfilled with clean imported soils and some of the clean on-site soils from the remedial excavation. Soil from the remedial excavation was considered clean when composite sample analysis did not detect TPHd exceeding its cleanup goal concentration of 100 mg/kg. The site groundwater will be monitored on a quarterly basis for 1 year. Upon receipt of confirmation that little or no impact is detected off site, the Navy will request UST case closure by the RWQCB without any requirement for further action.

5.1.2 RFA Confirmation Study Sampling

The RFA designated SWMU 1 as a high priority for future investigation because of the documented hydrocarbon release. This subsection describes the soil and groundwater sampling performed at SWMU

1 to investigate the hydrocarbon contamination and other potential contamination at the site. Boring locations are shown on Figure 10.

Soil

The objective of soil sampling at SWMU 1 was to (1) evaluate soils located in the vicinity of the purge water holding tank, grease and sand trap, and area where distressed vegetation was noted, and (2) to evaluate the extent of hydrocarbon contamination associated with the former diesel fuel spill. Six soil borings (01-01 through 01-06) were advanced using Geoprobe sampling methods at the locations shown on Figure 10. Samples recovered from borings near the oil water separator and purge water holding tank were analyzed for oil and grease, TPHg, and VOCs. Samples collected to investigate the limits of hydrocarbon contamination were analyzed for TPHd, TPHmo, and BTEX.

Groundwater

The objective of groundwater sampling was to evaluate groundwater underlying the SWMU. Previous analytical data indicated that groundwater contained dissolved VOCs and petroleum hydrocarbons. Groundwater samples were collected from monitoring wells MW-1 through MW-6 to verify the existence and concentrations of VOCs and petroleum hydrocarbons in groundwater.

5.1.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Tables 5A and 5B and on Figure 10.

Soil

The soil investigation at SWMU 1 was focused on two potential areas of contamination. The first was associated with boiler purging operations and the oil and grease sand trap located on the west side of Building IA-6. In this area, ponded water and a sparse growth of grass were observed. PRC probed and sampled three borings in the area (01-01, 01-02, and 01-03). Three to four soil samples were collected from each boring between the ground surface and 15 feet bgs and were analyzed for TPHg, TPHd, oil and grease (O&G), and VOCs. Oil and grease were detected to a maximum concentration of 130 mg/kg in a sample from boring 01-01. None of the other analytes were detected.

Borings 01-04, 01-05, and 01-06 were probed in the area surrounding the former UST at Building IA-6. Two to three soil samples were collected from each boring and analyzed for TPHd, TPHg, and BTEX. TPHd and BTEX were detected in soil samples collected at depths of up to 14.5 feet. The maximum concentration of TPHd was detected 10 feet below the ground surface in boring 01-06 at a concentration of 350 mg/kg. TPH as motor oil (TPHmo) was also detected at some locations but, when present, was not as concentrated as TPHd.

Groundwater

Groundwater samples were collected from the six wells located at SWMU 1 and analyzed for TPHd, TPHg, O&G, BTEX, and VOCs.

TPHd and TPHmo were only detected in groundwater samples from wells MW-1 and MW-5, located downgradient from the former UST. The sample from well MW-1 contained 960 micrograms per liter (μg/L) of TPHd and 240 μg/L of TPHmo. Since the last groundwater sampling from MW-1, the well has been abandoned and contaminated soil surrounding the well has been disposed of off-site. The sample from well MW-5 contained 150 μg/L TPHmo but did not contain detectable TPHd.

PCE was the only VOC detected and was present in water samples from each well except the upgradient well (MW-2). PCE was consistently detected at low estimated (J qualified) concentrations of 5 to 6 μg/L, which is slightly below the EPA Contract Laboratory Program required detection limit of 10 μg/L. Although PCE was not detected in samples from well MW-2 during the recent sampling event, it was detected during sampling in September 1993. The recorded presence of PCE in all wells of SWMU 1 (including the upgradient well) indicates that the source of PCE is upgradient of and not associated with SWMU 1.

5.1.4 Conclusions and Recommendations

Oil and grease was detected in soil samples in the vicinity of the former oil water separator and boiler purge water holding tank. The oil and grease concentrations detected were less than 130 mg/kg in all soil samples. The O&G method of analysis sometimes detects naturally occurring oils in the soil from plant organic matter. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are insufficient to determine if the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. Although there is no regulatory criteria or applicable standard for the evaluation of oil and grease concentrations in soil, empirical evaluation suggests that the O&G concentrations are relatively low. Because O&G was the only constituent detected in these borings surrounding the oil water separator and purge water holding tank and because the O&G was detected at a low concentration, the O&G is most likely from a naturally occurring source. Even if the O&G is the result of site contamination, because of its low levels, it is unlikely to pose any risk to human health or the environment. There is no evidence to suggest that the boiler purge tank or the grease and sand trap have leaked hazardous constituents to the environment.

In September 1987, a significant diesel spill at SWMU 1 contaminated soil and groundwater. Soil and groundwater at the site still contain detectable contamination. The extent and concentration of hydrocarbon contamination is well quantified at SWMU 1. The site can be described as a low-risk groundwater case per RWQCB guidance, as described in the following paragraphs.

A January 5, 1996 RWQCB memorandum provides RWQCB supplemental instructions to the State Water Board December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Sites. Specifically, the memorandum identifies six criteria that must be met to identify a low-risk groundwater case. The former UST at SWMU 1 qualifies as a low-risk groundwater site because it satisfies all six criteria as follows:

1. The leak has been stopped and ongoing sources, including free product, removed or remediated.

   The UST was removed in 1989 along with 80 cubic yards of surrounding contaminated soil. The excavation was backfilled with clean imported fill. Subsequent soil remediation in 1996 has resulted in the removal and disposal of an additional 180 cubic yards from the site. In the latest monitoring event, free product was not found, the maximum concentration of TPHd detected in the soil confirmation samples is 380 mg/kg.

2. The site has been adequately characterized.

   The lateral limits of significant soil contamination has been explored, excavated, and removed from the site for landfill disposal. The lateral extent of groundwater contamination has also been determined. The site is therefore adequately characterized.

3. The dissolved hydrocarbon plume is not migrating.

   The original spill occurred in 1987. The hydrocarbon contamination in soil during the recent field investigation (1995) exceeding 10 mg/kg is not present within a distance of 40 feet downgradient of the former UST. As illustrated in the following table, the concentrations of TPHd and TPHmo decrease rapidly with distance from the former source in groundwater (1995 data).

Well Identification	Distance from Former UST (feet)	Concentration of TPHd in Groundwater (μg/L)	Concentration of TPHmo in Groundwater (μg/L)
MW-1	25	960	240
MW-5	60	< 100	150
MW-6	120	< 100	< 100

   Since the 1995 groundwater sampling, additional soil remediation has been conducted and quarterly groundwater monitoring is currently being conducted.

4. No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be affected.

   Three wells were formerly located within approximately 3,000 feet of the site adjacent to Kinne Boulevard. These were abandoned and sealed by the Navy in 1995. The U.S. Geological Service (USGS) topographic map of the site area indicates a well for the golf course within about 2,000 feet of the site (Figure 8). In addition, the city of Concord has a number of municipal water wells that surround Mallard Reservoir more than 5,000 feet northwest of the site.

   The limits of groundwater impact from the former UST are bounded by well MW-6 located 120 feet away.

5. The site presents no significant risk to human health.

   There is no complete pathway for contaminated soil because the affected soils have been remediated and the highest detected concentration of residual contamination is deeply buried (deeper than 10 feet). Since there are no drinking water wells in the vicinity of the site, the drinking water pathway need not be considered in this assessment.

6. The site presents no significant risk to the environment.

   Contaminated soil is not present near the ground surface and there is no exposed surface water within the contaminated plume area that can be influenced.

Current site information indicates that the site is a low-risk groundwater case according to the RWQCB criteria. However, site groundwater has never been monitored quarterly to verify the groundwater information consistently through each season. The RWQCB management strategy for such cases includes monitoring for a minimum of 1 year to determine if conditions will remain stable or improve over time. Therefore, groundwater at SWMU 1 should be monitored on a quarterly basis for 1 year. If the current status of groundwater is confirmed, the Navy will request site closure under RWQCB lead as a low-risk groundwater case. Quarterly groundwater monitoring is now being conducted under contract N62474-94-C7559 with CAL Inc.

A low concentration of PCE present at SWMU 1 is associated with an upgradient off-site source. During the recent sampling, PCE at SWMU 1 was present at a concentration approximately equal to the Maximum Contaminant Level (MCL) for drinking water (5 µg/L), per Title 22 of the Code of California Regulations. There is no evidence of discharges of hazardous materials from the boiler cleaning operations at SWMU 1, and no hazardous constituents associated with SWMU 1 were detected in soil or groundwater. The site is recommended for no further action under the RCRA corrective action program. Since the source of PCE contamination in groundwater has not been determined, a CERCLA investigation should be pursued to determine the source of PCE contamination. The investigation encompassing SWMUs 2, 5, 7, and 18 should be used to evaluate the source and extent of PCE contamination at SWMU 1.

5.2 SWMU 2 - BUILDING IA-7

This section presents site background, sampling performed, investigation results, and conclusions and recommendations for SWMU 2. The features of the site are presented in Figure 11.

5.2.1 Site Background

Building IA-07 was constructed in the 1940s and is about one-half mile south of the main entrance, on the west side of Kinne Boulevard. The building is a fire station for the Inland Area. Between 1969 and 1973, fire-fighting training activities were conducted twice a year in a shallow pit located south of the fire station. Fuel oil and napalm were used in the practice burns. Extinguisher chemicals used included potassium chloride, sodium chloride, ammonium phosphate, and potassium carbonate. Between 1969 and 1973, residues of these chemicals were reported to have been scraped off the ground and disposed of in the Seal Creek bed (usually dry), which runs just south of the fire station. Since 1973, practice burns were conducted in shallow metal pans. Chemical residues remaining in the pans were disposed of at approved sites.

Two storage facilities, Building 114 and Building 416, are located south of Building 1A-07. The area south of Building 114 slopes gradually toward Seal Creek, which is about 200 feet to the south. This area is overgrown with grass and trees.

The area east of Building IA-07 is paved and used for parking vehicles. The parking area extends 300 feet east and approximately 200 feet to the south. Aerial photographs show that during the period from 1976 to 1986, the parking area was expanded to the south. The 1976 aerial photograph shows the parking lot boundary extending from Building IA-07 east to Building IA-08, and shows the area to the south of the parking lot as having been partially backfilled. The present parking lot extends 150 feet south of Building IA-07.

A storm drain located 50 feet east of Building IA-07 flows into the drainage ditch about 100 feet south of the building. The drainage ditch flows to the south into Seal Creek. This drainage was not present in the 1957 aerial photograph, and the storm drain may not have been in place then. Aerial photographs from 1969 show that the storm drain may have been installed during the period from 1957 to 1969. The aerial photograph from 1986 shows that the drainage from the storm drain outfall shifted slightly to the west when the parking lot was expanded to the south. One of the satellite accumulation points for hazardous waste is adjacent to the storm drain outfall. The hazardous waste is held in drums in a yellow metal shed until it is delivered to the hazardous waste storage facility at Building 433.

5.2.2 RFA Confirmation Study Sampling

The RFA designated SWMU 2 a high priority for future investigation because of a documented release consisting of burning napalm and dumping of residue at the burn pit. Investigations at SWMU 2 included soil sampling from borings and a trench excavation to investigate the area to determine if hazardous constituents were released because of these activities. These investigations are described below. Figure 11 shows the locations of the borings and the trench. The RFA conducted by EPA in 1992 reported direct disposal of fire extinguisher residues to Seal Creek between 1969 and 1973. The basis and accuracy of this statement have not been confirmed. The RFA confirmation study work plan did not propose direct sampling within Seal Creek because of the low probability that any residues would remain after 23 years of winter creek flows. Visual inspection of the area near SWMU 2 did not reveal depositional areas within the Seal Creek channel that appeared to have accumulated waste material or debris. Sediment sampling within the creek remains a possibility, but is not recommended due to the low probability of any residue remaining within the creek.

Soil

The objective of soil sampling at SWMU 2 was to evaluate soils underlying the former burn area and soils along the drainage to Seal Creek for potential contamination because of former fire fighting practices and potential spills of hazardous materials from the hazardous materials accumulation area. In addition to analysis for various hazardous materials, the soils were analyzed for anions because anions are reportedly used in firefighting. Discovery of anions at high concentrations in soil could indicate that the area was used for practice burns. Four soil borings (02-01, 02-02, 02-03, and 02-04), spaced at approximately 50-foot intervals, were advanced to depths of 3 to 4.5 feet bgs along the drainage leading to Seal Creek. Two soil borings (02-07 and 02-08) were advanced to 4.5 and 5 feet bgs adjacent to the building located at the hazardous waste accumulation area. Two soil borings (02-05 and 02-06) were advanced to 4.5 feet bgs in the area of the former burn pit. Five additional borings (02-10, 02-11, 02-12, 02-13, and 02-14) were advanced to depths of 6 to 7.0 feet bgs to evaluate the area for hydrocarbons, VOCs, and SVOCs.

One trench (02-09) located approximately 30 feet southeast of Building 114 was excavated and sampled. The soil samples were collected from the ends and in the center of the trench. The trench was approximately 18 feet long, 16 inches wide, and 4.5 feet deep. Soil samples were collected from native soil. A log of the trench is presented in Appendix A.

Groundwater

The objective of groundwater sampling was to evaluate groundwater underlying the SWMU for potential hydrocarbon and VOC impacts. Groundwater samples were obtained from borings 02-10 and 02-14.

5.2.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Tables 6A and 6B and on Figure 11.

Soil in borings 02-01, 02-02, 02-03, 02-04, 02-05, 02-06, 02-07, 02-08, and trench 02-09 located along the drainage leading to Seal Creek and adjacent to the hazardous waste accumulation area and burn area was sampled to a maximum depth of 5.0 feet and analyzed for metals, hydrocarbons, BTEX, and anions. The soil was analyzed for anions because they are sometimes associated with fire fighting chemicals. Soil in borings 02-10, 02-11, 02-12, 02-13, and 02-14 located near the burn pit was sampled to a maximum depth of 7 feet and analyzed for TPHd, TPHg, and BTEX. Soil from boring 02-12 was also analyzed for VOCs, semivolatile organic compounds (SVOC), and metals. Elevated concentrations of TPHg and BTEX were not detected.

Low concentrations of TPHd and TPHmo (<36 mg/kg) were detected in some of the borings. Potentially elevated concentrations of anions may be present at some locations.

One soil sample in boring 02-06 at a depth of 0.3 feet contained arsenic at a concentration of 14.3 mg/kg, which is above the estimated ambient limit concentration of 7.3 mg/kg and the residential PRG of 0.38 mg/kg. The same soil sample also contained lead at a concentration of 334 mg/kg, which is above the estimated ambient limit concentration of 18 mg/kg and the state of California modified PRG of 130 mg/kg. Although the lead and arsenic are in excess of the estimated ambient limit concentration in the near-surface sample of boring 02-06, elevated concentrations were not detected in any other soil sample at the site. Neither constituent is a known site contaminant.

The borings drilled in the former burn pit area (02-05, 02-06,02-12, and 02-13) contained hydrocarbon constituents (TPHd, TPHmo, and BTEX) in one or more soil samples. VOCs and SVOCs were analyzed in soil from boring 02-12, but were not detected. TPHg was not detected in any soil sample collected at SWMU 2. The depth and concentration of TPH constituents in soil were highly variable. Concentrations of TPHd as high as 130 mg/kg and TPHmo as high as 3,400 mg/kg were detected. The distribution of contaminated soils at SWMU 2 is random and without any identifiable source. Only three samples contained TPHmo in excess of 500 mg/kg. These included the sample from 0.3 feet in boring 02-06 (TPHmo = 3,400 mg/kg), the sample from 2 feet in boring 02-13 (TPHmo = 1,100 mg/kg), and the sample from 0.3 feet in 02-05 (TPHmo = 680 mg/kg). Both vertically and laterally, no pattern of hydrocarbon contamination was identified. In all cases, the concentrations of these constituents diminished significantly with depth and there was no soil contamination identified that extended to the depth of groundwater.

Anions were detected in several soil samples. Most of the analytes in the anion classification do not have published residential PRGs. Nitrite is the exception but the concentration of nitrite in the soil samples did not exceed the method detection limits.

Groundwater

Groundwater samples collected at the site contained TPHd (up to 130 μg/L), TPHmo (up to 120 μg/L), and BTEX (up to 4.90 μg/L). No other VOCs were detected in any groundwater samples.

5.2.4 Conclusions and Recommendations

VOCs and SVOCs were not detected in soil samples at the site and anions were not detected at concentrations of concern. However, the soil samples containing the highest concentrations of TPH were not analyzed for VOCs and SVOCs. Although VOCs and SVOCs were not analyzed in the soil samples with the highest concentrations of hydrocarbons, VOCs and SVOCs were not detectable in nearby soil samples, suggesting that the hydrocarbons released were not associated with a significant release of VOCs or SVOCs. TPHmo was detected in three soil samples at concentrations exceeding 500 mg/kg. Generally, each of the soil samples was collected in areas where surrounding samples (laterally and vertically) did not indicate significantly elevated hydrocarbons. All three soil samples containing a TPHmo concentration in excess of 500 mg/kg were underlain by soil samples containing less than 30 mg/kg TPHmo. As evidenced by surrounding soil samples, the volume of TPH-contaminated soil is limited to a small surface area(s).

Arsenic and lead in the shallow soil sample in boring 02-06 were detected above estimated ambient limit concentrations; however, soil samples collected from immediately below the shallow soil sample and from the surrounding borings did not contain arsenic or lead at concentrations above the estimated ambient limit concentrations. Based on the observed distribution of lead and arsenic detected, it appears that metals exceeding residential PRGs are isolated in lateral and vertical extent. The low incidence of arsenic and lead concentrations exceeding both the residential PRG and estimated ambient limit concentrations also suggests that a relatively small volume of soil exceeds both these criteria. A small volume of affected soil tends to limit the soil's potential to act as a source of contamination to other areas and also limits the risk associated with direct exposure. Another factor that tends to limit the potential threat of these constituents is their tendency to adsorb to fine-grained soils. For the above reasons, no further investigation or evaluation of arsenic and lead are recommended for the site.

TPHg was not detected at SWMU 2. Extractable TPH (TPHd and TPHmo) does not have any applicable regulatory criteria or a PRG for soils. Three soil samples at SWMU 2 contained extractable TPH exceeding 500 mg/kg. Each of these samples was located adjacent to another sample with significantly lower or nondetected concentrations of hydrocarbons (vertically or laterally). The low and dispersed incidence of these higher concentrations of TPH suggests a small release of TPH and a relatively small volume of significantly affected soils. A small volume of affected soil tends to limit the soil's potential to act as a source of contamination and also limits the risk associated with direct exposure. Because of the limited extent of extractable TPH in soil and lack of toxic constituents detected, there is a low risk to human health and the environment. In addition, extractable TPH constituents have a strong tendency to adsorb to soil particles, and thus the migration potential for these constituents is very limited. Because of the heterogeneous nature of soil contamination (evidenced by the limited lateral extent of contaminated soil) and lack of hazardous constituents detected, no removal or further investigation of soil is currently recommended at SWMU2.

The source of TPH detected in groundwater is unknown and should be determined. Additional investigation is recommended to locate the source, determine no ongoing release, and evaluate remedial alternatives. Additional sampling and analysis of groundwater should be conducted upgradient of the site to locate the source of the groundwater contamination and to evaluate the lateral extent of contaminated groundwater. Since the source and extent of groundwater contamination is unknown, and several SWMU sites in the vicinity exhibit groundwater contamination, including hazardous constituents at some locations, a CERCLA process investigation is recommended encompassing SWMUs 2, 5, 7 and 18.

5.3 SWMU 5 - BUILDING IA-12

This section presents site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 5. Figure 12 shows the locations of significant site features at SWMUs.

5.3.1 Site Background

Building IA-12 was constructed in the early 1940s and is in the main industrial complex of Naval Weapons Station Concord, approximately 1 mile east of the main entrance and north of Kinne Boulevard. The building houses the locomotive repair shop where approximately 1,100 pieces of railway, automotive, construction, and weight-handling equipment were maintained.

Battery maintenance and recharging was conducted at the northeast corner of Building IA-12. Water was added to batteries that were low in liquid. This procedure was discontinued in early 1992. Batteries, that are recycled, are stored in a satellite accumulation point on the north side of Building IA-12. Approximately 49 automotive batteries are recycled annually. Approximately 24 locomotive batteries have also been recycled from this facility in the past 5 years. Battery acids from automotive and locomotive batteries are drained into a 5-gallon carboy, which is then delivered to Mare Island Naval Ship Yard for recycling. The outside of the battery casings are rinsed and neutralized prior to recycling. A grease and sand trap is located along the northwest interior wall of Building IA-12.

Waste is generated and accumulated at various locations around Building IA-12. A locomotive and rail car steam cleaning area was approximately 60 feet west of Building IA-12. (A new railcar steam cleaning facility and wastewater collection system was constructed in 1995 at the same location.) Wash water from the steam cleaning area was collected from the north and west sides of the pad. Records show that the pad steam cleaning area was installed in 1976 to collect oily wastes for processing through an oil/water separator. The oil/water separator, located about 5 feet west of the steam cleaning area, was a single-walled, 6-inch-thick concrete sump with a 200-gallon capacity. The separator was about 4 feet wide, 9 feet long, and 7 feet deep. The oil/water separator was also known as Sump Container No. IA-12B. It is cleaned annually by a contractor that pumps the contents to a vacuum truck. The oil water separator is inspected biannually. The separator was inspected on January 21, 1997, and was last pumped out on September 23, 1996. The water from the separator drains into a manhole through 6-inch-diameter vitrified clay pipe located about 190 feet west of the separator. The water discharges to the sewer system under the Naval Weapons Station Industrial Waste Discharge Permit, with the approval of the Contra Costa County Sanitation District.

A diesel fuel transfer pump is located at the northwest corner of Building IA-12. The dispenser is connected to an active 10,000-gallon UST located about 50 feet north of Building 1A-12 and built in 1944.

A 6,000-gallon capacity waste oil UST was located along the south side of Building IA-12. It was used to store waste oil generated from locomotives. A sink on the outside platform delivered the waste oil to the UST. The UST was removed during 1993 as part of a RCRA closure. The waste oil UST was removed on November 4, 1994. The soil samples collected at the time of the UST removal did not contain detectable VOCs, PAHs, TPHd, BTEX, fluoride, or asbestos. The samples contained low concentrations of TPHmo. Metals were detected, but were not judged to be the result of contamination.

After the UST was removed, a small additional volume of soil (36 cubic yards) was excavated and confirmation soil samples were collected at the limits of the excavation. One analytical test result from the final confirmation soil samples contained petroleum hydrocarbons at a concentration of 25 mg/kg. The remaining three soil samples did not contain detectable hydrocarbons. A request for clean closure of the UST was submitted by the Navy to DTSC on June 2, 1994. The UST was certified closed in a March 21, 1995 letter by Mr. Lester Kaufman of DTSC.

Stained asphalt is visible along the northeast wall of Building 1A-12. A stained area (approximately 3 by 10 feet) was also observed along the southeast wall. Staining was observed around the diesel fuel transfer pump. Based on visual examination, the staining appears to be associated with the use of fuels and oils or the storage of batteries.

5.3.2 RFA Confirmation Study Sampling

The RFA identified several hazardous waste accumulation areas at SWMU 5 and designated SWMU 5 as a medium-priority site for future investigation because of visible oil or hazardous waste stains. Since there was no confirmed released of hazardous constituents at the site, the priority of the SWMU was not elevated. Soil and groundwater sampling investigations were performed at SWMU 5. These investigations are summarized below. Figure 12 shows the soil boring locations.

Soil

The objective of soil sampling at SWMU 5 was to investigate site soils for potential releases of hazardous constituents at each of the five areas where hazardous wastes were stored or surface staining was observed.

One soil boring (05-03) was advanced to 20.5 feet bgs adjacent to the grease and sand trap, and one soil boring (05-04) was advanced to 21 feet bgs within 5 feet of the edge of the oil/water separator. Samples from both of these borings were analyzed for metals, TPHd, TPHmo, O&G, VOCs and SVOCs.

One soil boring (05-02) was advanced to 26 feet bgs within 5 feet of the edge of the fuel dispenser. Samples from this boring were analyzed for TPHg, TPHd, TPHmo, and BTEX.

Two soil borings (05-07 and 05-08) were advanced to 5.5 and 4.5 feet bgs, and one soil boring (05-01) was advanced to 20.5 feet bgs in a paved area along the north wall of Building IA-12 (battery accumulation area). Soils from each of these borings were analyzed for metals.

Two soil borings (05-05 and 05-06) were advanced to 6 feet bgs along the southeast wall where staining was observed on the asphalt. The soils from these borings were analyzed for TPHd, TPHmo, BTEX, and O&G.

Groundwater

The objective of groundwater sampling was to evaluate representative groundwater samples for the presence of contaminants in the immediate vicinity of suspected sources; however, groundwater was also evaluated at widely distributed locations to evaluate overall groundwater quality at the site. Groundwater samples were collected from four soil borings (05-01, 05-02, 05-03, and 05-04). All groundwater samples were analyzed for metals, TPHg, TPHd, TPHmo, O&G, VOCs, SVOCs, and pH.

5.3.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 7A and 7B and on Figure 12.

Soil

Soil samples from the soil borings adjacent to the grease and sand trap (05-03) and near the edge of the oil/water separator (05-04) did not detect metals at concentrations in excess of PRGs or estimated ambient limit concentrations. Soil samples from these borings did not contain detectable TPHd. TPHmo was detected at a concentration of 8 mg/kg in one sample from boring 05-03. O&G was detected in seven of the eight samples from these borings, but the detected concentrations of O&G did not exceed 100 mg/kg. VOCs were not detected in any soil samples collected from these borings with the exception of a concentration of 1,1,1-trichloroethane (0.003 J mg/kg [estimated]) from the sample in 05-04 at a depth of 21 feet. SVOCs were not detected in any of the soil samples.

Soil samples from the soil boring near the fuel dispenser (05-02) did not contain metals at concentrations in excess of PRGs or the estimated ambient limit concentrations. Soil samples from this boring did not contain detectable TPHg or TPHd. TPHmo was detected at concentrations of 6 and 7 mg/kg in four of five soil samples from boring 05-02. BTEX was not detected in any soil sample from the boring.

Soil samples from the soil borings collected near the Building IA-12 battery accumulation area (05-01, 05-07, and 05-08) did not contain metals above residential PRGs and Inland Area estimated ambient limit concentrations.

Soil samples from the two soil borings advanced along the southeast wall of Building IA-12 where staining was observed (05-05 and 05-06) did not contain TPHd or BTEX above detection limits. TPHmo and O&G were detected at maximum concentrations of 14 and 74 mg/kg, respectively.

Groundwater

Groundwater was sampled in four borings at SWMU 5 (05-01, 05-02, 05-03, and 05-04). Metals were detected in all groundwater samples. Although the data was not screened against any specific criteria, review of the data did not reveal any indication of site contamination. Groundwater samples from these borings consistently contained hydrocarbons, but the constituents and concentrations were varied. The groundwater sample from boring 05-01 contained 1,500 μg/L of TPHmo. Other organic contaminants were not detected.

The groundwater sample from boring 05-02 contained 470 μg/L of TPHd and 140 μg/L of TPHmo but other organic contaminants were not detected.

The groundwater sample from boring 05-03 contained 32 μg/L of TPHg, 760 μg/L of TPHd, 780 μg/L of TPHmo, 6 μg/L of O&G, 11 μg/L of VOCs (6 μg/L of 1,1-dichloroethane and 5 μg/L of 1,2-dichloroethene), and 4 μg/L of SVOCs (3 μg/L of 2-methylnaphthalene and 1 μg/L of naphthalene).

The groundwater sample from boring 05-04 contained 73 μg/L of TPHg, 510 μg/L of TPHd, 380 μg/L of TPHmo, and 10 μg/L VOCs (7 μg/L of PCE and 3 μg/L of trichloroethene). O&G and VOCs were not detected.

5.3.4 Conclusions and Recommendations

The soil sample collected from 21 feet bgs in boring 05-04 contained 1,1,1-trichloroethane at a low concentration. Since the overlying samples did not contain 1,1,1-trichloroethane, the contaminant detected in the 21 foot deep sample was likely transported from an upgradient source by groundwater. Although there are no regulatory standards or criteria for the evaluation of hydrocarbons and oil and grease in soils, empirical evaluation suggests that significant concentrations of petroleum hydrocarbon constituents and O&G were not present in any soil boring. Soil analyses at SWMU 5 did not detect significant organic or inorganic contaminants.

However, groundwater has been contaminated by TPHg, TPHd, TPHmo, VOC, and SVOCs. Since the soils analyses at SWMU 5 did not detect these constituents at significant concentrations , the source of these contaminants has not been established. Additional investigation is necessary to establish the location of the source and to determine whether contaminants are migrating through soil. It is possible that the USTs located to the north of Building IA-12 may be contributing to groundwater contamination. Upgradient areas should be investigated to evaluate whether the groundwater contamination originates from Building IA-12. Because of the presence of VOCs in groundwater, a CERCLA process investigation should be conducted in the area surrounding Building IA-12.

5.4 SWMU 7 - BUILDING IA-16

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 7. Figure 13 shows the locations of Building IA-16 and other features.

5.4.1 Site Background

Building IA-16 was constructed in the 1940s and is located in the main industrial complex of Naval Weapons Station Concord, approximately 1 mile east of the main entrance and north of Kinne Boulevard. About 20 painters worked out of Building IA-16 prior to 1960. They were responsible for interior and exterior painting of base buildings. Much of the paint they used was oil-based. Furthermore, much of the exterior paint was lead-based. Prior to the 1970s, all waste paint, thinners, and cans were likely disposed of in the Tidal Area Landfill (IR Site 1). Paint usage was estimated at 700 gallons per year, generating approximately three drums of solid waste per year. By the early 1960s, the paint shop crew was reduced to three painters responsible for touch-up and repair work and minor interior finishing. Major finishing jobs are now performed by contractors who are responsible for cleanup and disposal of their materials.

A paint shop, storage shed, and paint locker are located northeast of Building IA-16. A satellite accumulation area for waste paints and thinners is near the storage shed northeast of the building. Leftover paint from 1- and 5-gallon cans is drained into a 55-gallon drum. Empty paint cans are allowed to dry and then are disposed of as nonhazardous waste at a municipal trash bin.

Asphalt in a 10- by 40-foot area along the northeast wall was observed to be cracked and stained with paint. The area of cracked and stained asphalt is illustrated on Figure 13. Some paint staining was observed around the paint locker.

Four 10,000-gallon USTs are located beneath the paved area between Buildings IA-12 and IA-16 (two gasoline USTs and two diesel fuel USTs). Three of the USTs (2, 3, and 4) are located adjacent to the southeastern corner of Building IA-16 and supply fuel to a gas station located 60 feet southeast of

Building IA-6. The fourth UST (UST 1) supplies diesel fuel to the fuel dispenser at the northwest corner of Building IA-12 (SWMU 5).

5.4.2 RFA Confirmation Study Sampling

The RFA designated SWMU 7 a low-priority site for future investigation because of potential releases from the hazardous waste accumulation area. The low potential volume of the releases was responsible for the low priority assigned. Soil and groundwater sampling investigations were completed at SWMU 7. These investigations are summarized below. Figure 13 shows the soil boring locations.

Soil

The objective of the soil sampling was to investigate potential contamination of two areas: the satellite accumulation area for waste paints and thinners; and the area near the four 10,000-gallon USTs.

The satellite accumulation area for waste paints and thinners (including visibly stained areas) was investigated as follows: three soil borings were advanced adjacent to the paint locker (07-03, 07-04, and 07-05) to depths of 0.5 to 1.5 feet bgs; two soil borings were advanced to 4.5 and 6.0 feet bgs (07-01 and 07-02); and one soil boring was advanced to 16 feet bgs (07-06) along the north wall of Building IA-16. Soil samples from each of these borings were analyzed for metals and VOCs. Because of lead detected in a soil sample from boring 07-01 and TPHmo detected in the groundwater sample from boring 07-06, four additional borings (07-10, 07-11, 07-12, and 07-13) were completed at SWMU 7. Soil samples from the borings were analyzed for one or more of the following constituents: TPHd, BTEX, and metals.

The area near the four existing gasoline and diesel fuel USTs was investigated as follows: three soil borings (07-07, 07-08, and 07-09) were advanced from 25.5 to 26 feet bgs in the vicinity of the USTs. Data from previous investigations at Building IA-6 (Fugro-McClelland 1993) and Building 178 (PRC 1994b) indicated groundwater flow is in a northwest direction. One of the soil borings was located downgradient (07-07) of USTs 2, 3, and 4, and approximately 10 feet from the edge of UST 1. A second soil boring was located upgradient (07-09), northeast of USTs 2, 3, and 4, but no more than 10 feet from the edge of UST 4. A third soil boring (07-08) was located downgradient, but no more than 10 feet from the edge of UST 2. Soil from each of these borings was analyzed for TPHg, TPHd, TPHmo, and BTEX.

In December 1995, Harding Lawson Associates, Inc., drilled two borings (B-1 and B-2) in the vicinity of the USTs at the site (HLA 1996). Soil samples from those borings were analyzed for TPH and BTEX. The results of these analyses are illustrated on Figure 13.

Groundwater

The objective of groundwater sampling was to investigate impacts to groundwater from potential UST leakage and from potential leakage from paint storage containers. Groundwater samples were collected from six soil borings (07-06 through 07-09 and 07-11 through 07-13) using a HydroPunch sampler. Groundwater samples from borings 07-06 through 07-09 were analyzed for metals, TPHg, TPHd, TPHmo, and VOCs. Groundwater samples from borings 07-11 through 07-13 were analyzed for TPHd, TPHmo, and BTEX.

5.4.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Tables 8A and 8B, and on Figure 13. The analytical results from the Harding Lawson Associates borings are also summarized on Figure 13.

Soil

Borings 07-01, 07-02, 07-03, 07-04, 07-05, 07-06, 07-10, 07-11, 07-12, and 07-13 were completed in the vicinity of the paint locker and Building IA-16. Soil samples from these borings did not contain metals in excess of the estimated ambient limit concentration and PRG concentrations, except for lead (375 mg/kg) and nickel (2,160 mg/kg) in a soil sample collected from boring 07-01 at a depth of 4.5 feet. Soil samples from six of these borings were analyzed for VOCs but none were detected.

Soil borings 07-07, 07-08, 07-09, 07-12, and 07-13 were completed in the vicinity of the four USTs and in the area to the north of the USTs. All soil samples from boring 07-07 were heavily contaminated with TPHd (concentrations up to 3,400 mg/kg). Some of the soil samples from borings 07-08, 07-12, and 07-13 also contained detectable TPHd or TPHmo, but at lower concentrations (up to 1,300 mg/kg). Soil samples from boring 07-09 did not contain detectable hydrocarbons. BTEX constituents, typically at low concentrations, were detected in a number of soil samples. The maximum total BTEX concentration detected at SWMU 7 was 0.016 mg/kg except in boring 07-07, where high concentrations of diesel were detected. In boring 07-07, the maximum total BTEX concentration was 1 mg/kg.

Groundwater

Groundwater samples were collected from seven soil borings. Groundwater samples throughout SWMU 7 contain levels of petroleum hydrocarbons. Groundwater samples collected from borings 07-07 and 07-08 contained 130,000 and 25,000 μg/L of TPHd, respectively. Detectable TPH or BTEX was present in every groundwater sample obtained from SWMU 7, although the concentrations were significantly lower than those detected in borings 07-07 and 07-08.

The groundwater samples were also analyzed for VOCs. The groundwater sample collected from boring 07-08 contained 2 μg/L of 1,2-dichloroethane. No other VOCs (including BTEX) were detected in any of the groundwater samples.

5.4.4 Conclusions and Recommendations

Elevated concentrations of lead and nickel were detected in the 4.5-foot-deep soil sample from boring 07-01. However, borings subsequently drilled in the vicinity of boring 07-01 did not detect lead and nickel exceeding estimated ambient limit concentrations and residential PRGs. Neither lead nor nickel concentrations exceeded their industrial PRGs (1,000 mg/kg and 34,000 mg/kg, respectively) in the 4.5-foot-deep sample at boring 07-01. In addition, the 0.5-foot soil sample in boring 07-01 also did not contain elevated concentrations of lead or nickel. The source of the lead and nickel in boring 07-01 has not been established. However, concentrations of lead and nickel in excess of the PRGs and estimated ambient limit concentrations have not been detected beyond the vicinity of the 4.5-foot soil sample from soil boring 07-01, and there is no identifiable impact to groundwater from lead and nickel. The low incidence of lead and nickel concentrations exceeding both the residential PRG and estimated ambient limit concentrations suggests that a small volume of soil exceeds both these criteria. A small volume of contaminated soil tends to limit the soil's potential to act as a source of contamination to other areas and also limits the risk associated with its direct exposure. In addition, lead and nickel tend to adsorb to fine-grained soils, thus limiting their potential for migration or leaching. Because of the asphalt concrete surface cover at the site, there is no complete exposure pathway for human contact. For these reasons, there is a low risk that lead and nickel detected at the site could adversely affect human health or the environment. Therefore, no further investigation of the area with lead and nickel contamination is necessary.

Analysis of the soil and groundwater samples collected in the vicinity of Building IA-16 did not detect concentrations of metals or VOCs that indicate that spilled paint has contaminated soil or groundwater at the site. As a result, no further investigation of the area is necessary to evaluate the potential impacts from paint spillage in the vicinity of the paint locker and Building IA-16.

Soil and groundwater samples collected from the borings drilled around the four existing USTs indicate that there are significant impacts to the site from leakage from one or more of these tanks (and not from SWMU 7 activities). All of the tanks are scheduled for replacement under Military Construction Project # P075. The lateral extent of soil and groundwater contamination should be determined and remedial alternatives evaluated. Because the impacts to soil and groundwater at the site originate from the USTs, investigation and removal of the four USTs should proceed under the Navy's UST program.

The source of 1,2-dichloroethane detected in groundwater has not been established. Because 1,2-dichloroethane was not detected in any soil samples from SWMU 7, there is no evidence that suggests an on-site source of this VOC in groundwater. The lateral extent, concentration, and source of 1,2-dichloroethane should be further investigated in the area. A CERCLA process investigation should be conducted to evaluate the groundwater in the vicinity of SWMUs 2, 5, 7, and 18.

5.5 SWMU 12/20 - BUILDINGS IA-24 AND IA-55

Because of their proximity to one another, SWMU 12 and 20 (Buildings IA-24 and IA-55) were combined during the investigation and therefore are discussed together here. This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 12/20.

SWMU 12/20 is associated with the Buildings IA-24 and IA-55, being investigated under IR Site 17, which is currently undergoing a CERCLA RI. SWMU 12/20 is specifically associated with the operation of septic tanks that service the buildings included in Site 17. However, previous investigations of IR Site 17 are also discussed in the sections that follow.

Figure 14 shows the locations of Buildings IA-24 and IA-55, and other features.

5.5.1 Site Background

This section provides the site description and summary of previous investigations for SWMU 12/20.

Site Description

Building IA-24 was constructed in the 1940s and is located 60 feet north of Kinne Boulevard, approximately 3 miles from the front gate. Building IA-24 is used for maintenance of forklift equipment. Some of the hazardous wastes generated are used oil, absorbent materials soaked with oil, used paint spray cans from touch-up painting jobs, and batteries, which are recycled. The building has a satellite accumulation area for these wastes.

Building IA-55 was constructed in the early 1950s and is located south of Building IA-24. Building IA-55 is an office building where tools and supplies are issued and returned. Hazardous wastes generated include used paint spray cans and adhesives. The building serves as one of the hazardous waste satellite accumulation points for used paint spray cans.

All solid wastes generated in Building IA-24 were probably disposed of in the Tidal Area Landfill (IR Site 1) until 1978. These wastes included oily wastes, battery casings, rags, old parts and tools, and cans containing small amounts of paints and solvents.

Also, as part of forklift maintenance, the forklifts and batteries are steam cleaned to remove oil and grease. The steam cleaner discharges through a line from the southwest side of Building IA-24 and drains into Seal Creek, but the steam cleaning pad has not been used since 1988. In addition, Naval Weapons Station Concord personnel park 3-ton trucks on the unpaved areas between Buildings IA-24 and IA-55.

A 2,000-gallon diesel UST is located along the southeast wall of Building IA-24. The integrity of the UST was first checked by precision testing in January 1988 and annually thereafter. The UST failed the tests twice because of piping leaks. The leaks were repaired and the UST and piping retested. The UST again failed the test and was then taken out of service. Adjacent to the UST is a shallow vadose-zone well that was installed in December 1987 to monitor vadose zone vapors in the vicinity of the UST (ERM-West 1989). While drilling the vadose-zone well, a petroleum odor was reported starting at a depth of 4 feet down to 8 feet bgs.

A 1,000-gallon diesel UST is located near the northwest corner of Building IA-55. In December 1987, a shallow vadose-zone well was installed to monitor vadose zone vapors in the vicinity of the UST and a faint diesel odor was detected from the ground surface to a depth of 5 feet (ERM-West 1989).

Building IA-24 has a sink and sanitary sewer system that drains into two septic tanks through a 6-inch vitrified clay pipe. The sewer line that drains from Building IA-24 to the septic tanks is connected to a sewer that drains from Building IA-55. The septic tanks are about 200 feet south of Building IA-24 and are 20 feet from each other. Sewage from Building IA-55 drains through a 6-inch cast iron sanitary sewer pipe and connects with the 6-inch vitrified clay pipe, which connects to the two septic tanks. Railroad tracks are located 40 feet to the north of the septic tanks and parallel to Kinne Boulevard.

The septic tanks are partially covered with dirt. The outlet of each septic tank splits into two 4-inch open-joint unglazed clay pipes that run parallel to the drain field. The two unglazed clay pipe drains are about 10 feet apart. Each leach field drain trench is about 2 feet wide and 2.5 feet deep.

Previous Investigations

The dumping of battery acid, reported in the Initial Assessment Study (Ecology and Environment 1983), may have caused a low pH and possible lead contamination in the groundwater. The Initial Assessment Study also concluded that the acid would probably be neutralized from contact with the soil and that lead would bind to the soil, reducing its migration into groundwater. Given the absence of groundwater usage in the area, the Initial Assessment Study recommended no further investigation at this site (Ecology and Environment 1983).

During site investigations (SI) field work, conducted by PRC and Montgomery Watson in 1992, soil and groundwater were sampled southeast of the forklift parking lot in an attempt to verify the location of the disposal sump. Several shallow trenches (see trench detail A, Figure 14) were excavated with a backhoe in an area of stained soil presumed to be associated with the former acid sump. A total of 13 soil samples were collected from 12 locations (ACS-1 through ACS-5 and ACS-7 through ACS-13) within the trenches, at 2 to 5 feet bgs. Two of these samples were collected from areas where surface soil staining was visually identified, and the remaining samples were evenly spaced throughout the trenches. Of the soil samples collected, only one sample contained TPHd above the detection limit (soil sample ACS-13-SB-02.0).

A 43-foot-deep soil boring (ACS-06-SB) was drilled adjacent to ACS-10, and soil samples were collected at 5-foot intervals until groundwater was encountered at 34 feet. TPHd was detected in three soil samples at concentrations varying from 4.40 to 5.36 mg/kg at depths of from 20 to 30 feet bgs. A temporary well was set within the deep soil boring (ACS-06-SB) and screened from 33 to 43 feet bgs. The groundwater level was measured at 34 feet bgs under unconfined conditions. TPHd (364 µg/l) and trichloroethene (17.8 mg/kg) were detected in a sample from this temporary well.

Additionally, surface soil samples were collected at the termini of two runoff locations. The first sample, ACS-01-SFC, was collected near the culvert that drains storm water from the suspected acid sump area. Storm water from this area flows into a drainage ditch that discharges into a field. TPHd (17.8 mg/kg) and sulfate (67.7 mg/kg) were detected in the soil sample. The second surface sample, ACS-02-SFC, was collected at the end of the steam cleaning discharge line where it discharges into Seal Creek. TPHd (164 mg/kg) and TPHg (82.4 mg/kg) were detected in this soil sample. At sample location ACS-SB-030, the sample at 3 feet bgs contained a TPHmo concentration of 4,100 mg/kg. Samples collected in the vicinity of Seal Creek were also analyzed for metals, VOCs, and SVOCs. VOCs and SVOCs were not detected. Metals did not exceed both the estimated ambient limit concentrations and residential PRGs in any sample.

One of the septic tanks was sampled on August 17, 1993. TRPH and total oil and grease (TOG) were detected in the sludge sample.

As part of the ongoing effort to replace or remove old USTs, an investigation was conducted by Harding Lawson Associates on September 9, 1993. One soil boring (No. 5) was drilled adjacent to the 2,000-gallon UST to a depth of 10.5 feet bgs. Analytical results indicated that no petroleum hydrocarbons, specifically TPHd, were present in the soil above the detection limits.

The detection of TPH and hazardous constituents in the vicinity of Buildings IA-24 and IA-55 has led to further investigation of these buildings as IR Site 17 under the CERCLA RI. The results of the RI samples collected in the vicinity of SWMU 12/20 are discussed below with the results of the sampling conducted for this investigation. The RI report will be completed by PRC in the fall of 1996.

5.5.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 12/20 a medium priority for future investigation because of the presence of septic tanks that may have released hazardous constituents to the environment. There are no documented releases associated with SWMU 12/20.

Soil and septic tank sampling was conducted at SWMU 12/20. The RI of IR Site 17 included sampling in the vicinity of the SWMU 12/20 septic tanks. The locations of selected borings for the investigation of IR Site 17 are discussed below and are illustrated on Figure 14. Groundwater at the site has been measured at a depth exceeding 30 feet. Sampling and analysis of groundwater at the septic tank sites was not proposed unless the investigation of the sites suggested impacts to soil exceeding a depth of 15 feet.

Soil

The objective of soil sampling at SWMU 12/20 was to investigate potential impacts of hazardous wastes on soils in the vicinity of the septic tank and leach field system. Three 10- to 15-foot-deep soil borings were completed at the site. One boring (12/20-02) was located between the two leach field systems and the other two (12/20-01 and 12/20-03) were located downgradient from the septic tanks or leach field systems; adjacent to the deeply incised Seal Creek drainage channel. The soil samples from these borings were analyzed for O&G, VOCs, SVOCs, and metals.

Seven borings were also completed during the RI to investigate IR Site 17 in the vicinity of SWMU 12/20. Selected soil samples from these borings were analyzed for TPHg, TPHd, TPHmo, VOCs, SVOCs, metals, and Waste Extraction Test (WET) metals. Some of these samples were collected from the drainage channel of Seal Creek and are listed as sediment samples in Table 9.

Septic Tank

The objective of the septic tank sampling was to determine if hazardous constituents are present within the tank for eventual release to soil or groundwater from the leach field system. The septic tank sewer water was analyzed for VOCs, SVOCs, metals, and O&G.

5.5.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 9A and on Figure 14.

Soil

<u>O&G and TPH</u>

Seven of the eight soil samples from the three SWMU 12/20 borings contained detectable concentrations of oil and grease to a maximum concentration of 64 mg/kg. The source of oil and grease in these samples has not been established; however, it is likely attributable to naturally occurring plant oils from organic materials in the soil.

Soil samples analyzed for the RI at IR Site 17 did not include O&G analysis but did include analyses for TPHg, TPHd, and TPHmo. In samples collected near SWMU 12/20, TPHmo was detected at concentrations up to 4,100 mg/kg.

<u>VOCs</u>

All of the soil samples collected to investigate SWMU 12/20 were analyzed for VOCs; 1,2-dichloropropane was detected at a concentration of 0.06 mg/kg in boring 12/20-02 at a depth of 10 feet; however, 1,2-dichloropropane was not detected in any other soil sample. For comparison, the residential PRG is 0.68 mg/kg.

Another VOC, 4-methyl-2-pentanone, was detected in soil samples at a depth of 15 feet in borings 12/20-01 and 12/20-03 at concentrations of 0.005 and 0.004 mg/kg, respectively. Soil samples above that depth did not contain detectable VOCs. There is no published EPA PRG for 4-methyl-2-pentanone.

VOCs were not detected in soil samples collected near SWMU 12/20 as part of the RI for IR Site 17.

SVOCs

All of the soil samples collected to investigate SWMU 12/20 were analyzed for SVOCs. The SVOC phenol was detected at a concentration of up to 0.8 mg/kg in four of the eight soil samples analyzed for SVOCs at SWMU 12/20. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

Two surface soil samples collected during the RI near SWMU 12/20 (from locations ACSSB039 and ACSSB040) contained several SVOCs in the surface sample. The combined concentration of SVOC (total SVOC) in each sample was less than 1 mg/kg. Both samples also contained TPHmo at concentrations from 570 to 1,300 mg/kg.

Inorganics

Manganese, nickel, and thallium were detected at concentrations exceeding residential PRGs and their estimated ambient limit concentrations. Manganese was detected at a concentration of 12,100 mg/kg in the 15-foot-deep soil sample from boring 12/20-03; the estimated ambient limit concentration for manganese is 870 mg/kg. Thallium was detected in the same soil sample at a concentration of 15.6 mg/kg; the estimated ambient limit concentration for thallium is equal to the analytical test method detection limits. Nickel was detected at a concentration of 165 mg/kg at a depth of 5 feet in boring 12-02; the estimated ambient limit concentration for nickel is 86 mg/kg and the residential PRG is 150 mg/kg.

Soil samples analyzed in the vicinity of SWMU 12/20 for the RI of Site 17 did not contain metals exceeding both residential PRGs and estimated ambient limit concentrations except for lead, detected in boring ACS-SB-039 at a concentration of 224 mg/kg. The California modified residential PRG for lead is 130 mg/kg and the estimated ambient limit concentration is 18 mg/kg at SWMU 12/20.

Septic Tank

A sample of the septic tank sewer water was analyzed and a complete list of analytical results is presented on Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state total threshold limit concentration (TTLC) or soluble threshold limit concentration (STLC) or the federal toxicity characteristic leaching procedure criteria (TCLP). These criteria are used to determine if the waste exceeds the toxicity characteristic of a state or federal hazardous waste. The septic tank contents did not exceed the applicable criteria and are therefore considered nonhazardous.

Three VOC constituents (bromodichloromethane, chloroform, and dibromochloromethane) were detected at concentrations of less than 3 µg/L (estimated) each. Four SVOC constituents (1, 2-dichlorobenzene [89 µg/L (estimated)], 2-methylnaphthalene [54 µg/L (estimated)], 4-methylphenol [180 µg/L (estimated)]), and phenanthrene [37 µg/L (estimated)]) were detected.

A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils. However, the metals results for the septic tank water from SWMU 12/20 were compared to the results from all other septic tanks as well as the metals results from soil. Section 5.5.4 discusses of the metals that exceeded the estimated ambient concentrations and residential PRGs in soil samples. In each case, the metals in soil do not appear to be related to the same metals detected in the septic tank water.

5.5.4 Conclusions and Recommendations

Manganese — Manganese exceeding the residential PRG at SWMU 12/20 was detected in only one soil sample at a depth of 15 feet. It was in a location where results for shallower soil samples did not exceed the residential PRG. In addition, manganese exceeding the PRG was not detected in any soil samples collected at locations closer to the leach field. In the septic tank water at SWMU 12/20, the concentration of manganese was 1,800 µg/L. The manganese concentration in all other septic tank sewer water samples ranged from 59.3 to 6,620 µg/L. Although manganese in the sewer water at SWMU 12/20 was not the highest detected, the concentration of manganese in soil samples did not exceed the residential PRG at any other SWMU site containing a septic tank.

Thallium — Thallium was detected above the residential PRG in the same soil sample that contained the elevated concentration of manganese. However, thallium was not detected in the septic tank water sample.

Nickel — The maximum concentration of nickel in soil at SWMU 12/20 (from boring 12-02 at a depth of 5 feet) was 165 mg/kg. As discussed in the text of the RFA confirmation study report, the concentration of nickel in that sample exceeded the estimated ambient limit concentration (86 mg/kg) and the State of California modified PRG (150 mg/kg). No other soil samples analyzed for SWMU 12/20 exceeded these criteria for nickel. The concentration of nickel detected in septic tank sewer water at SWMU 12/20 was 350 µg/L (the maximum concentration of nickel detected in any septic tank water sample).

Because the fate and transport of nickel and lead are expected to be similar, the impacts to soil from lead and nickel should be similar. As a result, lead is considered below as additional information to suggest that the concentration of nickel associated with contamination from the septic tank sewer water is unrelated to the septic tank sewer water. Lead was detected in the septic tank sewer water sample at SWMU 12/20 at a concentration of 3,310 µg/L. The concentration of lead in the septic tank water is approximately 10 times the concentration of nickel. However, these impacts were not observed in the soil sample containing the 165 mg/kg of nickel. Lead in the sample from boring 12-02 at 5 feet deep was detected only at a concentration of 8.6 mg/kg, which is less than the estimated ambient limit of 18 mg/kg.

The lead analytical results suggest that the elevated concentration of nickel in the soil sample is not associated with contamination from the septic tank sewer water. This conclusion is supported by similar observations regarding the concentrations of other metals (including copper and zinc) in septic tank sewer water compared to the concentrations of these constituents detected in the soil sample from boring S12-02 at 5 feet. Also, the conclusion that elevated nickel is not due to the septic tank sewer water is further supported by the fact that elevated concentrations of nickel were not detected in any other soil samples collected near the septic tank leach field.

Based on the evaluations of the concentrations of manganese, thallium, and nickel detected in soil at SWMU 12/20, there is no correlation between the concentrations of these metals detected in soil samples and those detected in the septic tank sewage water samples.

Although several constituents were detected in one or more samples from the three borings at SWMU 12/20, none were present at concentrations that suggest a potential for site contamination capable of harming human health or the environment. In addition, there is no indication that the constituents detected in the septic tank have caused significant impacts to soil in the vicinity and downgradient of the leach field systems. Although the septic tank did not contain hazardous waste and there has been no discernible impact on soil in the vicinity of the septic tank or leach field, the septic tank samples did contain elevated or potentially elevated concentrations of several constituents. To safeguard soil in the vicinity septic tank and leach field, the Navy had the contents of the septic tank removed and the septic tank was cleaned. The removal of septic wastes and the septic tank cleaning was completed by early March 1997, and is documented in the closure report (CH2M Hill 1997).

O&G were detected in soil at concentrations of less than 100 mg/kg. The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. Although there are no regulatory standards or criteria for the evaluation of O&G concentrations in soils, empirical evaluation suggests the concentrations are low and do not suggest a potential threat to receptors of any type.

Manganese, nickel, and thallium were detected in soil samples at concentrations exceeding the estimated ambient limit concentrations and PRGs. The source of these constituents has not been determined. This RFA confirmation study has not identified a correlation between the elevated concentrations of manganese and thallium in the 15-foot-deep soil sample from boring 12/20-03 and any other soil sample at the site. The elevated concentration of nickel was present in only one soil sample (boring 12/20-02 at a depth of 5 feet). The nickel concentration (165 mg/kg) only slightly exceeds the residential PRG (150 mg/kg) and is well below the industrial PRG. This information suggests that elevated metals concentrations occur in isolated areas. In addition, soil containing elevated concentrations of these constituents is covered with more than 5 feet of soil and is therefore unavailable for exposure to humans or environmental receptors. The potential for future migration or leaching of these constituents is low because they tend to adsorb to fine-grained soil and the potential source volume is limited. A small volume of potentially contaminated soil not only limits the soil's potential to act as a source of contamination but also limits the risk associated with direct exposure. Because of the low hazard potential associated with metals at SWMU 12/20, no further investigation or evaluation of these constituents are recommended.

Two VOCs were detected in soil. Both were present at low concentrations and therefore do not appear to have a potential for significant migration. The VOC 1, 2-dichloropropane was detected at a concentration of 10 times less than its PRG, and 4-methyl-2-pentanone was also detected at a low concentration, although no EPA PRG has been established.

The SVOC phenol was one of the most commonly detected constituents at Naval Weapons Station Concord. Phenol was detected at concentrations of up to 0.8 mg/kg, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

Constituents detected at elevated concentrations in the borings completed to investigate IR Site 17 do not appear related to any constituents detected in the septic tank or soils surrounding the septic tank and leach field. Some of the same metals were detected; however, no metals in the RI soil samples exceeded PRGs except for lead, which was detected in a sample collected at the ground surface upgradient from the septic tanks. None of the same SVOCs were detected in the IR Site 17 borings except for phenanthrene, also detected in the surface soils located upgradient from the septic tanks.

Although some residential PRGs for metals were exceeded in some soil samples at SWMU 12/20, there is little risk to human health or the environment because the metals have a low incidence of detection above PRGs or estimated ambient limit concentrations. The risk to human health from VOCs in soil is low because of the low incidence of detection and the low concentrations detected. For the same reasons, there is no evidence to suggest that additional site investigation is warranted. As a result, the SWMU 12/20 is recommended for no further action under the RCRA corrective action program.

5.6 SWMU 13 - BUILDING IA-25

This section presents the site background, RFA confirmation study sampling performed, investigation results, and conclusions and recommendations for SWMU 13.

5.6.1 Site Background

This subsection provides the site description and summary of previous investigations at SWMU 13. Figure 15 shows the locations of Building IA-25 and other features.

Site Description

Building IA-25 is 110 feet west of the end of L Street, which intersects Kinne Boulevard approximately 2.5 miles from the main entrance. The topography around Building IA-25 slopes gradually to the northwest. The building was used exclusively for pilot-scale development of munitions. During the 1940s, when the building was put into service, hexahydro-1,3,5-trinitro-s-trianzine (RDX), pentaerythritol tetranitrate (PETN), lead styphnate, and lead azide were developed as military explosives. A paint booth used for repainting components was located in the southwest corner of the building. In addition to the nitrogen-based compounds, metals associated with casings, solvents, and pesticides are known to have been used in or around the facility. Pipes are wrapped in asbestos, and wall materials may also contain asbestos fibers. Building IA-25 has been renovated as a production facility for the rework of explosives. The renovation work included repair of (1) structural damage to walls and floor, (2) lighting systems, (3) ventilation and heating systems, and (4) removal of asbestos insulation on pipes and asbestos wallboard materials. Currently, the operations at Building IA-25 include various types of ordnance workloads including electronic X-ray nondestructive testing.

Building IA-25 has a sink and sanitary sewer system that drains into a septic tank through a 6-inch vitrified clay pipe. The septic tank is located about 120 feet north of Building IA-25 and is partially buried. The outlet of the septic tank splits into two 4-inch open-joint tile drains.

A 6-inch storm drain line is connected from Building IA-25 to the north side of L Street. The storm drain line discharges to an earthen pit that is filled with 0.5 cubic yard of 1.5- to 2-inch-diameter crushed rock.

Previous Investigations

In 1983, the Initial Assessment Study investigation team was told that a burn pit and solvent disposal area existed behind Building IA-25 at one time. However, visual examination of the area revealed no environmental damage. The Initial Assessment Study indicated that up to 1,000 gallons of paints and solvents may have been disposed of at the site.

A contractor was hired in 1987 to perform an asbestos survey under Building IA-25 (Pacific Environmental Services, Inc. 1988). The survey discovered an area of approximately 50 square feet beneath the building where pieces of pipe insulation containing asbestos fibers were found. The report stated that the general public would not be subject to any health hazards under normal conditions, but that the asbestos area would be a hazard to maintenance workers or others who might disturb the soil beneath the building.

On November 10, 1988, Navy personnel collected soil samples from beneath Building IA-25. Elevated soil concentrations of nitrates, potassium, and phosphorous were detected at all locations. VOCs, SVOCs, and pesticides were detected in various samples. Lead, zinc, and trivalent chromium were detected in one sample at concentrations above the State of California total threshold limit concentrations (TTLC). Two samples contained soluble lead concentrations that exceeded soluble threshold limit concentrations (STLC). The area beneath Building IA-25 was sampled again on June 28, 1989. Trace amounts of the pesticide 4,4'-DDT, herbicides, VOCs, and SVOCs were detected in soil samples SS-02 and SS-07 (IT 1990). Lead, zinc, and chromium were detected in all samples.

During the two sampling events, a total of 27 samples were collected from 18 sample locations in the crawl space below Building IA-25. Sample analyses conducted by the Navy and IT Corporation included metals, explosives and explosive by-products, VOCs, SVOCs, pesticides and PCBs, PAHs, and chlorinated herbicides. Not all analyses were conducted on each sample.

Several analytes were detected at concentrations exceeding residential PRGs and estimated ambient limits. The following table lists the constituents detected at concentrations exceeding PRGs, the maximum concentration detected, estimated ambient limits, the residential PRG, the number of samples exceeding the residential PRG, the industrial PRG, and the number of samples exceeding the industrial PRG.

The septic tank was sampled on October 9, 1990, and on August 17, 1993. Total recoverable petroleum hydrocarbons (TRPH) and TOG were detected in the liquid sample from October 9, 1990. TOG was detected in the sludge sample from August 17, 1993. VOCs and SVOCs were detected only in the October 9, 1990 liquid sample. VOCs detected included 1,1-dichlorobenzene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, total 1,2-dichloroethene, toluene, and trichloroethene. SVOCs detected were 4-methylphenol, di-n-octylphthalate, and 1,4-dichlorobenzene.

CONSTITUENTS DETECTED BELOW BUILDING IA-25 AT CONCENTRATIONS EXCEEDING ESTIMATED AMBIENT CONCENTRATIONS AND PRGs

Constituent	Maximum Detected (mg/kg)	Estimated Ambient Limit (mg/kg)	Residential PRG (mg/kg)	Samples Exceeding Residential PRG	Industrial PRG (mg/kg)	Samples Exceeding Industrial PRG
Beryllium	16.0	0.12	0.14	14 of 27	1.10	7 of 27
Cadmium	460	0.28	9.00	4 of 27	85.0	1 of 27
Chromium	2,600	62.0	210	1 of 27	450	1 of 27
Lead	3,400	32.0	130	10 of 27	1000	2 of 27
Benzo(a)-pyrene	0.150	ND	0.061	1 of 11	0.26	0 of 11

5.6.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 13 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soil and septic tank sampling investigations were therefore performed at SWMU 13 to investigate potential releases from the septic tank and leach field. This RFA confirmation study did not include investigation of the Building IA-25 area. Groundwater sampling was not proposed at the septic tank sites due to the anticipated depth to groundwater unless soil contamination was discovered to depths of 15 feet.

Soil

The objective of soil sampling at SWMU 13 was to investigate potential leakage of hazardous wastes from the septic tank and leach field system to nearby subsurface soils. An additional objective was to investigate if the existing storm drain outfall could have contaminated surface soils. Two soil borings (13-01 and 13-02) were completed to depths of 15 to 15.5 feet and located downgradient of the leach field and septic tank. One soil boring (13-03) was completed to a depth of 3 feet bgs immediately below the storm drain outfall. Soil samples from all three borings were analyzed for metals, O&G, VOCs, SVOCs, and explosives. Soil samples from borings 13-01 and 13-03 were also analyzed for pesticides and PCBs.

Septic Tank

The objective of the septic tank sampling was to determine if hazardous constituents were present within the tank and therefore could be released to soil or groundwater from the leach field system. The septic tank sewer water was sampled and analyzed for metals, O&G, VOCs, SVOCs, pesticides/PCBs, and explosives. A sample of the septic tank sewage sludge was also collected and analyzed for the same constituents.

5.6.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 10A and on Figure 15.

Soil

Five of the eight soil samples from all three borings contained detectable concentrations of O&G. Four of the samples contained O&G at concentrations of 65 mg/kg and less. The source of O&G in these samples has not been established; however, it is likely attributable to naturally occurring plant oils from organic materials in the soil.

The highest concentration of O&G was detected in the surface soil sample at 13-03 located at the storm drain outfall (920 mg/kg). Neither the 3-foot-deep sample in the same boring nor the surface sample in the downgradient boring (13-01) contained any O&G above detection limits. The source of O&G at the storm drain outfall is likely associated with minor spills in the vicinity of Building IA-25 that have been transported to the storm drain via storm water. The extent of contaminated soils is limited both laterally and vertically, as evidenced by adjacent soil samples. There are no regulatory standards or criteria for the evaluation of O&G concentrations in the soil; therefore, direct evaluation of the O&G concentrations is not possible. The limited extent of soil containing O&G suggests a small release and limited potential for receptor contact and limited potential risk to receptors. Hazardous constituents normally associated with petroleum products were not detected in the soil sample containing the O&G.) Due to the limited volume of contaminated soil and lack of hazardous constituents, the O&G does not appear to pose a risk to human and environmental receptors.

Metals were not detected at concentrations exceeding the estimated ambient limit concentrations and residential PRGs. VOCs were not detected. SVOCs were not detected except for phenol, which was detected in one of eight soil samples at a concentration of 0.3 mg/kg. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

The pesticide endosulfan II was detected in the surface soil sample collected at the end of the storm drain outfall at a concentration (estimated) equal to the detection limit (0.004 mg/kg). This concentration of endosulfan is significantly less than the residential PRG of 3.3 mg/kg. Endosulfan was detected at a very low concentration in only one sample and was not present in detectable concentrations at downgradient locations, either vertically and horizontally. Because of its low concentration and limited lateral extent, endosulfan is not considered a significant site contaminant.

Septic Tank

A sludge sample and a septic tank sewer water sample were both collected from the septic tank at SWMU 13, and the complete results are presented on Tables 28 and 29. The sludge sample contained VOCs, SVOCs, pesticides, explosives, metals, and O&G. The septic tank sewer water sample contained VOCs, explosives, metals, and O&G. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP criteria. The septic tank sludge exceeded the TTLC criteria for TCE and was therefore considered to be hazardous waste.

The sample of the septic tank sludge contained an estimated 12,000 mg/kg of 1,1,1-trichloroethane and an estimated 2,700 mg/kg of trichloroethene. Several SVOCs were also detected, including 1,4-dichlorobenzene, 2-methylnaphthalene, 4-methlyphenol, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, naphthalene, phenanthrene, and pyrene. Of these constituents, only three were detected at concentrations greater than 2 mg/kg. These were 1,4-dichlorobenzene (33 mg/kg), 4-methlyphenol (34 mg/kg), and bis(2-ethylhexyl)phthalate (1,200 mg/kg). Several pesticides including 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-BHC, alpha-chlordane, beta-BHC, endosulfan II, gamma-chlordane, and heptachlor epoxide were detected in the sludge sample at concentrations ranging from 0.005 to 0.04 mg/kg. The explosive RDX was detected at a concentration of 0.9 mg/kg. All metals were detected except for selenium, silver, and thallium. O&G was detected at a concentration of 693 mg/kg.

A sample of the septic tank sewer water was also analyzed and a complete list of analytical results is presented on Table 29. The septic tank water sample contained the following VOCs: 1,1,1-trichloroethane (100 μg/L [estimated]), 1,1-dichloroethane (97 μg/L [estimated]), 1,1-dichloroethene (6 μg/L [estimated]), 1,2-dichloroethene (47 μg/L [estimated]), chloroform (4 μg/L [estimated]), and trichloroethene (32 μg/L [estimated]). No SVOCs or pesticides were detected. The explosive 2,6-dinitrotoluene was detected at a concentration of 1 μg/L (estimated). A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals in septic tank leachate adsorbing to soils. O&G was detected at a concentration of 210 μg/L.

5.6.4 Interim RCRA Corrective Action

The septic tank sludge sample contained VOC concentrations that exceed hazardous waste criteria. To minimize the potential for future release of these constituents to soil from standard operation of the septic tank, all sludge and sewer water was removed from the septic tank and the tank was cleaned under an interim RCRA corrective action completed by the Navy Public Works Centers in March 1997. The results of the corrective action are documented in the closure report (CH2M Hill 1997).

5.6.5 Conclusions and Recommendations

The most significant detections of constituents were in the septic tank at SWMU 13. As a result, an interim RCRA corrective action was conducted to remove the septic tank contents and clean the tank. Although constituents were detected in the septic tank at concentrations exceeding hazardous waste criteria, these constituents were not detected in soil samples at SWMU 13. The most significant detection of constituents in soil was from the surface soil sample located by the storm drain outfall (boring 13-03). The soil sample contained 920 mg/kg of O&G, 0.004 mg/kg of endosulfan II, and 0.1 mg/kg of 4-nitrotoluene. O&G were detected in most soil samples at concentrations of less than 100 mg/kg. However, as discussed in the investigation results sections none of these constituents is present at concentrations of concern with regard to human health. The lateral extent of these constituents appears limited in both vertical and horizontal extent. Adjacent soil samples in the same boring (13-03) from a depth of 3 feet and the surface soil sample located downgradient (in boring 13-01) did not contain these constituents at concentrations above detection limits. Because of the immobility of these constituents in the environment at SWMU 13 and the low concentrations detected, there is no evidence of a significant release of contaminants to soil. The low concentrations and limited lateral extent of detected organic constituents suggest a low risk to potential environmental receptors. In addition, there are no detectable impacts on soils in the vicinity of the septic tank and leach field system from the constituents detected within the septic tank water and sludge samples.

Phenol was detected at a concentration of 0.3 mg/kg in one soil sample, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

According to standard protocol at Naval Weapons Station Concord, proper care should be taken when handling hazardous constituents at the site in accordance with the applicable RCRA regulations. Proper future operations will be sufficient to protect the septic tank from recontamination. Following the completion of the interim RCRA corrective action to remove the septic tank contents, the SWMU site including the septic tank, leach field, and storm drain outfall are recommended for no further action under the RCRA corrective action program.

Potentially significant concentrations of beryllium, cadmium, chromium, lead, and benzo(a)pyrene were detected in soil samples collected below Building IA-25. A focused human health risk assessment conducted by IT Corporation evaluated the potential threat to human health associated with proposed remodeling and maintenance activities that have since been completed below Building IA-25. The study concluded that "no long-term health effects are anticipated from either remodeling activities at Building IA-25 or the regular maintenance of the structure. No further studies would appear warranted at this site." (IT Corporation, 1990)

Although these conclusions are appropriate given the exposure assumptions of the IT Corporation report, the risk assessment was not conducted using the standard industrial exposure assumptions used when conducting human health risk assessments under CERCLA, and the site of Building IA-25 may not be appropriate for unrestricted future use if the building is demolished. Re-evaluation of the existing data using CERCLA risk assessment methodology and the establishment of future land use restrictions could be appropriate for Building IA-25. As a result, Building IA-25 is recommended for incorporation into the CERCLA process evaluation.

5.7 SWMU 14 - BUILDING IA-27

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 14. Figure 16 shows the locations of Building IA-27 and other features.

5.7.1 Site Background

This section provides the site description for SWMU 14.

Site Description

Building IA-27 was constructed in the mid-1940s and is located 100 feet south of Kinne Boulevard, approximately 2.5 miles from the main entrance. The building was used to house the carpenter shop; however, the building now provides storage for the furniture of Marines housed on base. Carpentry personnel often used paints and thinners.

The building is surrounded by a 16-foot-high berm on the north and south sides. A paved parking area is between Building IA-27 and the south berm. Railroad tracks are adjacent to the north side of building IA-27 and run parallel to the south side of the north berm. A large parking area is between the north berm and Kinne Boulevard. West of L Street is a paved, fenced area used to store equipment and supplies.

Building IA-35 (boiler house) is located about 100 feet south of Building IA-27, and Building IA-44 is about 120 feet to the south. A UST was removed from the south side of Building IA-35 in 1992. No petroleum hydrocarbons were detected in excavated soil.

Building IA-27 has a sink and sanitary sewer system that drains into a manhole connecting to a septic tank through a 6-inch vitrified clay pipe. The septic tank is located about 200 feet south of Building IA-27, adjacent to the southwest corner of Building IA-44. The reinforced concrete septic tank is about 11 feet long, 4 feet wide, and 7.5 feet deep. It is accessible through a 2-foot by 3-foot opening at the top of the tank at the ground surface. The outlet of the septic tank splits into two 4-inch open-joint tile drains that run parallel to the drain field. The two tile drains are about 10 feet apart. Each distribution field is about 2 feet wide and 2.5 feet deep. The drain field is located about 40 feet from Seal Creek. During previous septic tank sampling events, the septic tank was dry and could not be sampled.

5.7.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 14 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soil and septic tank sampling investigations were performed at SWMU 14 to evaluate the potential release of contaminants from the septic tank. Groundwater investigation at the septic tank sites was not proposed, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet. Figure 16 shows the soil boring locations.

Soil

The objective of soil sampling at SWMU 14 was to investigate potential leakage of hazardous wastes from the septic tank and leach field system to nearby subsurface soils. Two 16-foot soil borings (14-01 and 14-02) were completed near the septic tank and drain field. Soil boring 14-01 was advanced within the drain field near Seal Creek because chemicals of potential concern (COPC) may have migrated into Seal Creek. Seal Creek is at an elevation approximately 20 feet lower than the drain field, the edge of the drain field is approximately 40 feet from Seal Creek, and drainage channels have cut approximately to the edge of the drain field. The second soil boring (14-02) was completed adjacent to the west end of the septic tank. The soil samples were analyzed for VOCs, SVOCs, O&G, and metals.

Septic Tank

The objective of the septic tank sampling was to determine if hazardous constituents are present within the tank and may be released to soil or groundwater from the leach field system. Water and sludge samples were collected from the septic tank. During previous sampling attempts, the septic tank was dry. The last attempt occurred during August 1993, the driest period of the year. Also, Building IA-27 is not now used. The septic tank sewer water and sludge samples were obtained in April 1995 from these borings and were analyzed for metals, O&G, VOCs, and SVOCs.

5.7.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 11A and on Figure 16.

Soil

Except for nickel detected in two samples from boring 14-02, metals were not present at SWMU 14 above the estimated ambient limit concentrations or residential PRG screening levels. The samples containing nickel above these screening criteria were located at depths of 10.5 and 16.0 feet and the concentrations were 164 and 256 mg/kg, respectively. However, nickel in the soil sample at 5.5 feet was less than the estimated ambient limit concentration. The California modified PRG for nickel is 150 mg/kg and the estimated ambient limit concentration at SWMU 14 is 86 mg/kg.

O&G was not detected in the samples, nor were VOCs. SVOCs were not detected except for phenol. The phenol was detected at concentrations up to 0.6 mg/kg in five of the six soil samples analyzed at SWMU 14. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

Septic Tank

A sample of the septic tank sludge was analyzed and the complete results are presented on Table 28. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP concentration. The septic tank contents did not exceed the applicable criteria; therefore, the contents are considered to be nonhazardous. The VOCs 1,1,1,-trichloroethane and trichloroethene were detected at concentrations of 0.03 and 0.003 mg/kg (each was estimated) in a sample of the septic tank sludge. The SVOCs benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, and pyrene were detected at concentrations (all were estimated) ranging from 0.09 to 0.3 mg/kg in samples of the septic tank sludge. Most metals, including nickel (at a concentration of 36 mg/kg), were detected in the sludge. O&G was detected at a concentration of 3,600 mg/kg.

A sample of the septic tank sewer water was also analyzed and a complete list of analytical results is presented on Table 29. No VOCs or SVOCs were detected in the septic tank water. A number of metals, including nickel (at a concentration of 252 ug/L) were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environment impacts from metals in septic tank leachate adsorbing to soils. Several metals were detected at higher concentrations in the septic tank water, but these did not appear at potentially elevated concentrations in the soil samples. Also, the concentration of nickel in soil appears to generally increase with depth. If the septic tank is associated with the elevated concentration of nickel in soil, higher concentrations of nickel would be expected at the shallow soil depths associated with the leach field. There is no identifiable correlation between the detected nickel in the septic tank water and the elevated (exceeding the estimated ambient limit concentration and residential PRGs) concentration of nickel in two soil samples at SWMU 14. O&G was detected in the septic tank sewer water at 6.6 µg/L.

5.7.4 Conclusions and Recommendations

Based on the analysis of samples collected in the vicinity of the septic tank and leach field, there are no hazardous constituents present in soil at concentrations that pose a threat to human health or the environment.

Phenol was detected at concentrations of up to 0.6 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No detected metals exceeded either their estimated ambient limit concentrations or PRGs except for nickel. Nickel was detected in two soil samples at depths of 10.5 and 16.0 feet bgs at concentrations of 164 and 256 mg/kg, respectively. The California modified residential PRG for nickel is 150 mg/kg; however, the industrial PRG for nickel is 34,000 mg/kg. The concentration of nickel in that soil sample exceeded the residential PRG but is significantly less that the industrial PRG. In addition, like most metals, nickel tends to adsorb to fine-grained soils so its potential migration is limited. Nickel was the only constituent in soil at SWMU 14 that exceeded both the estimated ambient limit concentration and PRG concentrations. Furthermore, these PRG concentrations were exceeded in only two samples (the source of the nickel in soil has not been established). Regardless of the source, because these samples were located at depth rather than near the surface, they do not pose a threat to human or ecological receptors.

The septic tank sewer water sample contained nickel as well as a number of other metals. As a conservative safety precaution, the septic tank was pumped free of contents and was cleaned in early March 1997. Future septic tank operations at the site will adhere to standard Naval Weapons Station Concord protocol, and should not adversely affect the area.

The nickel detected in soil does not constitute a threat to human health and the environment, because its occurrence is isolated and migration of the nickel is unlikely. The site is therefore recommended for no further action under the RCRA corrective action program as soon as the septic tank contents are removed for disposal.

5.8 SWMU 15 - BUILDING IA-41

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 15.

5.8.1 Site Background

This subsection provides the site description for SWMU 15. Figure 17 shows the locations of Building IA-41 and other features.

Building IA-41 is located about 800 feet south of the old airport and 1,800 feet east of Building IA-56, and was used as a paint storage shop. According to the RFA, this building has a sink and sanitary sewer system that drains into a septic tank. However, the septic tank was not located during the septic tank sampling event performed at all septic tanks in August 1993. Review of available engineering drawings by Naval Weapons Station Concord did not reveal the presence of a septic tank. Also, the small bunker is a one-room building and visual inspection did not reveal evidence of a former sink or drainage system.

The building is a bunker covered with fill material on three sides. A transmission line that belongs to the Bureau of Reclamation runs directly above Building IA-41. The area around Building IA-41 is flat and used for grazing. The nearest housing is located a quarter-mile south of SWMU 15, just outside the base boundary.

5.8.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 15 a medium priority for future investigation because of the assumed presence of a septic tank that may have released hazardous constituents to the environment. However, there is no evidence that a sink or septic tank ever existed at the site.

The objective of sampling at Building IA-41 was to investigate site soils for contamination that could have resulted from paint storage and spills from both inside and outside the structure. The floor of the building is cracked. Because paints and paint thinners may have leaked to the soils through the cracks, one soil boring was advanced to a depth of 4 feet bgs through the floor of the Building (15-03). Two soil borings were advanced to depths of 6 and 5 feet bgs outside the door of the Building (15-01 and 15-02), where paint or paint thinners may have been dumped. The soil samples from these borings were analyzed for metals, VOCs, and SVOCs. Groundwater investigation was not proposed at the septic tank sites except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

5.8.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 12A and on Figure 17.

Six soil samples were collected and analyzed for metals at SWMU 15. Of these, one soil sample contained concentrations of three metals that exceeded residential PRGs and estimated ambient limit concentrations. The sample was collected from a depth of 4 feet in boring 15-03 and contained manganese (9,090 mg/kg), nickel (196 mg/kg), and thallium (11.0 mg/kg). No other metals were detected above residential PRGs or estimated ambient limit concentrations.

The SVOC phenol was detected at concentrations up to 1 mg/kg in four of the six soil samples analyzed for SVOCs at SWMU 15. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg. No other VOC or SVOC constituents were detected.

5.8.4 Conclusions and Recommendations

Phenol was detected at concentrations of up to 1.0 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

The site soils at SWMU 15 did not contain any substances above PRGs except for the one sample from boring 15-03, which contained the three metals listed above. The sample was overlain by soils that do not contain metals above the residential PRG or estimated ambient limit concentrations. In addition, surrounding samples do not contain manganese, nickel, or thallium above residential PRGs or estimated ambient limit concentrations. The incidence of manganese, nickel, and thallium concentrations exceeding both the residential PRG and estimated ambient limit concentrations suggests that a relatively small volume of soil exceeds both these criteria. A small volume of contaminated soil limits its potential to act as a source of contamination and also limits the risk associated with direct exposure. Another factor that tends to limit the potential threat of these constituents is their tendency to adsorb to fine-grained soils. For these reasons, there is a low risk of impacts to human health and the environment associated with SWMU 15. Because of the low risk, the SWMU is recommended for no further action under the RCRA corrective action program.

5.9 SWMU 16 - BUILDING IA-46

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 16.

5.9.1 Site Background

This subsection provides the site description for SWMU 16. Figure 18 shows the locations of Building IA-46 and other features.

Building IA-46 was constructed in the 1940s and is located in the main industrial complex of Naval Weapons Station Concord, approximately 1 mile east of the main entrance and north of Kinne Boulevard, off of D Street. The building is fenced on all sides, with the entrance on the west side. Building IA-49 is located 80 feet northwest, and Building 433 is located 60 feet east of Building IA-46. Several buildings for storage of paint, oxygen, and acetylene are located south of Building IA-46. Along the south fence is a storage area for construction supplies. Suspected releases of asbestos from packing operations in drums were noted in the RFA; however, no asbestos piping or residue was noted during the site visit.

A fluorescent light tube crusher, located at the east end of Building IA-46, is used to reduce the bulk of used fluorescent light bulbs generated at Naval Weapons Station Concord. Approximately 10 to 20 fluorescent light tubes are crushed bi-monthly. The crusher operates by feeding the fluorescent light tubes through a cylindrical metal tube attached to a 55-gallon drum. Any particulates from the operation are entrained by a bag attached to the tube crusher's pump. Once the drum is filled, it is transferred to Building 433, which is one of the five permitted hazardous waste management units at Naval Weapons Station Concord. It is included in the Hazardous Waste Facility Permit effective July 31, 1993. The RFA noted the possibility of releases of mercury from fluorescent light tube crushing operations; however, no mercury residues were observed on the walls, floor, or ceiling of the room where the fluorescent light tube crusher is located.

A storage shed for accumulation of asbestos waste was located at the west end of Building IA-46. Friable asbestos was stored in drums that were disposed of at a permitted Class II disposal facility. Nonfriable asbestos pipe, used for minor repairs, was also stored near the shed. This shed was also used to mix pesticides. Mixing was performed according to instructions on container labels. Empty cans were triple-rinsed and the rinse water was deposited in the spray tanks. The empty containers were then suitable for disposal as solid waste. A sink in the shed was used to provide water for pesticide mixing. Occasional spills were reported. The Initial Assessment Study stated that in 1966 an agricultural lessee complained that poisonous chemicals had been spilled into a drain that flowed into his cattle grazing area located south of the intersection of Kinne Boulevard and D Street. A drainage ditch flows underneath Kinne Boulevard 200 feet east of the intersection of Kinne Boulevard and D Street. A drain was then installed to connect the storage shed to the sewer system. Public works personnel at Naval Weapons Station Concord acknowledged that chemical wastes from the pesticide storage and mixing area may have been dumped into an adjacent gutter on D Street that flowed toward the area in question.

5.9.2 RFA Confirmation Study Sampling

The RFA designated SWMU 16 as a low priority for future investigation because of potential releases of mercury from tube crushing operations. There were also suspected releases of asbestos. The use of the site for storage and mixing of pesticides was not documented in the RFA. The objectives of soil sampling at SWMU 16 were to investigate the site for the possible presence of mercury, asbestos, and pesticides.

Three soil borings were drilled to 5 feet bgs along the south boundary fence (16-01, 16-02, and 16-03) in areas where asbestos was suspected or where staining was apparent. Soil samples from these borings were all analyzed for asbestos.

Since pesticides were noted to have been spilled into the drainage ditch adjacent to D Street, two borings were installed to 5 feet bgs (16-04 and 16-05) and one boring was completed to 14 feet bgs (16-06) in the former shed area along the west edge of Building IA-46. Significantly elevated concentrations of several pesticides were detected in soil samples from each of these three borings. Consequently, seven additional borings (16-07 through 16-13) were drilled to delineate the lateral and vertical extent of pesticides in the area. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

5.9.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 13A and on Figures 18 and 19.

Analysis of all samples collected from borings 16-01, 16-02, and 16-03 did not detect asbestos.

More than 3,000 mg/kg of pesticides were detected in the 0.5 foot soil sample from boring 16-05. A sample collected from a depth of 5 feet in the same boring contained less than 0.5 mg/kg of pesticides. The near-surface samples from borings 16-04, 16-06, 16-07, 16-10, and 16-11 contained concentrations of pesticides ranging from less than 0.1 mg/kg to less than 3 mg/kg. Of these borings, only 16-04, 16-05, and 16-06 contained pesticides at concentrations exceeding residential PRGs. In all cases, the concentrations of pesticides diminished rapidly with depth and the 5-foot sample from most soil borings did not contain detectable pesticides. Furthermore, no sample collected from 5 feet bgs contained concentrations of pesticides in excess of residential PRGs. Soil samples from borings 16-08, 16-09, and 16-12 did not contain detectable concentrations of pesticides in any samples. One surface soil sample was collected at boring 16-13 in the off site drainage area to evaluate whether pesticides were transported off site by storm water flows. Although pesticides were detected in that boring, none were present at concentrations exceeding PRGs. A summary of the pesticides detected in soils at SWMU 16 is presented in the following table.

Eight soil samples were collected and analyzed for metals at SWMU 16. Of these, two soil samples contained concentrations of arsenic exceeding the residential PRG (0.38 mg/kg) and the estimated ambient limit concentration (7.3 mg/kg). The samples were collected from a depth of 0.5 feet in boring 16-04 (8.3 mg/kg) and 16-06 (23.7 mg/kg). No other metals were detected above residential PRGs or the estimated ambient limit concentration.

5.9.4 Interim RCRA Corrective Action

The surface soil samples from borings 16-04, 16-05, and 16-06 contained concentrations of pesticides that exceed both the residential and industrial PRGs. The site was almost entirely paved; however, a portion of the site was not paved, and the exposed surface soils posed a potential human health risk. As a result, access to the area was immediately restricted. During Summer 1996, PWC completed an interim RCRA corrective action to remove and dispose of all soils containing pesticides that exceed the industrial PRGs.

During the excavation, sampling was completed to evaluate the success of the pesticide removal and guide additional excavation. The corrective action cleanup goal was 1 mg/kg of DDT. Final confirmation samples were collected at the limits of the excavation. The limits of the excavation and all sample test results were documented in the closure report (CH2M Hill 1997). A copy of all the CH2M Hill analytical test results, including confirmation samples and samples from soil that was later removed, are illustrated on Figure 20. The depth and lateral extent of the final excavation is also illustrated on Figure 20.

SUMMARY OF PESTICIDES DETECTED IN SOIL SAMPLES AT SWMU 16
(reported in mg/kg)

BORING ID	DEPTH (feet)	Aldrin	Chlordanes (Total)	DDD	DDE	DDT	Dieldrin	Heptachlor
16-04	0.5	0.02	0.8	ND	0.05	0.09	0.1	0.009
16-04	0.5 duplicate	0.02	1.6	ND	0.08	0.2	0.1	0.02
16-04	5.0	ND	0.04	ND	ND	ND	0.005	ND
16-05	0.5	ND	680	120	43	2100	170	160
16-05	5.0	ND	0.2	ND	ND	0.2	0.02	0.01
16-05	5.0 duplicate	ND	0.2	ND	ND	0.2	0.02	0.01
16-06	0.5	ND	0.8	ND	0.06	0.6	0.2	0.04
16-06	0.5 duplicate	ND	1.5	ND	0.09	1	0.2	0.05
16-06	5.0	ND	0.001	ND	ND	ND	0.002	ND
16-06	11.0	ND	ND	ND	ND	ND	ND	ND
16-06	14.0	ND	ND	ND	ND	ND	ND	ND
16-07	0.5	ND	0.0038	0.0024	ND	0.009	ND	ND
16-07	5.0	ND	ND	ND	ND	0.0022	ND	ND
16-08	1.0	ND	ND	ND	ND	ND	ND	ND
16-08	4.5	ND	ND	ND	ND	ND	ND	ND
16-09	0.5	ND	ND	ND	ND	ND	ND	ND
16-09	5.0	ND	ND	ND	ND	ND	ND	ND
16-10	0.0	ND	0.051	0.015	0.031	0.15	0.014	ND
16-10	2.0	ND	ND	ND	ND	ND	ND	ND
16-10	4.5	ND	ND	ND	ND	ND	ND	ND
16-11	0.5	ND	ND	ND	ND	0.0051	ND	ND
16-11	2.0	ND	ND	ND	ND	ND	ND	ND
16-11	5.0	ND	0.0054	ND	ND	0.0047	ND	0.0012
16-12	0.5	ND	ND	ND	ND	ND	ND	ND
16-12	5.0	ND	ND	ND	ND	ND	ND	ND
16-13	0.0	ND	0.024	0.0087	0.006	0.076	0.0068	ND
EPA Residential PRGs		0.026	0.34	1.9	1.3	1.3	0.028	0.099
EPA Industrial PRGs		0.11	1.5	7.9	5.6	5.6	0.12	0.42

Notes: 1 Data qualifiers are applicable to some of the above results but are not reported in this table.
2 Shaded areas indicate analytical results that exceed EPA residential PRGs.

The low incidence of arsenic concentrations exceeding both the residential PRG and estimated ambient limit concentration suggests that a relatively small volume of soil exceeded these criteria. A small volume of contaminated soil limits its potential to act as a source of contamination and also limits the risk associated with direct exposure. These factors reduce the significance of detectable arsenic at the site. Consequently, confirmation samples did not include analysis for metals.

5.9.5 Conclusions and Recommendations

The site is recommended for no further action under the RCRA corrective action program because pesticide-contaminated soils were removed from the site during the RCRA corrective action.

5.10 SWMU 17 - BUILDING IA-50

This section presents the site background, RFA Confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 17.

5.10.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 17. Figure 21 shows the locations of Building IA-50 and other features.

Site Description

Building IA-50 was constructed in the early 1950s and is located about 100 feet south of Kinne Boulevard, 2.7 miles from the main entrance. Six years ago, Building IA-50 was used as a transfer station for ordnance materials. Packages of ordnance materials were frequently broken down and repackaged inside the building. Ordnance was labeled using stencil and paint spray cans. The used spray cans were the hazardous wastes generated at that time.

Building IA-50 functioned as a rail/truck transfer depot. Both sides of the building have a platform leading to a railroad spur.

Building IA-50 has a sink and sanitary sewer system that drains into a septic tank through a 6-inch vitrified clay pipe. The septic tank is located about 80 feet south of Building IA-50. The outlet of the septic tank splits into two 4-inch open-joint tile drains that run parallel to each other. The two tile drains are about 10 feet apart. Each distribution field is about 2 feet wide and 2 feet deep.

Seal Creek is located approximately 100 feet from the edge of the drain field and is approximately 20 feet lower in elevation.

Previous Investigations

TRPH was detected in a septic tank sample collected on October 9, 1990 and total organic carbon (TOC) was detected in a septic tank sample collected on August 17, 1993. The SVOC 1,4-dichlorobenzene and the VOCs benzene and chlorobenzene were detected in the October 9, 1990, liquid sample.

5.10.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 17 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. The soils and septic tank were sampled at SWMU 17 during the RFA Confirmation study. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 17 was to investigate potential leakage of hazardous wastes from the septic tank and leach field system to nearby subsurface soils. Two soil borings were advanced to depths of 15 to 15.5 feet bgs (17-01 and 17-02).

Soil boring (17-01) was located within the drain field and the second soil boring (17-02) was located adjacent to and west of the septic tank, just north of the leach field. Soil samples from the two borings were analyzed for metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank and therefore could be released to soil or groundwater via the leach field system. The septic tank sewer water was sampled and analyzed for VOCs, SVOCs, metals, and O&G.

5.10.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 14A and on Figure 21.

Soil

No VOCs were present in soil samples at concentrations above detection limits. The SVOC phenol was detected at concentrations of up to 0.8 mg/kg in four of the six soil samples analyzed for SVOCs at SWMU 17. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

No metals were detected in soil samples at concentrations above estimated ambient limit concentrations or residential PRGs. O&G was detected in two of the six soil samples at concentrations of up to 41 mg/kg.

Septic Tank

A complete list of analytical results for the septic tank sewer sample is presented on Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria; therefore, the contents are considered to be nonhazardous. One VOC constituent, chlorobenzene, was detected at a concentration of 2 μg/L (estimated); however, SVOC constituents were not detected in the septic tank sewer water. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils. O&G was detected at a concentration of 22 μg/L (estimated).

5.10.4 Conclusions and Recommendations

Phenol, metals, and O&G were the only constituents detected in the soil samples at SWMU 17, and none of these were present at concentrations that suggest potential site contamination.

In addition, there is no indication that the constituents detected in the septic tank have caused impacts to soil in the vicinity and downgradient of the leach field system. Metals were not present in soils at concentrations in excess of PRGs and are therefore not recommended for further investigation. O&G was detected in soil at concentrations less than 50 mg/kg. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are insufficient to determine if the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. However, in either case, empirical evaluation suggests the concentrations are low and do not suggest a potential for constituent mobility or a threat to receptors of any type.

Metals were detected in the septic tank sewer water sample. However, metals were not detected at elevated concentrations in the septic tank, and none were detected simultaneously at elevated concentrations (exceeding the estimated ambient limit concentrations and residential PRGs) in the soil samples.

SVOCs were not detected in the septic tank sewer water sample and with only one exception were not present in soil samples from SWMU 17. The exception was phenol, which has been detected frequently at Naval Weapons Station Concord. Phenol was detected at concentrations of up to 0.8 mg/kg, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

Although the septic tank did not contain hazardous waste and there has been no discernible impact on soil in the vicinity of the septic tank or leach field, the septic tank did contain waste with elevated or potentially elevated concentrations of several metals. To safeguard the environmental quality of soil in the vicinity septic tank and leach field, the Navy had the contents of the septic tank removed and the septic tank was cleaned. The removal of septic wastes and the septic tank cleaning was completed by early March 1997 and is documented in the closure report (CH2M Hill 1997).

Residential PRGs were not exceeded in any soil samples at SWMU 17. Furthermore, there appears to be no relationship between constituents present in septic tank sewer water and those present in site soil (with the exception of low concentrations of O&G). As a result, there is no evidence of site contamination at SWMU 17 and the site is recommended for no further action under the RCRA corrective action program.

5.11 SWMU 18 - BUILDING IA-51

This section presents the site background, RFA Confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 18.

5.11.1 Site Background

This subsection provides the site description. Figure 22 shows the locations of Building IA-51 and other features.

Building IA-51 was constructed in the 1940s and is located in the main industrial complex. The building was used as a steam cleaning facility for locomotives, trucks, and other vehicles. The steam cleaner was deactivated in the mid-1970s, when the steam cleaning unit west of Building IA-12 became operational. Oily waste generated by the steam cleaning operations drained directly into the sump (Container No. IA-51). The oil was pumped out by a contractor's vacuum truck, and the sump was periodically cleaned by the contractor.

Prior to the early 1960s, a zinc chromate rust inhibitor was added to motor antifreeze and waste antifreeze was disposed of by a contractor. After the early 1960s, antifreeze which was believed to be free of chromates was typically discharged to the ground and into storm drains. According to the 1992 DTSC RFA report (DTSC 1992), chromates were detected in Seal Creek in 1978. The source of this information is not referenced in the DTSC report and additional information regarding the location of samples and concentrations detected has not been found. When it was discovered that the new antifreeze contained zinc chromate, the type of antifreeze was changed and biodegradable rust and scale inhibitor was added.

The area along the west side of the building is currently used to store old tires. Railroad tracks run east to west along the north and south sides of the building. A 40-foot long splash wall is located approximately 20 feet east of the building. A sump installed in 1945 is located 12 feet east of the splash wall, is made of concrete 6 inches thick, and had a capacity of 40 gallons. The sump was filled with concrete when the steam cleaning unit was deactivated.

Aerial photographs show that a turntable for locomotives, approximately 44 feet in diameter, existed 100 feet east of Building IA-51 until at least 1969. A semicircular crack in the asphalt indicates where the turntable existed. The turntable is not present in the 1976 aerial photograph. Though the exact nature of activities occurring in the vicinity of the former turntable is not evident from the aerial photograph, base personnel who work at Building IA-51 say that an incinerator, used to destroy classified documents, was present in the excavation for the former turntable in 1976. A drop pit to collect steam cleaning water was formerly located 10 feet north of the turntable. The drop pit was destroyed when the turntable was removed.

5.11.2 RFA Confirmation Study Sampling

The RFA designated SWMU 18 as a high priority for future investigation because of documented releases of oily waste to the sump and because of the documented release of zinc chromates to Seal Creek from the storm drains. Soil and groundwater sampling investigations were performed at SWMU 18. These investigations are discussed below.

Soil

The objective of soil sampling at SWMU 18 was to investigate site soils for the presence of hydrocarbons in the vicinity of the oil sump, vehicle maintenance area, locomotive steam cleaning area, and railroad turntable, and to investigate the storm drainage outfall for residual contamination from surface discharges in the area.

One soil boring (18-01) was advanced to 15.5 feet bgs at a location as close to the former sump as practicable and one soil boring (18-02) was advanced to 15.5 feet bgs in the area of the former turntable. Soil samples from both borings were analyzed for metals, TPHd, TPHmo, and O&G. Soil samples from boring 18-01 were additionally analyzed for BTEX, and soil samples from 18-02 were also analyzed for VOCs and SVOCs.

Three soil borings (18-03, 18-04, and 18-05) were advanced along the storm drainage outfall south and east of Building IA-8 (refer to Figure 23). The soil samples from these borings were analyzed for metals. The bed of Seal Creek downstream of the storm drain outfall was not sampled because residual contamination is unlikely after approximately 20 years of intermittent flushing cycles since the reported release. Because contaminants were not suspected in the creek bed, sampling was not proposed in the field work plan. The drainage above the creek, closer to the potential source, was judged to be a more likely area of contamination.

Based on the analytical results of samples collected from borings 18-01 and 18-02, an additional seven borings were probed in an attempt to locate the source of TPHmo detected in soil and groundwater. Borings 18-06, 18-07, 18-08, 18-09, 18-10, 18-11, and 18-12 were probed in the vicinity of the former sump pit, former drop pit, and former locomotive turntable. These borings were analyzed for TPHd, TPHmo, and BTEX.

Groundwater

The objective of groundwater sampling was to investigate whether releases of hydrocarbons have caused impacts to groundwater. Groundwater samples were collected from two soil borings (18-01 and 18-02).

Surface Water

Surface water was not present during field activities in February 1995. Therefore, no surface water samples were collected.

5.11.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Tables 15A and 15B and on Figures 22 and 23.

Soil

Soil samples from borings 18-01 and 18-02 did not contain detectable TPHd or VOCs. In addition, metals were not present at concentrations greater than residential PRGs or estimated ambient limit concentrations. TPHmo was detected at a concentration of 1,100 mg/kg in boring 18-02 at a depth of 5 feet; however, soil samples collected at three deeper depths in the same boring did not contain more than 10 mg/kg TPHmo. Soil samples from four of the eight borings surrounding boring 18-02 contained TPHmo at concentrations of 340 to 9,700 mg/kg in soils at depths of 1.5 to 2.5 feet bgs. The remaining four borings contained TPHmo ranging from the method detection limits to 34 mg/kg in soils less than 3 feet deep. In all cases where deeper soil samples were collected, the concentration of TPHmo diminished to nondetectable at a depth of 9.5 feet.

Several SVOCs were detected at concentrations of less than 0.1 mg/kg in the shallow soil sample in boring 18-02; however, none of these exceeded residential PRGs. In addition, SVOCs were not detected in any deeper soil sample.

Analytical results of shallow soil borings 18-03, 18-04, and 18-05 did not include concentrations of metals exceeding residential PRGs and estimated ambient limit concentrations.

Groundwater

Groundwater was measured at a depth of 22 feet in two soil borings (18-01 and 18-02) at SWMU 18. A groundwater sample was collected from each boring using a HydroPunch sampler. TPHd, O&G, VOCs, and SVOCs were not present in the groundwater samples above detection limits. Metals were detected in the two groundwater samples. However, since the samples were not filtered, the concentration of metals detected could be falsely elevated because of particulate matter within the samples. TPHmo was detected at a concentration of 740 µg/L in boring 18-01 and at a concentration of 540 µg/L in boring 18-02.

5.11.4 Conclusions and Recommendations

TPHmo was detected at concentrations of 1,100 to 9,700 mg/kg in four soil samples and at depths of 5 feet and less. In several cases, nearby soil borings did not contain high concentrations of TPHmo. At three out of these four locations where higher concentrations of TPHmo were detected, deeper soil samples contained less than 10 mg/kg TPHmo.

One of the soil samples (with a TPHmo concentration of 1,100 mg/kg) was analyzed for VOCs and SVOCs. VOCs were not detected and SVOCs were not present at concentrations greater than residential PRGs.

TPHmo was detected in groundwater at concentrations of 540 to 740 µg/L.

Based on this information, the following conclusions can be drawn:

- The source of TPHmo contamination of groundwater has not been determined. The soil samples that were collected at the site between 10 feet and 22 feet bgs, the approximate depth of the groundwater table, were not significantly contaminated.
- TPHmo at SWMU 18 has been detected in some areas of the site in the shallow soils; however, the horizontal pattern of detections above a concentration of 500 mg/kg appears random.
- The lateral limits of TPHmo to the east of borings 18-06 and 18-11, and north of boring 18-06, are not defined.
- Where TPHmo is detected in shallow soils, it diminishes in concentration rapidly with depth and is not present above a concentration of 10 mg/kg at depths of 10 feet and greater.
- Hazardous constituents have not been detected at the site at concentrations above residential PRGs.

Based on the above site investigation and conclusions, the following recommendations have been developed:

- The source of TPH groundwater contamination at SWMU 18 should be determined. A CERCLA process investigation should be conducted to evaluate the source of contamination to groundwater. The investigation should encompass SWMUs 2, 5, 7, and 18.
- Although TPHmo has been detected in soil samples at SWMU 18, there is no evidence that the TPHmo detected in soil is likely to spread or is potentially harmful to humans. In its current state, the entire area is covered with pavement, and there is no exposure pathway for human or environmental receptors even if hazardous constituents were present. At present, there is no evidence to suggest that soil remediation in the vicinity of SWMU 18 is necessary because of the immobility of the TPHmo and the lack of hazardous constituents.

5.12 SWMU 22 - BUILDING 81

This section presents the site background, RFA Confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 22.

5.12.1 Site Background

This subsection provides the site description and summary of previous investigations. Figure 24 shows the locations of Building 81 and other features.

Site Description

Building 81 was constructed during the late 1950s and is located on Chosin Road approximately 1 mile east of the intersection of Kinne Boulevard and Willow Pass Road. Fuses and hydraulic fluids are tested in this Building for handling and temperature sensitivity. In addition, ordnance is maintained in Building 81. As part of regular maintenance, labels are painted on the ordnance using stencils and paint spray cans. The hazardous waste satellite accumulation point for used paint spray cans is located in Building 82.

Building 81 has cells or small rooms with reinforced walls and screened ceilings for safety. Each room has a fuse-detonating machine the size of a small oven where small quantities of ordnance fuses are detonated. Small volumes of air emissions, if any, are carried out of the Building through exhaust fans. No permit from the Bay Area Air Quality Management District is needed because of the small volume of the emissions.

Three USTs are located between Building 83 and Building 86. The USTs, used to fuel the boilers in the boiler house and a generator, are scheduled to be removed and replaced under a separate program.

The area around the Buildings is flat and covered with asphalt. The topography dips steeply from the parking lot to the southeast and south. To the north and northwest the topography climbs steeply. A drainage outfall exits from underneath Chosin Drive approximately 120 feet east of the northeast corner of Building 81. A septic tank is located down slope from the drainage outfall and 80 feet from Building 81.

Building 81 has a sink and sanitary sewer system that drains through an 8-inch vitrified clay pipe to manhole No. 2, then drains through manhole No. 1 into a septic tank located south of Building 81. The septic tank discharges through a 4-inch vitrified clay pipe and connects to a splitter box, which divides the flow.

A second septic tank is located west of Buildings 81 and 82. The extent of this septic tank's leach field system is not known.

Previous Investigations

A sludge sample collected from the southern septic tank on October 9, 1990, contained TRPH, TOG, SVOCs, and one VOC, 1,2-dichloroethene. A second sludge sample collected on August 17, 1993 contained TRPH and the SVOCs 1,4-dichlorobenzene and 4-methylphenol. One VOC was detected in the October 9, 1990, liquid sample.

Harding Lawson Associates conducted an investigation in the vicinity of the existing USTs on September 8, 1993. A soil boring was drilled to a depth of 21.5 feet bgs and sampled at 15.25 feet bgs and 21.0 feet bgs. The analytical results indicated that TPHd was present in the 15.25-foot sample. The analysis of the 21.0-foot sample did not indicate any TPHd above detection limits. TPHd was also detected in samples of groundwater, which was encountered at 17.0 feet bgs.

5.12.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 22 a medium priority for future investigation because of the presence of the southern septic tank that may have released hazardous constituents to the environment. Soils and the septic tanks were sampled at SWMU 22. Each is discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 22 was to investigate potential leakage of hazardous wastes from the septic tanks and from the leach field system to subsurface soils. Three borings were advanced to 15.5 feet bgs (22-01, 22-02, and 22-03). Borings 22-01 and 22-02 were advanced near the southern septic tank and leach field system. Soil boring 22-03 was advanced near the western septic tank.

Two soil borings were advanced to 4 feet bgs (22-04 and 22-05) by hand auger along the drainage south of the southern septic tank. Soil samples were collected from 0 to 0.5 feet and 5 to 5.5 feet bgs.

All soil samples collected from the borings were analyzed for metals, O&G, VOCs, SVOCs, and explosives.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tanks and therefore could be released to soil or groundwater from the leach field system. The sewer water samples from the southern septic tank (identification number of S22SP015) and western septic tank (sample identification number of S22SP016) were each analyzed for metals, O&G, VOCs, SVOCs, and explosives.

5.12.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 16A and on Figure 24.

Soil

Soil samples from all of the borings were analyzed for O&G, VOCs, and SVOCs. No explosives, VOCs, and SVOCs were detected except that the SVOC phenol was detected at concentrations up to 1.0 mg/kg in eight of the 13 soil samples analyzed for SVOCs at SWMU 22. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

No metals were present above residential PRGs or estimated ambient limit concentrations. O&G was detected in five of 13 samples at a maximum concentration of 150 mg/kg.

Septic Tank

A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous. The water sample from the southern septic tank contained low concentrations (less than 1 µg/L [all were estimated]) of benzene, chlorobenzene, and toluene. No other VOCs, SVOCs, explosives, or O&G were detected. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils. A complete list of analytical results for both samples is presented on Table 29.

The sample from the western septic tank contained low concentrations (less than 5 µg/L [all were estimated]) of the following VOCs: 1,2-dichloroethene, carbon disulfide, and trichloroethene. The sample contained the SVOC 4-methylphenol (7 µg/L [estimated]), the explosive RDX (0.2 µg/L [estimated]), and O&G (10 µg/L [estimated]). No other VOCs, SVOCs, or explosives were detected. A number of metals were detected.

5.12.4 Conclusions and Recommendations

Hazardous constituents have been detected in the septic tanks, but at only trace concentrations. There is no evidence that a release of these constituents has caused detectable impacts to soils. There is a low risk that the detected constituents could cause future impacts at the low concentrations detected in the septic tanks.

Relatively low concentrations (150 mg/kg and less) of O&G were detected in some soil samples. The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, it cannot be determined if the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. There are no applicable regulatory standards or criteria for evaluation of O&G in soils; however, empirical evaluation suggests that the concentrations are low and do not suggest a potential threat to receptors of any type.

Phenol was detected at concentrations of up to 1.0 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

Since there is no evidence of a release of hazardous constituents at the site and there is a low risk of releases in the future based upon standard Naval Weapons Station Concord waste handling protocol, the site is recommended for no further action under the RCRA corrective action program.

5.13 SWMU 23 - BUILDING 87

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 23.

5.13.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 23. Figure 25 shows the locations of Building 87 and other features.

Site Description

Building 87 was constructed in the late 1950s and is located on Inchon Drive approximately 1 mile east of the intersection of Kinne Boulevard and Willow Pass Road. Minor maintenance, such as labeling of ordnance using stencil and paint spray cans, was done at this building and hazardous wastes generated included used paint spray cans, oil, and solvents. Naval Weapons Station Concord no longer conducts the missile work at this facility and hazardous waste is no longer generated at this site.

Buildings 88 and 89 are located south of Building 87. A 6,000-gallon steel UST for diesel fuel storage is located about 25 feet west of Building 87. Associated gauge, oil suction/return, and vent lines are connected to the UST.

Building 87 has a sink and sanitary sewer system that drains from a 4-inch cast iron pipe to a 6-inch vitrified clay pipe that ultimately drains into a septic tank. The septic tank is located about 70 feet west of the southwest corner of Building 87. The effluent from the septic tank is divided into three distribution boxes. Each distribution box splits flow into three drain lines. Each drain line then flows along the entire length (100 feet) of the drain field. The UST is located 8 feet from the edge of the drain field. A parking lot has been constructed over the drain field.

Previous Investigations

A liquid sample collected from the septic tank on August 17, 1993 contained TOG. SVOCs diethylphthalate, butyl benzyl phthalate, bis(2-ethylhexyl)phthalate, and benzoic acid were also detected in the sample.

5.13.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 23 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soils and the septic tank were sampled at SWMU 23. Each of these is discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 23 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to subsurface soils. Two soil borings were advanced to 15.5 feet bgs (23-01 and 23-02) using the Geoprobe. All soil samples from these borings were analyzed for explosives, metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. A sample of the septic tank sewer water was collected and analyzed for VOCs, SVOCs, metals, and O&G.

5.13.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 17A and on Figure 25.

Soil

No explosives, VOCs, or SVOCs were detected in any soil sample except that the SVOC phenol was detected at concentrations up to 1.0 mg/kg in three of the six soil samples analyzed for SVOCs at SWMU 23. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

No metals were present above the residential PRGs or estimated ambient limit concentrations, except for arsenic, which was detected at a concentration of 8.8 mg/kg in boring 23-01 at a depth of 5 feet bgs. The residential PRG for arsenic is 0.38 mg/kg, and the estimated ambient limit concentration is 7.3 mg/kg.

O&G was detected in all six samples at concentrations up to 140 mg/kg.

Septic Tank

The analytical results for the sewer water sample from the septic tank are presented in Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous. The sample from the septic tank contained concentrations of the VOCs 2-butanone (72 µg/L [estimated]) and acetone (2,800 µg/L [estimated]) and the SVOCs 4-methylphenol (640 µg/L [estimated]), fluoranthene (14 µg/L [estimated]), and phenanthrene (13 µg/L [estimated]). No other VOCs or SVOCs were detected. A concentration of 84 µg/L (estimated) O&G was also detected. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.13.4 Conclusions and Recommendations

Relatively low concentrations (140 mg/kg and below) were detected. The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. There is no applicable regulatory standard or criteria for evaluation of O&G in soils; however, empirical evaluation suggests that the concentrations are low and do not suggest a potential threat to receptors of any type.

Phenol was detected at concentrations of up to 1.0 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

Arsenic was detected in a soil sample at a concentration exceeding the estimated ambient limit concentration and residential PRG. The estimated ambient limit concentration is 7.3 mg/kg, and the detected concentration of arsenic was 8.8 mg/kg. The arsenic concentration appears to be naturally occurring rather than related to site activities. Even if the 8.8 mg/kg of arsenic was associated with site activities, the detected concentration only slightly exceeds the estimated ambient limit concentration. The low incidence of arsenic exceeding the residential PRG and estimated ambient limit concentration suggest that a small volume of soil exceeds both these criteria. A small volume of contaminated soil limits its potential to act as a source of contamination and also limits the risk associated with direct exposure. Another factor that tends to limit the potential threat of these constituents is their tendency to adsorb to fine-grained soils. No other metals exceeded both the estimated ambient limit concentrations and PRGs. Because of the limited extent of arsenic and low potential risk, no further evaluation or investigation is recommended with regard to the arsenic detected at SWMU 23.

There is no evidence of a release to the environment at SWMU 23 that could have an adverse effect on human or ecological receptors. As such, the site is recommended for no further action under the RCRA corrective action program.

Although the septic tank did not contain hazardous waste and there has been no discernible impact on soil in the vicinity of the septic tank or leach field, the septic tank did contain waste with elevated or potentially elevated concentrations of several constituents. To safeguard the environmental in the vicinity of the septic tank and leach field, the Navy had the contents of the septic tank removed and the septic tank was cleaned. The removal of septic wastes and the septic tank cleaning was completed in March 1997 and is documented in the closure report (CH2M Hill 1997).

5.14 SWMU 24 - BUILDING 93

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 24.

5.14.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 24. Figure 26 shows the locations of Building 93 and other features.

Site Description

Building 93 was constructed in the early 1960s and is located on the south side of Kinne Boulevard at the east end of Naval Weapons Station Concord. Building 93 appears to be the site of one of the largest generators of hazardous wastes at Naval Weapons Station Concord. These wastes include used paint spray cans, solvents, and adhesives. Generated wastes are stored at a satellite accumulation point at Building 429, located west of Building 93.

Sewage from Building 93 is discharged through a 6-inch vitrified clay pipe to manhole A located 100 feet west of Building 93. Manhole A discharges to a 2,500-gallon prefabricated steel septic tank, located about 240 feet northwest of the manhole, through an 8-inch vitrified clay pipe. The outlet of the septic tank connects to a splitter box that divides the effluent into 13 4-inch open-joint vitrified clay pipe drains that run parallel to the distribution fields. The 13 vitrified clay pipe drains are each at least 7 feet apart. Each distribution field is about 2 feet wide and 2 feet deep.

The area to the west of Building 93 is grass covered and slopes gradually to the edge of Seal Creek, which is located approximately 400 feet west of the drain field. The elevation drops approximately 20 feet between the top of the grassy field and the bottom of Seal Creek.

Previous Investigations

A liquid sample collected from the septic tank on October 9, 1990 contained the SVOCs phenol, 4-methyphenol, and benzoic acid, and the VOC toluene. A second sample collected on August 17, 1993 contained TRPH and TOG.

5.14.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 24 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soils and the septic tank were sampled at SWMU 24. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 24 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to subsurface soils. Three soil borings were advanced to depths ranging from 10.5 to 16 feet bgs (24-01, 24-02, and 24-03) using the Geoprobe. All soil samples were analyzed for metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. A sample of the septic tank sewer water was collected and analyzed for VOCs, SVOCs, metals, and O&G.

5.14.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 18A and on Figure 26.

Soil

No VOCs or SVOCs were detected except for the VOC chloroform, detected in one of eight samples at a concentration of 0.002 mg/kg (estimated), and the SVOC phenol, detected in seven of the eight samples at concentrations of up to 0.6 mg/kg. For comparison, the EPA residential PRG for chloroform is 0.53 mg/kg, and the residential PRG for phenol is 39,000 mg/kg.

Metals were not present above the residential PRGs or estimated ambient limit concentrations. One exception was noted for nickel, detected at a concentration of 195 mg/kg in boring 24-01 at a depth of 16 feet bgs.

O&G was detected in six of the eight samples at a maximum concentration of 64 mg/kg.

Septic Tank

One sewer water sample from the septic tank was collected and analyzed. A complete list of analytical results for the sample is presented on Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous. The sample from the septic tank contained concentrations of the VOCs carbon disulfide (2 μg/L [estimated]) and toluene (270 μg/L [estimated]) and the SVOC 4-methylphenol (320 μg/L [estimated]). No other VOCs or SVOCs were detected. A concentration of 9.4 μg/L (estimated) O&G was also detected. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.14.4 Conclusions and Recommendations

Chloroform was detected in one sample at a concentration of 0.002 mg/kg (estimated), which is significantly lower than the EPA residential PRG of 0.53 mg/kg. The low incidence of detection and the low concentration of chloroform indicates that chloroform does not pose a threat to human health or the environment. No further investigation of chloroform at the site is recommended.

Phenol was detected at concentrations of up to 0.6 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

O&G was detected in some of the soil samples, but at relatively low concentrations (64 mg/kg and below). The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. However, in either case, empirical evaluation suggests that the concentrations are low and do not suggest a potential threat to receptors of any type.

No metals were detected that exceeded either the estimated ambient limit concentrations or PRGs except for nickel, which was detected in one soil sample at a concentration of 195 mg/kg at a depth of 16 feet. The residential PRG for nickel is 150 mg/kg and the industrial PRG is 34,000 mg/kg, and the estimated ambient limit concentration is 100 mg/kg. The concentration of nickel in that soil sample exceeds the residential PRG but is significantly less that the industrial PRG. In addition, like most metals, nickel tends to adsorb to fine-grained soils, so the migration or leaching potential is limited. The low incidence of nickel concentrations exceeding the residential PRG suggests that a relatively small volume of soil contains nickel at concentrations exceeding the criteria. A small volume of contaminated soil limits its potential to act as a source of contamination and limits the risk associated with direct exposure. Nickel was the only constituent in soil that exceeded both the estimated ambient limit concentration and PRG concentrations, and only one sample exceeded these criteria. The source of the nickel in soil is therefore not established. Regardless of the source, the sample was collected from a depth of 16 feet bgs and is therefore assumed to not pose a risk to human or ecological receptors.

The septic tank sewer water sample contained an elevated concentration of nickel as well as a number of other metals. Because the septic tank and leach field might have contributed to the nickel detected in soil at 16 feet bgs, the septic tank was pumped free of sewer water and was cleaned. The removal of septic tank waste and cleaning was completed in March 1997. Future septic tank operations at the site are not expected to adversely impact the area.

The nickel detected in soil does not constitute a threat to human health and the environment since its occurrence appears isolated and because migration of the nickel is unlikely. The site is therefore recommended for no further action under the RCRA corrective action program provided the septic tank contents are removed for disposal.

5.15 SWMU 25 - BUILDING 97

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 25.

5.15.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 25. Figure 27 shows the locations of Building 97 and other features.

Site Description

Building 97 was constructed in the early 1960s and is located at the east end of Naval Weapons Station Concord at the end of R Street. The building was an ordnance assembly building for the Rocket Maintenance Facility of the Guided Missile Department in the Inland Area. Maintenance operations included the rebuilding of rocket motors, cleaning and painting rocket parts, and testing rocket engine components. The facility is currently unused but is being refurbished. Three USTs used to store JP-5 fuel were removed from the north side of the building in 1990, and a 4,000-gallon diesel UST was removed from the south side of Building 96 during April 1994.

The Initial Assessment Study reported that hazardous wastes generated at Building 97 included trichloroethane, epoxy, ethyl alcohol, contact cleaners, corrosion preventatives, oil, JP-5 rocket fuel, and solvent wastes. The hazardous wastes were collected per the Naval Weapons Station Concord RCRA permit and disposed of off base. Paint sludge was bagged and handled similarly. Until about 1978, the Tidal Area Landfill (IR Site 1) probably received all wastes generated from the building.

Building 97 has a sink and sanitary sewer system that drains to a septic tank through a 6-inch vitrified clay pipe. The 2,500-gallon prefabricated steel septic tank is located about 200 feet southwest of Building 97. The outlet of the septic tank connects to a splitter box which divides the effluent into nine 4-inch open-joint vitrified clay pipe drains that run parallel to the drain field. The nine vitrified clay pipe drains are at least 7 feet apart. Each leach line trench is about 2 feet wide and 2 feet deep.

Previous Investigations

A liquid sample collected from the septic tank on October 9, 1990 contained TOG and SVOCs, including phenol, benzo(a)anthracene, 1,4-dichlorobenzene, 4-methylphenol, benzo(b)fluoranthene, benzo(k)-fluoranthene, benzo(a)pyrene, chrysene, and dibenz(a,h)anthracene. A second sample collected on August 17, 1993 contained TOG and SVOCs, including 1,4-dichlorobenzene, phenol, and 4-methylphenol.

On December 9, 1990, the three USTs north of Building 97 were removed. Analytical results of soil samples collected from the UST excavation were below the method detection limit (Minter & Fahy 1991). The excavation was overseen by the Contra Costa County Environmental Health Division. No analytical results were available for the removal of the 4,000-gallon UST at the time this report was prepared.

5.15.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 25 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soils and the septic tank were sampled at SWMU 25. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of the soil sampling at SWMU 25 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to subsurface soils. Two soil borings were advanced to 5 feet bgs (25-01 and 25-02) using the Geoprobe. Boring 25-01 met refusal on bedrock at a depth of 8 feet. A third boring (25-03) was attempted adjacent to boring 25-01; however, it also met refusal on bedrock at 14 feet. All soil samples were analyzed for metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. A sample of the septic tank sewer water was collected and analyzed for VOCs, SVOCs, metals, and O&G.

5.15.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 19A and on Figure 27.

Soil

No VOCs or SVOCs were detected, except for the SVOC phenol detected in three of the five samples at concentrations of up to 0.8 mg/kg. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg. No metals were present above the residential PRGs and estimated ambient limit concentrations. O&G was detected in three of the five samples at a maximum concentration of 37 mg/kg.

Septic Tank

Analytical results for the sewer water sample from the septic tank are presented in Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous. The sample from the septic tank contained a concentration of the SVOC 4-methylphenol (370 μg/L [estimated]). No VOCs or other SVOCs were detected. An estimated 27 μg/L of O&G was also detected. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.15.4 Conclusions and Recommendations

O&G was detected in some of the soil samples, but at relatively low concentrations (37 mg/kg and below). The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. However, in either case, empirical evaluation suggests the concentrations are low and do not suggest a potential threat to receptors of any type.

Phenol was detected at concentrations of up to 0.8 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No metals in soil were detected that exceeded either the estimated ambient limit concentrations or PRGs.

The septic tank sewer water sample contained an elevated concentration of one SVOC (4-methylphenol) and several metals. However, the 4-methylphenol was not present at detectable concentrations in the soil sampled and metals were not detected above the screening criteria in soils. Constituents of potential concern are present in the septic tank at low concentrations but have not caused a detectable impact on soils. Because of the low concentrations of constituents present in the septic tank, the potential for future impacts to soil is low, provided that hazardous materials are not released to the septic tank. Naval Weapons Station Concord's operating permit under RCRA prohibits such releases. Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, the site is recommended for no further action under the RCRA corrective action program.

5.16 SWMU 37 - BUILDING A-29

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 37.

SWMU 37 is surrounded on three sides by IR Site 11 (except to the northeast). IR Site 11 is known as the Wood Hogger Site, which was used as a wetland disposal site for chipped wood. In contrast, SWMU 37 is a dry fill area that was used to stockpile and store wood and wood chips. The Wood Hogger Site is undergoing a RI for a variety of potential contaminants. Previous investigations of IR Site 11 are discussed in the sections that follow.

5.16.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 37. Figure 28 shows the locations of Building A-29 and other features.

Site Description

Building A-29 is located at the end of Davidson Road adjacent to the Wood Hogger site, which is being investigated under the Installation Restoration Program. SWMU 37 includes areas that have not been investigated under the Installation Restoration Program. The boundaries of SWMU 37 include Davidson Road to the south and east, Building A-29 to the west, and the open field to the north. The Wood Hogger site is located to the south and west. SWMU 37 is adjacent to a diked wetland habitat, and is bounded by Otter Sluice on two sides. As such, SWMU 37 lies at the boundary of land with significant habitat value.

Approximately 600 cubic yards of treated wood debris were removed from the dunnage area in 1992. Most of this wood waste was chemically treated. Dark brown wood was treated with creosote, light brown wood was treated with pentachlorophenol, and greenish wood was treated with copper arsenate.

Most treated wood waste items, such as used railroad ties or wharf timbers, are recycled on base or off base through other federal or state agencies for projects such as landscaping and retaining walls, or are sold to contractors who reuse the timbers for applications requiring use of treated wood. Some scrap treated wood was stockpiled near Building A-29.

A storage yard, at this SWMU, is currently paved with asphalt. Aerial photographs from as far back as 1952 show this storage yard was active, with railroad tracks providing access to the storage yard from the northeast corner of the site. The storage yard now contains scrap metal and wood, and other surplus materials, and is generally covered with weathered wood chips. Current storage practices in the storage yard and information derived from historical photographs indicate that a variety of wood and metal materials have been stored in sections of the yard at various times.

Previous Investigations

IT Corporation conducted an SI at the Wood Hogger site during 1989 through 1991. The SI included installing four monitoring wells located around and north of the Wood Hogger equipment (two of these wells are located near SWMU 37), collecting 12 surface water and 8 sediment samples, and sampling 15 soil borings. Groundwater samples were also collected.

Forty soil samples were collected from the soil borings. A total of 31 organic compounds were detected in the soil samples. VOCs detected included acetone, 2-butanone, carbon disulfide, methylene chloride, and PCE. SVOCs detected included 2-methylnaphthalene, 3,3'-dichlorobenzene, benzoic acid, polynuclear aromatic hydrocarbons (PAH), and phthalates. The chlorinated pesticides 4,4'-DDT and chlordane were detected five times. Three explosive compounds were detected in two soil borings. Four of the six metals were detected above the background values determined by IT Corporation (IT 1992).

Eight sediment samples were collected from throughout the Wood Hogger site. Four VOCs were detected in the samples, but all of the chemicals detected were common laboratory contaminants or a naturally occurring compound in the bay environment. Two phthalates were detected at all of the sample locations and are common laboratory contaminants. Copper and zinc were detected along the southern portion of the site above the background values determined by IT Corporation (IT 1992).

Groundwater samples were collected from the IR Site 11 monitoring wells for four quarters. The only VOC detected was acetone. Five SVOCs were detected in the groundwater. Five of the six metals with background values were detected at concentrations exceeding background values determined by IT Corporation (IT 1992).

Surface water samples were collected from four locations. The two VOCs detected were methylene chloride and acetone. No metals were detected above the site background values as determined by IT Corporation (IT 1992).

Between June 1995 and May 1996, PRC collected samples of soil and groundwater in the areas surrounding SWMU 37. The sampling was conducted as a part of the Tidal Area RI at Naval Weapons Station Concord. During the RI, detected metals, pesticides, PCBs, SVOCs, and hydrocarbons were detected in soil samples collected near SWMU 37. Metals were detected in the groundwater samples exceeding the U. S. EPA chronic ambient water quality criteria for protection of marine life. The results of the RI have been summarized in an interim draft report (PRC 1997).

5.16.2 RFA Confirmation Study Sampling

The RFA designated SWMU 37 as a medium priority for future investigation because of the potential for the release of small amounts of hazardous contaminants to soil and groundwater because of leaching from treated scrap wood. Soil and groundwater sampling investigations were performed at SWMU 37. These investigations are discussed below.

Soil

The objective of soil sampling at SWMU 37 was to investigate whether hazardous constituents including metals (specifically copper), creosote, and pentachlorophenol may have contaminated site soils. Seven soil borings were installed to depths of 0 to about 5 feet bgs (37-01, 37-02, 37-03, 37-04, 37-05, 37-06, and 37-07) and were located either between wood piles, in areas where staining is evident, or in areas where wood may have been stored on soil. Soil borings were sited at accessible locations and no wood piles were moved. Two soil borings were installed to 5 and 4.5 feet bgs (37-08 and 37-09) and were located adjacent to the west side of Building A-29. Two soil borings (37-11 and 37-12) were advanced up to 7 feet below the groundwater table borings. Soil boring 37-12 was located adjacent to the west end of Building A-29, where treated wood was stored. Soil boring 37-11 was located along the north boundary of the dunnage area. Soil samples were collected at 0 to 0.5 feet bgs and 5 to 5.5 feet bgs.

All soil samples were analyzed for metals, VOCs, SVOCs, pesticides/PCB, TOC, and explosives.

Groundwater

The objective of groundwater sampling at SWMU 37 was to investigate whether hazardous constituents have leached from the piles of treated scrap wood and have impacted groundwater. Groundwater samples were collected from these soil borings (37-11, 37-12, and 37-13). The groundwater samples were collected using Geoprobe sampling methods. One of the groundwater samples was analyzed for metals, VOCs, SVOCs, pesticides, PCBs, and explosives. The other groundwater sample was analyzed only for metals.

5.16.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 20A and 20B and on Figure 28.

Soil

VOCs were not detected in the soil samples. The SVOC phenol was detected at concentrations up to 0.3 mg/kg (estimated) in 4 of the 23 soil samples analyzed for SVOCs at SWMU 37. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg. No other SVOCs were detected.

One or more of the pesticides 4,4-DDD, 4,4-DDT, and endrin ketone were detected in three of the 23 soil samples analyzed for pesticides, at maximum concentrations of 0.004 mg/kg (estimated). No other pesticides were detected.

The explosive 1,3-dinitrobenzene was detected in one of 23 soil samples analyzed for explosives at a concentration of 0.1 mg/kg. No other explosives were detected.

Metals were not detected above estimated ambient limit concentrations or EPA residential PRGs.

Groundwater

Two unfiltered groundwater samples were collected from two Geoprobe borings during the investigation. No VOCs, SVOCs, pesticides, or explosives were detected. Metals were also not detected at elevated concentrations with the exception of arsenic, which was detected at a concentration of 404 μg/L in boring 37-11. At a later date, a new boring (37-13) was advanced adjacent to boring 37-11, and a second water sample was collected and analyzed for arsenic. This time, the water sample was filtered in the field using a 5.0 micron filter prior to shipment to the laboratory, and arsenic was detected at a concentration of 4.1 μg/L.

5.16.4 Conclusions and Recommendations

One or more of the pesticides 4,4-DDD, 4,4-DDT, and endrin ketone were detected at maximum concentrations of 0.004 mg/kg (estimated) in three of the 23 soil samples analyzed for pesticides. The lowest residential PRGs for these constituents are 1.9 mg/kg, 1.3 mg/kg, and 20 mg/kg, respectively.

The explosive constituent 1,3-dinitrobenzene was detected at a concentration of 0.1 mg/kg in one of 23 soil samples analyzed for explosives. The residential PRG for 1, 3-dinitrobenzene is 6.5 mg/kg.

Phenol was detected at concentrations of up to 0.3 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg.

Potential soil contaminants were detected infrequently and at low concentration at five out of the 12 locations sampled. With the exception of 4,4-DDT and phenol, none of these constituents were detected in more than one soil sample at SWMU 37. No constituents were detected in soil at concentrations exceeding residential PRGs. Because the distribution and concentration of pesticides, 1,3-dinitrobenzene, and phenol detected at the site do not pose a threat to human health or the environment, no further investigation of these constituents is recommended.

Groundwater samples did not contain any organic contaminants, and only one inorganic constituent (arsenic) in one sample was detected at a concentration of potential concern. However, since there was no elevated concentration of arsenic in the soil from the boring, the analytical result was suspected to be elevated because of soil particulate matter suspended in the water sample. A filtered groundwater sample was obtained later, and the arsenic concentration was 100 times lower. Because most soil particles cannot migrate with groundwater, the filtered groundwater sample is considered to be more representative of concentration of arsenic in groundwater than the unfiltered sample. Based on the results of the filtered groundwater sample, it appears that arsenic has not affected groundwater.

No regulatory criteria have been promulgated for the evaluation of soil contamination or wetland soils. However, due to the location of SWMU 37 in an area close to potentially significant wetland wildlife habitat, the results of the soil analysis were screened relative to the ecological effects range low (ER-L) and effects range median (ER-M) values criteria developed by Long and others (1995). ER-L and ER-M screening values were developed and are principally used in evaluation of offshore subtidal sediments. The ER-L and ER-M values are based on chemical and biological effects data from a wide variety of studies on invertebrates in marine and esturarine sediments. The ER-L represents the lower 10th percentile of the effects data and the ER-M the 50th percentile or median of the effects data. Concentrations below the ER-L represents levels at which adverse biological effects to offshore invertebrates are rarely expected; concentrations between the ER-L and ER-M may occasionally result in adverse biological effects. At concentrations above the ER-M, adverse biological effects, such as mortality or sublethal effects, are expected.

The chemical levels in soils at SWMU 37 were complared to ER-Ls and ER-Ms due to concerns about potential migration of these soils into the surrounding wetland habitats. If soil was transported and deposited, contaminated sediment could present some degree risk of to marine receptors. As a result, the ER-L and ER-M screening values are used as conservative screening values to evaluate potential environmental impacts from the surface and subsurface soils in SWMU 37. A few samples exceeded the ER-L criteria and the estimated ambient limit concentrations. These samples are listed below:

**SAMPLES EXCEEDING ER-L
AND ESTIMATED AMBIENT LIMIT CONCENTRATIONS**

Sample ID	Sample Depth (ft)	Constituent	Sample Concentration (mg/kg)
37-03	0 to 1.0	Mercury	0.35
37-10	0.5 to 1.0	Copper	86.0
37-10	0.5 to 1.0	Mercury	0.51
37-10	0.5 to 1.0	Silver	1.3
37-11	0.5 to 1.0	Copper	60.8

The following table compares the above analytical results exceeding the estimated ambient limits with the ER-L criteria.

A COMPARISON OF INORGANIC CONSTITUENT SCREENING CRITERIA

Constituent	ER-L (mg/kg)	ER-M (mg/kg)	Estimated Ambient Limit Concentration (mg/kg)	RWQCB Wetlands Cover Criteria (mg/kg)	RWQCB Wetlands Non-cover Criteria (mg/kg)
Copper	34.0	270.0	59.0	90.0	390.0
Mercury	0.15	0.71	0.22	0.31	1.3
Silver	1.0	3.7	Detection Limit	1.0	2.2

The following observations suggest that the site conditions relative to ecological criteria do not present a significant threat to ecological receptors:

- The ER-M is not exceeded in any sample.
- The RWQCB Wetland Cover Criteria is exceeded in some samples but the RWQCB Wetland Non-cover criteria is not exceeded in any sample.
- Relatively few samples exceeded the ER-L and this suggests that materials exceeding the criteria are relatively limited in volume and spatial distribution.

There is no evidence that treated wood storage and handling on the site has caused impacts to soil or groundwater. As a result, SWMU 37 is recommended for no further action under the RCRA corrective action program.

5.17 SWMU 40 - BUILDING 174

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 40.

5.17.1 Site Background

Figure 29 shows the location of Building 174 and other features. Building 174 is located at the southeast corner of the intersection of White Road and Anderson Road. The building serves as an electric substation which houses the electrical transformer that steps power down to distribution voltage levels. The transformer does not contain PCBs. In the past, this site housed a PCB transformer and may have been used to temporarily store PCB transformers that were not in use. Drip pans were used to contain leaks from the transformers being stored in Building 174.

5.17.2 RFA Confirmation Study Sampling

The RFA designated SWMU 40 as a low priority site for future investigation because of the possible leakage of PCB-contaminated transformer oil from the transformer storage facility. Three soil borings were advanced to depths of 0 to a maximum of 5 feet bgs (40-01, 40-02, and 40-03) around the perimeter of Building 174. All soil samples were analyzed for BTEX, TPHd, TPHmo, and pesticides/PCBs. Groundwater investigation was not proposed at the septic tank sites except in those cases where significant impacts to soil were found at the depth of groundwater. When groundwater was not encountered within 15 feet of the ground surface, additional drilling or groundwater investigation was not proposed unless significant impacts to soil were detected at a depth of 15 feet.

5.17.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 21A and on Figure 29.

BTEX constituents were not detected in any of the soil samples from the site. TPHd was detected in two samples at concentrations up to 8 mg/kg (estimated). Motor oil was detected in four of the five samples at concentrations up to 26 mg/kg.

Two soil samples from borings 40-02 and 40-03 contained PCBs and pesticides, including alpha-chlordane (up to 0.008 mg/kg), Aroclor 1248 (up to 0.4 mg/kg), Aroclor 1254 (up to 0.2 mg/kg), Aroclor 1260 (up to 0.07 mg/kg), and gamma-chlordane (up to 0.005 mg/kg). Of these concentrations, only Aroclor 1248 and Aroclor 1260 exceed residential PRGs.

5.17.4 Interim RCRA Corrective Action

Based on the recommendation of the RWQCB to address the PCBs detected in soil at the site, an interim RCRA corrective action to pave over the area of concern was pursued by the Navy. The Navy's Public Works Center excavated the vicinity of the site containing detectable concentrations of PCBs. The site was excavated to a depth of 1.5 feet. At that depth, one confirmation soil sample was collected from the center of the excavation. The confirmation soil sample was analyzed for PCBs, and PCBs were not present in the sample above detection limits. The area was backfilled with clean soil, compacted, and then paved with a 6-inch concrete slab. The excavation area and slab are illustrated on Figure 29.

5.17.5 Conclusions and Recommendations

All detectable PCB-contaminated soil at the site was removed during the interim RCRA corrective action, (CH2M Hill 1997). The only remaining detectable constituents included low concentrations of TPHd, TPHmo, and pesticides. The remaining constituents do not exceed PRGs and do not threaten human health or the environment because of the low concentrations and limited lateral extent. The site is recommended for no further action under the RCRA corrective action program.

5.18 SWMU 44 - BUILDING 350

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 44.

5.18.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 44. Figure 30 shows the locations of Building 350 and other features.

Site Description

Building 350 is located at the east end of the Tidal Area, 200 feet south of Port Chicago Highway. The building is located within a double fenced area, known as the "Q" Area, and was formerly guarded by U.S. Marine Corps personnel. Used paint spray cans, rags, and solvents were generated at the site. Building 350 is one of the satellite accumulation points for hazardous waste.

Building 350 contains two USTs that were used for diesel fuel oil storage: UST 350A and UST 350B. UST 350A was used to fuel the steam boiler that provides heating to this building, and UST 350B provided fuel to an emergency electrical generator for the building. The USTs were installed in 1981 and have a capacity of 2,000 gallons each. These USTs are tested for leaks annually, and the results are submitted to the Contra Costa County Environmental Health Division. In June 1991, a pressure gage leaked about 20 gallons of diesel fuel oil onto the floor in Building 350. Navy personnel contained and cleaned up the spill using absorbent materials.

According to records, Building 350 and Building 351 (a former Marine guard post) have sinks and sanitary sewer systems that drain into a common septic tank. The septic tank is located 55 feet from the southeast corner of Building 350. Sanitary sewer lines from Building 350 and Building 351 hook into a common manhole located 12 feet southwest of the septic tank. The drain field extends north of the septic tank and parallels the eastern wall of Building 350.

Previous Investigations

Analysis of a liquid sample from the septic tank collected on August 17, 1993 detected TOG. The only SVOC detected in the liquid sample was 4-methylphenol. VOCs detected in the liquid sample were 1,4-dichlorobenzene and toluene.

5.18.2 RFA Confirmation Study Sampling

The RFA assigned SWMU 44 a medium priority for future investigation because of the presence of a septic tank that may have released hazardous constituents to the environment. Soils and the septic tank were sampled at SWMU 44. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 44 was to investigate potential leakage of hazardous wastes from the septic tank and leach field system. An additional objective was to investigate whether diesel fuel from the nearby 2,000-gallon tanks had contaminated soil in their vicinity. Two soil borings were advanced to depths of about 15.5 feet bgs (44-01 and 44-02). Soil samples were collected at 5.0 feet bgs and at the water table from each soil boring. All soil samples were analyzed for metals, TPHd, TPHmo, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank and, therefore, could be released to soil or groundwater in the leach field system. One sample of septic tank sewer water was collected and one sample of septic tank sewage sludge was collected. Both samples were analyzed for VOCs, SVOCs, TPHd, TPHmo, metals, and O&G.

5.18.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 22A and on Figure 30.

Soil

None of the six soil samples analyzed for VOCs and SVOCs contained any constituents except for phenol, which was detected in two of the samples at a maximum concentration of 1.0 mg/kg. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

TPHd was detected in two of the six samples at concentrations of 6 mg/kg (estimated). TPHmo was also detected in two samples at a maximum concentration of 15 mg/kg. O&G was detected in four of the soil samples at a maximum concentration of 81.

No inorganic constituents were detected in soil exceeding both the estimated ambient limit concentrations and residential PRGs.

Septic Tank

A complete list of analytical results for the septic tank sewer water is presented on Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or

STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous.

The septic tank sludge sample contained two VOCs: 1,1,1-trichloroethane (estimated 48 mg/kg) and trichloroethene (estimated 12 mg/kg). SVOCs detected included 2-methynaphthalene (estimated 2 mg/kg), 4-chloroaniline (estimated 9 mg/kg), and phenanthrene (estimated 2 mg/kg). The sludge does not exceed any state or federal hazardous waste criteria and is therefore classified as nonhazardous. TPHd was detected at a concentration of 16,000 mg/kg, and TPHmo was detected at a concentration of 51,000 mg/kg. O&G was detected at a concentration of 96,300 mg/kg.

The septic tank sewer water sample did not contain detectable VOCs. The SVOC 4-chloroaniline was detected at a concentration of 4 μg/L (estimated). TPHd was detected at a concentration of 20 μg/L (estimated), and TPHmo was detected at a concentration of 89 μg/L (estimated). O&G was detected at a concentration of 464 μg/L (estimated). A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.18.4 Conclusions and Recommendations

O&G was detected in some of the soil samples, but at relatively low concentrations (81 mg/kg and less). The soil samples were also analyzed for petroleum hydrocarbons, but detections of TPHd and TPHmo did not strictly correlate with detections of O&G (the sample with the highest O&G did not contain any detectable TPH). The source of the O&G has not been determined. The O&G may be derived from naturally occurring oils from plant organic matter. TPHd and TPHmo were detected to maximum concentrations of 15 mg/kg. Empirical evaluation suggests the concentrations of O&G, TPHd, and TPHmo are low and do not pose a potential threat to receptors of any type. Although significant concentrations of O&G, TPHd, and TPHmo were detected in the septic tank sludge, this has not partitioned to the septic tank sewer water or soil in significant concentrations.

Although the septic tank did not contain hazardous waste and there has been no discernible impact on soil in the vicinity of the septic tank or leach field, the septic tank did contain waste with elevated or potentially elevated concentrations of several constituents. To safeguard the soil in the vicinity septic tank and leach field, the Navy had the contents of the septic tank removed and the septic tank was cleaned. The removal of septic wastes and the septic tank cleaning was completed in March 1997 and is documented in the closure report (CH2M Hill 1997).

Phenol was detected at concentrations of up to 1.0 mg/kg, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No inorganic soil constituents were detected in excess of both the estimated ambient limit concentrations and residential PRGs. The septic tank sewage sludge and sewer water samples contained elevated concentrations of a few VOCs, SVOCs, and several metals. However, none of these constituents are present in the soil at detectable concentrations. Constituents of potential concern are present in the septic tank at low concentrations but have not caused a detectable impact on soils. Because of the low concentration of these constituents present in the septic tank sewer water, the potential for future impacts to soil is low, provided that hazardous materials are not released to the septic tank. Naval Weapons Station Concord's operating permit under RCRA prohibits such releases. Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, the site is recommended for no further action under the RCRA corrective action program.

5.19 SWMU 50 - BUILDING E-108

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 50.

5.19.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 50. Figure 31 shows the locations of Building E-108 and other features.

Site Description

Former Building E-108 is located in a paved parking area south of the intersection of Christenbury Road and Born Road. Building E-108 was the boiler house that supplied heat to barracks located in this area. A 500-gallon fuel oil UST (E-108) was used to fire the boilers. The building was declared surplus in March 1965 and was removed from the site. It is not known whether the UST designated E-108 was removed or abandoned in place; however, excavations in the area where the most concentrated soil contamination has been observed have failed to uncover a UST. Based on the excavations to date, it appears that the UST was probably removed.

Building E-85 lies to the south of former Building E-108. A 1,500-gallon fuel oil UST is located at the northeast corner of Building E-85.

Previous Investigations

SWMU 50 was not identified in the RFA. The SWMU was designated as a management unit by the Navy because of the hydrocarbon contamination found in the site soils.

Construction to repair the parking lot north of Building E-85 began in 1994. While leveling the parking lot, the foundation for the old boiler house was encountered. To determine the depth of the foundation, a test hole was excavated adjacent to the southwest corner of the foundation using a backhoe. Discoloration of the soil from 4 to 6 feet bgs and a small amount of organic matter at 6 feet bgs were observed. Samples of the soil and groundwater were collected on December 30, 1993, and analyzed for TPHd. The analysis showed the presence of TPHd in water and in soil at 2 feet and 4 feet. TOG was also detected in water. Additional holes were excavated 20 feet to the north, south, west, and east on January 20, 1994. The results showed that the TPHd was not present in soil samples from the north and east holes, but was present in the west hole (E-85 West). No TPHd was detected in the south hole, but the soil was discolored. A groundwater sample was also collected from the monitoring well (MW1) adjacent to UST E-85. The results showed the presence of nondiesel petroleum hydrocarbons.

Harding Lawson Associates conducted an investigation in the vicinity of Building E-85 on September 10, 1993. A soil boring (No. 7) was drilled adjacent to the Building E-85 UST to a depth of 10 feet bgs and sampled at 4.25 and 7.5 feet bgs. The results indicated TPHd was present in the soil samples. TPHd was also detected in groundwater, which was encountered at 10.0 feet bgs.

5.19.2 RFA Confirmation Study Sampling

Soil and groundwater investigations were performed at SWMU 50 to evaluate the site for hydrocarbon contamination. These investigations are discussed below.

Soil

The objective of the soil sampling and analysis at the site was to confirm and evaluate the lateral and vertical limits of hydrocarbon contamination.

Borings were advanced to depths of 1 to 5 feet bgs (50-01, 50-02, 50-05, 50-06, 50-07, and 50-08) at locations north of Building E-85 to evaluate the depth and lateral extent of soil contamination at the site.

All soil samples were analyzed for TPHd, TPHmo, and BTEX. The soil samples in borings 50-01, 50-02, 50-03, and 50-04 were also analyzed for O&G.

Groundwater

The objective of the groundwater sampling was to confirm and delineate hydrocarbon impacts to groundwater. Two monitoring wells (50-03 and 50-04) were installed northwest of the former boiler house (Building E-108). Water samples were collected from the two new monitoring wells (50-03 and 50-04) and monitoring well MW-1, adjacent to UST E-85, in April 1995. The groundwater gradient and flow direction was determined from measurements of the groundwater elevations from these wells. The groundwater samples were analyzed for TPHd and TPHmo.

5.19.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Tables 23A and 23B and on Figure 31.

Soil

TPHd was detected in four of the 16 soil samples analyzed at SWMU 50. The maximum concentration of TPHd detected was 5,700 mg/kg in boring (50-02). This was the only sample that contained TPHd at a concentration of greater than 500 mg/kg.

TPHmo was more widely detected than TPHd and was found in 11 of the 16 soil samples and at a maximum concentration of 1,800 mg/kg in boring (50-05). Although the occurrence of TPHmo was more widespread, seven of the detectable results were at concentrations less than 100 mg/kg. The

TPHmo was generally detected at higher concentrations where TPHd was detected, although TPHmo was not detected at the location where the highest concentration of TPHd was found. However, the TPHmo detection limit for that sample was elevated to 600 mg/kg.

BTEX constituents were detected in several samples although benzene was detected only once, at a concentration of 0.002 mg/kg. Ethylbenzene was detected in two samples at concentrations of up to 0.3 mg/kg. Toluene was detected in three samples at concentrations of up to 0.09 mg/kg. Total xylenes were detected in five samples at concentrations of up to 0.8 mg/kg.

Groundwater

Detectable TPHd (estimated 130 μg/L) and TPHmo (estimated 550 μg/L) were present only in the water sample from well 50-03. BTEX was not detected in any water sample.

5.19.4 Conclusions and Recommendations

All significant occurrences of TPHd, TPHmo, and BTEX are from borings 50-02, 50-05, and 50-06. Lower concentrations of these constituents are found in surrounding borings 50-01, 50-07, and 50-08 and in sample E-85N.

The lateral limits of soil contamination at the site appear well-defined and groundwater contamination with TPH is present in well 50-03. Because of the detectable hydrocarbon contamination, this site has known impacts to groundwater; however, the severity of the impacts have been measured only once. The extent of the groundwater contamination has not yet been delineated. This site has been transferred to the Navy's UST program because of the known hydrocarbon impacts to soil and groundwater and the lack of RCRA authority for petroleum releases.

One of the following two recommended management strategies should be selected for closure of the site under the Navy's UST program.

1. Excavate and remove the significantly contaminated site soils to remove the source of contamination to groundwater. At present there is no state or federal guidance for the selection of a soil remediation cleanup goal. The scientific determination of a remediation goal would require significant time and money. Because of the small size of this site and limited volume of contaminated material, it would be more cost effective

and expedient to select a remediation goal that will reduce the source of TPH contamination to groundwater.

After the contaminated soil exceeding the cleanup goal has been removed, quarterly or yearly groundwater monitoring would be required to demonstrate that the site's effect on groundwater is improving. After monitoring groundwater at the site, a petition to close the site would be forwarded to the regulatory agencies for review and approval.

2. Drill one or more groundwater monitoring wells to delineate the lateral extent of groundwater contamination. Petition the regulatory agencies to establish a "zone of compliance" and negotiate the terms of groundwater monitoring necessary to petition for site closure.

Each of these site management techniques depend on the results of future work; therefore, the duration of the closure is unknown at this time. However, either of the above management strategies (or some combination of the two) is recommended rather than the active removal and treatment of groundwater. Active groundwater remediation may not be technically feasible or cost-effective because of the clayey subsurface conditions and low concentrations of TPH that currently exist.

5.20 SWMU 51 - BUILDING IA-56

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 51.

5.20.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 51. Figure 32 shows the locations of Building IA-56 and other features.

Site Description

Building IA-56 is at the old airport at the end of Beckman Road. Past operations of Building IA-56 are not documented. It is believed that it was an administration building for the runway located at the site. The building is now being used as a forklift operator training school.

Building IA-56 has a sink and sanitary sewer system that drains through a 6-inch cast iron pipe into a septic tank about 50 feet northeast. The drain field was replaced in 1991, but the septic tank was not.

The old drain field is located east of the new drain field, which partially overlaps the old drain field. The outlet of the septic tank connects to a splitter box, located about 25 feet north, via a 6-inch cast iron pipe. The splitter box divides effluent from the septic tank six ways through 4-inch-diameter polyvinyl chloride perforated pipes. The buried leach field trenches are about 2 feet wide and 3.5 feet deep.

Previous Investigations

SWMU 51 was not identified in the RFA. The SWMU was designated as a management unit by the Navy because of the presence of a septic tank that may have released hazardous constituents to the environment.

The septic tank was sampled on August 17, 1993. SVOCs detected in the liquid sample were benzoic acid, 4-methylphenol, and phenol.

5.20.2 RFA Confirmation Study Sampling

Soil sampling and septic tank investigations were performed at SWMU 51. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 51 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to subsurface soils. Two soil borings were advanced to 15.5 feet bgs (51-01 and 51-02). All soil samples were analyzed for metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. A sample of the septic tank sewer water was collected and analyzed for VOCs, SVOCs, metals, and O&G.

5.20.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 24A and on Figure 31.

Soil

VOCs and SVOCs were not detected in any of the soil samples collected at SWMU 51 except for the SVOC phenol, which was detected at a concentration of up to 0.9 mg/kg in five of the six soil samples. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

O&G was detected in each of the six soil samples analyzed at the site at concentrations ranging from 37 to 230 mg/kg. Although the maximum concentration of O&G detected was 230 mg/kg, no other sample exceeded a concentration of 100 mg/kg.

Metals were detected but none were present above either the residential PRGs or the estimated ambient limit concentrations except for beryllium, which was detected at a maximum concentration of 0.41 mg/kg.

Septic Tank

The septic tank sewer water was sampled and analyzed. A complete list of analytical results is presented on Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous.

VOCs were not detected in the septic tank sewer water sample. Three SVOCs were detected, including 4-methylphenol (98 µg/L [estimated]), bis(2-ethylhexyl)phthalate (8 µg/L [estimated]), and phenol (24 µg/L [estimated]). O&G was detected at a concentration of 28 µg/L (estimated). A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.20.4 Conclusions and Recommendations

O&G was generally detected at relatively low concentrations (100 mg/kg and less) in soil samples. O&G was detected at a concentration of 230 mg/kg in one soil sample. The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. Although there are no appropriate regulatory standards or criteria for evaluation of O&G in soil, empirical evaluation suggests that the concentrations are not high and do not suggest a potential threat to receptors of any type.

Phenol was detected at concentrations of up to 0.9 mg/kg, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No inorganic constituents were detected in soil exceeding both the estimated ambient limit concentrations and PRGs except for beryllium which was detected at a concentration of 0.41 mg/kg. The residential PRG for beryllium is 0.14 mg/kg, and the industrial PRG is 1.1 mg/kg. The estimated ambient limit concentration for beryllium at SWMU 51 is 0.12 mg/kg. The low incidence of beryllium concentrations exceeding the estimated ambient limit concentration suggests that a relatively small volume of soil exceeds the criteria. A small volume of potentially contaminated soil limits its ability to act as a source of contamination and limits the risk associated with direct exposure. The potential for future migration or leaching of beryllium is low because it tends to adsorb to fine-grained soil. Beryllium was not detected in the septic tank sewer water. Because the beryllium exceeds the residential PRG by a slight margin, does not exceed the industrial PRG, has a low detection frequency, is unlikely to migrate, and was not detected in the septic tank water, no further evaluation or investigation of the beryllium detected in soil is recommended.

The septic tank sewer water sample contained detectable concentrations of three SVOCs and metals. However, none of these constituents are present in the soil at detectable concentrations or concentrations exceeding PRGs or estimated ambient limit concentrations (except for phenol and O&G at low concentrations). Therefore, constituents of potential concern are present in the septic tank at low concentrations, but have not caused a detectable impact on soils (or significant impact in the case of phenol and O&G). Because of the low concentration of the constituents present in the septic tank sewer water, the potential for future impacts to soil is low, provided that additional hazardous materials are not released to the septic tank. Naval Weapons Station Concord's operating permit under RCRA prohibits such releases. Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, the site is recommended for no further action under the RCRA corrective action program.

5.21 SWMU 52 - BUILDING 7SH5

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 52.

SWMU 52 is located at the same site as IR Site 22. IR Site 22 is currently undergoing a RI; however, SWMU 52 was identified as a SWMU due to an existing septic tank and leach field system which is present at the site. As such, the SWMU designation is specifically associated with the operation of septic tank that services the building included in IR Site 22. Previous investigations of IR Site 22 are discussed in the sections that follow.

5.21.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 52. Figure 33 shows the locations of Building 7SH5 and other features.

Site Description

SWMU 52 is located between Sixteenth and Seventeenth Streets, along the southwest portion of the Inland Area. Building 7SH5 was built in 1944 as an inert storehouse (Navy 1944) and converted to a missile wing and fin repair facility around 1957 (Navy 1957). The building is currently used for manufacturing mobile laboratories to be used during explosive ordnance evaluation activities. Historical activities at the building have included paint stripping, cleaning, and repainting missile wings and fins. The maintenance activities primarily used acetone, trichloroethane, methyl ethyl ketone, chloroethane, and several types of paint thinners. The quantity of wastes generated from activities in the building was probably less than 100 gallons per year. From 1970 to 1978, the Tidal Area Landfill (IR Site 1) reportedly received all wastes from Building 7SH5. After 1978, generated wastes have been disposed of off base (Ecology & Environment 1983).

The following are potential areas of contamination identified during previous investigations including the RI by PRC (PRC 1996). During the initial assessment study, there was suspected disposal of paints, oil, and solvents generated from Building 7SH5 in a 24-inch-deep earthen disposal pit or into a nearby drainage ditch near Building 7SH5 (Ecology & Environment 1983). The location of the disposal pit was determined by IT Corporation to be in the parking lot to the west of the south corner of Building 7SH5 (Figure 32), where a section of the pavement is missing. This alleged disposal practice has ceased, and the disposal pit has been backfilled (IT 1989). The procedure used to abandon the disposal pit is not known.

A 1,000-gallon steel UST for storing diesel is located along the west wall adjacent to the building. The UST was installed in 1944 to supply fuel to the three heaters in the building (Navy 1944). It is likely that the UST was filled by a railroad tanker car through a fill pipe located at the southeast corner of Building 7SH5, next to the railroad tracks. The fill pipe runs to the UST, approximately 3 feet bgs and 10 feet away from the building, along the southwest side of the building. Staining is visible on the ground surface around the fill pipe. Workers inside the building indicated that during a pressure test of the UST, an unknown quantity of fuel was forced out the end of the fill pipe and onto the ground. Currently, the UST is filled by truck at a fill pipe next to the UST. The three heaters inside the building are connected to the UST by two 0.5-inch lines. These lines run approximately 5 feet from the western wall.

A concrete sand filter box (sump), 3.5 feet long by 2 feet wide, is located near the south corner of Building 7SH5. The sump has two chambers containing gravels and sands ranging from 3/8-inch gravel to 0.6-millimeter sand that screen particles from liquid. Construction drawings indicate that the sump may have been connected to Building 7SH5 and possibly to a paint booth (Navy 1975). The sump discharges to the earthen drainage ditch at the south end of the building, where a 4-inch polyvinyl chloride pipe is visible. The construction drawings show the drain pipe having 0.25-inch open slots and surrounded by gravel fill (Navy 1975). The sump is currently empty, and the paint booth inside Building 7SH5 is not used.

A 1.25-inch galvanized steel drain pipe is located along the western wall of Building 7SH5, near the UST. Construction drawings show that the drain was used for an environmental chamber that tested missile components exposure to water (Navy 1960). The drain is visible exiting the building but cannot be located within the western ditch. Construction drawings show the drain to be approximately 12 inches below existing grade and discharging into the ditch approximately 2.5 feet from the bottom (Navy 1960). The drain is currently not used and is plugged inside the building.

Building 7SH5 has a sink and on-site sanitary sewer system that drain into a 500-gallon septic tank through a 4-inch vitrified clay pipe. The septic tank is located about 18 feet northwest of Building 7SH5. The septic tank is completely covered with soil to a depth of approximately 1.5 feet below the existing grade. The distribution box from the tank splits the effluent into four 4-inch, open joint unglazed clay pipes that run parallel to the drain field and are about 8 feet apart. Each leach field trench is about 2 feet wide and 3.5 feet deep. The septic system currently receives wastes from the toilets, sink, and a service sink inside the building.

A 1.5-inch galvanized steel drain line is located at the north end of Building 7SH5. The drain line is approximately 84 feet long and is visible at the top of the drainage ditch to the north of the building. The drain is currently not used. The exact use of the drain line is unknown; it may have been used to drain steam condensate from inside the building.

Previous Investigations

The following sections describes the five previous investigations conducted in the area of Building 7SH5. SWMU 52 was not identified in the RFA. The SWMU was later designated as a management unit by the Navy because of the presence of a septic tank that could contain hazardous waste and the potential for releases of these constituents to the environment from the leach field system.

Initial Assessment Study

A visual inspection of the site was conducted by Ecology and Environment during the Initial Assessment Study (IAS) in 1983. No visual environmental impact was noted during the inspection (Ecology and Environment 1983).

This site was eliminated from consideration after the IAS because of the small quantity of wastes that might be present. Because of changes in regulations since the IAS (that is, CERCLA and Superfund Amendments and Reauthorization Act [SARA]) and the absence of records on disposal activities and pit abandonment, this site was included in the SI as IR Site 22 to determine whether it poses an environmental or health hazard under current regulations.

Site Investigation

The site investigation at IR Site 22 was conducted by PRC in June 1992 and included collecting and analyzing soil samples from three soil borings within the suspected disposal pit and collecting and analyzing one composite surface soil sample from the bottom of the drainage ditch.

Three soil borings were completed within the backfilled disposal pit. Two soil samples were collected from each of the three soil borings within the backfilled disposal pit at depths of approximately 2 and 4 feet bgs. The soil samples were analyzed for VOC, SVOCs, metals, tributyltin (TBT), TPH-purgeables, and TPH-extractables. The soil sample at the 3.5 foot depth from boring SB-1 contained TPHd at a concentration of 14.6 mg/kg. The sample at the 2-foot depth in the same soil boring did not contain any TPHd.

Three surface soil samples were also collected from the drainage ditch parallel and adjacent to Seventeenth Street. The three soil samples from the ditch were composited into one sample in the laboratory for chemical analysis. The soil sample was analyzed for VOC, SVOC, metals, TBT, TPH-purgeables, and TPH-extractables. The composited soil sample contained TPHd at 9.23 mg/kg and toluene at 13 mg/kg.

UST Investigation

The UST located west of Building 7SH5 was investigated by Harding Lawson Associates in September 1993. A soil boring (No. 2) was drilled to a depth of 16.5 feet bgs and sampled at depths of 4.5, 8, and 16 feet. The soil sample results indicated that TPHd was present at 4.5 and 8 feet bgs at concentrations of 7,700 mg/kg and 1,600 mg/kg, respectively (Harding Lawson Associates 1995). SVOCs detected in the 4.5-foot soil sample included acenaphthene, fluorene, 2-methylnaphthalene, and naphthalene. The SVOC detected in the 8-foot soil sample was naphthalene. No SVOCs was detected in the 16-foot sample. The UST was removed in February 1997.

Septic Tank Sampling

Analytical results of samples collected from the septic tank on October 9, 1990, indicated the presence of TOG, SVOCs including 4-methylphenol, and VOCs including 1,4-dichlorobenzene, toluene, and total 1,2-dichloroethene. An additional sample collected on August 17, 1993 contained the SVOCs 1,4-dichlorobenzene, 4-methylphenol, and naphthalene.

Phase I Remedial Investigation/Feasibility Study

In 1995, three areas around Building 7SH5 were sampled to gather data for the RI/FS (PRC 1995a). These areas include the suspected disposal pit area, the drainage ditches, and the UST and associated piping. The Phase I RI/FS report from the Inland Areas, which includes IR Site 22, will be available in late 1996.

The suspected disposal pit area was excavated to approximately 5 feet bgs, and 12 soil samples were collected and analyzed for VOCs, SVOCs, TPH-extractables, and metals to determine whether this area was used to dispose of waste liquids. No VOCs and SVOCs were detected in any soil samples. TPHmo was detected only at the surface and to a depth of 4 feet bgs at a maximum concentration of 250 mg/kg.

Three soil borings (SB015, SB024 through SB027) were completed around Building 7SH5 in the drainage ditches along the south and west sides of the site to determine whether any waste was dumped into the ditches. Samples were analyzed for SVOCs, TPH-extractables, and metals.

Most surface soils at the site contained concentrations of arsenic that exceeded residential and industrial PRGs and the estimated ambient limit concentration. The maximum concentration of arsenic detected was 127 mg/kg in the surface soils. The source of the arsenic has not been determined. However, based upon the results of a human health risk assessment performed during the RI, the arsenic does not elevate the site risk beyond the risk range of $1x10^{-4}$ for excess cancer risk. SVOCs and TPH were detected in some of the samples at low concentrations.

To further define the extent and magnitude of soil contamination associated with the UST piping, nine shallow soil borings, SB001 through SB009, were advanced along the UST pipeline along the south and southwest side of Building 7SH5. Nine soil samples were collected and analyzed for VOCs, SVOCs, and

TPH-extractables. TPHd was detected at two locations, next to the UST fill pipe in borings SB001 (35,000 mg/kg) and boring SB002 (370 mg/kg).

The soils from two of the deep borings (SB010 and SB011) were logged from the soil samples collected at IR Site 22. The soil at the site consists mostly of clay mixed with sands, gravels, and silts. The top 5 feet of soil is mostly a sandy soil that may be a fill material associated with site construction activities or utility line construction. The top of the water-bearing zone is located approximately 30 feet bgs, in a sandy and gravelly clay. The depth to groundwater at the site was determined from the well casing installed in the open boreholes. From these groundwater elevations measured May 5, 1995, the shallow groundwater flow direction appears to be approximately due west.

Groundwater samples were collected from each of the three deep borings. Samples were analyzed for VOCs, SVOCs, and TPH-extractables. The three groundwater samples contained TPHmo ranging from 630 to 380 µg/L. Two VOCs were also detected in groundwater: trichloroethene was detected at SB010 (27 µg/L), and trichloroethane (TCA) was detected in groundwater at SB011 (2 µg/L) and SB012 (1 µg/L). The MCL for trichloroethene in the groundwater is 5 µg/L (RWQCB 1995)

The data from previous sampling events for IR Site 22 indicate a release of TPH to soil and groundwater near Building 7SH5. This release is most likely from the UST, supply lines, and fill pipe near the building. The groundwater also contained TCA and trichloroethene. The source of the VOCs is unknown but is most likely from past operations in the building.

Based upon the results of the phase I RI, a phase II site investigation is proposed to further characterize the vertical and lateral extent of soil and groundwater contamination. The phase II investigation is also intended to identify the source or sources of TPH and VOC contamination.

5.21.2 RFA Confirmation Study Sampling

Although an RI is under way in the vicinity of SWMU 52 (at IR Site 22), these investigations have not been concerned with the septic tank and leach field system at SWMU 52. Soil, surface water, and septic tank investigations were conducted at SWMU 52. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 52 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to subsurface soils. Two soil borings were installed to depths of 15 feet bgs (52-01 and 52-02) and two soil borings were installed to depths of 3.5 and 2 feet bgs (52-03 and 52-04). Soil samples were analyzed for metals, O&G, VOCs, and SVOCs.

Surface Water

The objective of surface water sampling was to evaluate whether potential releases from the septic tank and leach field system may have caused impacts to surface water. One surface water sample (52-SW014) was collected from accumulated standing water in one of the ditches during the field activities. The surface water sample was analyzed for VOCs, SVOCs, metals, and O&G.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank for eventual release to soil or groundwater from the leach field system. The septic tank sewer water sample was analyzed for VOCs, SVOCs, metals, and O&G.

5.21.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 25A and 25B and on Figure 33.

Soil

None of the soil samples contained detectable VOCs or SVOCs except for the SVOC phenol, which was detected at concentrations up to 1.0 mg/kg in four of the 10 soil samples. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg.

Three of the soil samples contained O&G at a maximum concentration of 280 mg/kg.

Metals were not detected at concentrations exceeding either the residential PRGs or the estimated ambient limit concentrations except for arsenic and lead. Arsenic was detected at concentrations of 38.0 and 65.4 mg/kg in the surface samples from borings 52-03 and 52-04 and at a concentration of 20.7 mg/kg from boring 52-03 at a depth of 3.5 feet. Lead was detected at a concentration of 165 mg/kg in the surface soil sample from boring 52-03.

Surface Water

The surface water sample did not contain detectable VOCs, SVOCs, or O&G. However, metals were detected, including copper (estimated 21.5 μg/L) and lead (estimated 23.3 μg/L), which exceeded the following criteria. Copper exceeded the EPA's freshwater acute ambient water quality criteria (AWQC) (18 μg/L) and lead exceeded the EPA's freshwater chronic AWQC (3.2 μg/L). Lead did not exceed the freshwater acute AWQC (83 μg/L). The surface water sample was not filtered. Copper and lead are normal constituents of soil colloids and detections of these constituents at these concentrations are to be anticipated in unfiltered water samples. The detected concentrations are likely to be principally associated with soil colloids and, therefore, do not reflect significantly elevated copper and lead in surface water from the ditch.

Septic Tank

A sample of the septic tank sewer water was also analyzed and a complete list of analytical results is presented in Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous. The septic tank sewer water contained a concentration of 100 μg/L (estimated) of 1,2-dichloroethene, and an estimated 4 μg/L of carbon disulfide. No other VOCs were detected. SVOCs were generally not detected except for concentrations of 1,4-dichlorobenzene (190 μg/L [estimated]), 4-methylphenol (180 μg/L [estimated]), and phenol (31 μg/L [estimated]). A concentration of 11 μg/L (estimated) O&G was detected. A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals in septic tank leachate adsorbing to soils. There is no correlation between the detected arsenic and lead detected in the surface soils and the detection of these metals in the septic tank water because the only elevated concentrations of these constituents in soil were detected at the ground surface.

5.21.4 Conclusions and Recommendations

O&G was detected in four of the 11 soil samples. The O&G was generally detected at relatively low concentrations (280 mg/kg and less). The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine if the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. There are no applicable regulatory standards or criteria for the evaluation of O&G soil; however, empirical evaluation indicates the concentrations are not high (including the 280 mg/kg detected) and do not suggest a potential for constituent mobility or a threat to receptors of any type.

Phenol was detected at concentrations of up to 1.0 mg/kg, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No inorganic soil constituents were detected exceeding both the estimated ambient limit concentrations and residential PRGs except for arsenic, which was detected in the surface soil samples from borings 52-03 and 52-04, and lead which was detected in the surface soil samples from boring 52-03. Based on the soil sampling conducted for the RI of IR Site 22, the occurrence of elevated concentrations of lead in the surface soils is not typical. The detection of lead at a concentration of 165 mg/kg in boring 52-03 does not appear significant because it only slightly exceeds the residential PRG of 130 mg/kg and its occurrence appears isolated. Lead and arsenic are not expected to migrate significantly because of their tendency to adsorb to fine-grained soils.

Conversely, the occurrence of arsenic is more widespread in surface soils at the site. Surface soils in the vicinity of SWMU 52/IR Site 22 typically contain arsenic above the estimated ambient limit concentration and residential PRGs. The elevated concentrations of arsenic appear mostly within surface soils, although exceptions have been noted at IR Site 22. The lateral extent of elevated concentrations of arsenic in surface soils has not been established. There are no known former operations at IR Site 22 that used arsenic. The presence of arsenic in surface soils is not associated with the septic tank or leach field system at SWMU 52. The significance of arsenic present in the surface soils is discussed in greater detail in the RI report for IR Site 22. The risk assessment concluded that the risk to human health from arsenic is within the acceptable risk range for an industrial exposure scenario. There is no indication that the surface soil containing arsenic is related to the septic tank or leach field system. Consequently, further investigation of the SWMU site because of the occurrence of arsenic is not recommended.

The septic tank sewer water sample contained concentrations of two VOCs, three SVOCs, and several metals. However, none of these constituents are present in the soil at detectable concentrations (except for phenol, O&G, and metals, typically at low concentrations). Chemicals are present in the septic tank at low concentrations and have not caused a detectable impact on soils (or significant impact in the case of phenol, metals, and O&G). Because of the low concentration of the constituents present in the septic tank sewer water, the potential for future impacts to soil is low, provided that additional hazardous materials are not released to the septic tank. Naval Weapons Station Concord's operating permit under RCRA prohibits such releases. Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, SWMU 52 is recommended for no further action under the RCRA corrective action program.

5.22 SWMU 53 - BUILDING 7SH14

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 53.

5.22.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 53. Figure 34 shows the locations of Building 7SH14 and other features.

Site Description

Building 7SH14 was constructed during the 1940s and is located on Seventeenth Street approximately 0.75 miles south of the intersection of Kinne Boulevard and Wilden Road. The building was historically used to store munitions. The building is now used for inert storage, environmental testing, and training.

A 5,000-gallon UST is located near the southeastern corner of Building 7SH14. The UST contained diesel fuel to serve oil-fired heaters inside the building. The UST is scheduled to be removed and replaced under a separate program.

Building 7SH14 has a sink and sanitary sewer system that drains through a 4-inch pipe to the inlet manhole of a septic tank. The tank connects to a splitter box through a 4-inch pipe. The splitter box divides effluent from the septic tank flow into nine 4-inch pipes which run parallel to the drain field and are about 7 feet apart.

Previous Investigations

SWMU 53 was not identified in the RFA. The SWMU was designated as a management unit by the Navy because of the presence of a septic tank that may have released hazardous constituents to the environment. Liquid samples from the septic tank were collected on October 9, 1990, and August 17, 1993. TOG was detected in the samples analyzed.

5.22.2 RFA Confirmation Study Sampling

Soils and the septic tank were sampled at SWMU 53. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 53 was to investigate potential leakage of hazardous wastes from the septic tank and from the leach field system to nearby subsurface soils. Two soil borings were advanced to depths of 15.5 feet bgs (53-01 and 53-02). The soil samples were analyzed for VOCs, SVOCs, metals, and O&G.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. The septic tank sewer water was analyzed for VOCs, SVOCs, metals, and O&G.

5.22.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 26A and on Figure 34.

Soil

VOCs and SVOCs were not detected except for the SVOC phenol, which was detected at concentrations up to 4 mg/kg in all of the six soil samples analyzed for SVOC at SWMU 53. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg. Metals were not detected at concentrations above both the estimated ambient limit concentrations and residential PRGs. O&G was detected at concentrations up to 110 mg/kg in five of the six soil samples analyzed.

Septic Tank

A sample of the septic tank sewer water was also collected. A complete list of analytical results from the septic tank sewer water sample is presented in Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous.

The sewer water sample from the septic tank did not contain detectable VOCs or SVOCs except for the SVOC 4-methylphenol, which was present at a concentration of 74 µg/L (estimated). A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals adsorbing to site soils.

5.22.4 Conclusions and Recommendations

The O&G was detected in some of the soil samples, but at relatively low concentrations (110 mg/kg and less). The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are insufficient to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. There are no applicable regulatory standards or criteria for the evaluation of O&G in soils; however, empirical evaluation suggests that the concentrations are low and do not suggest a potential for constituent mobility or a threat to receptors of any type.

Phenol was detected at concentrations of up to 4.0 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No inorganic soil constituents were detected exceeding both the estimated ambient limit concentrations and PRGs. The septic tank sewer water sample contained an elevated concentration of one SVOC and several metals. However, neither of these constituents is present in the soil at concentrations of significance. COPCs are present in the septic tank at low concentrations but have not caused a detectable impact on soils. Because of the low concentration of the constituents present in the septic tank sewer water, the potential for future impacts to soil is low, provided that hazardous materials are not released to the septic tank. Naval Weapons Station Concord's operating permit under RCRA prohibits such releases. Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, the site is recommended for no further action under the RCRA corrective action program.

5.23 SWMU 54 - BUILDING 79

This section presents the site background, RFA confirmation study sampling, investigation results, and conclusions and recommendations for SWMU 54.

5.23.1 Site Background

This subsection provides the site description and summary of previous investigations for SWMU 54. Figure 35 shows the locations of Building 79 and other features.

Site Description

Building 79 was constructed during the 1950s and is located at the intersection of Kula Gulf Street and Coral Sea Road approximately 0.25 miles north of Kinne Boulevard. Building 79 housed the Reaction Fast Force, a group of 20 to 30 Marines. The facility maintained a kitchen and restrooms for the Marines. After being abandoned in the mid-1980s, plans were drawn up to convert the building into an x-ray facility. Construction began but was never completed.. The building is no longer used.

Building 79 has an old septic tank and drain field system that was abandoned in 1978. The old septic tank was located about 60 feet east of the building. The old drain field, which is about 60 feet by 120 feet, is located just north of the Alpha area and about 80 feet east of Building 79. The 6-inch vitrified clay pipe connected to the old septic tank was plugged with concrete.

A new sink and sanitary sewer system drains into a 2,175-gallon septic tank through a 4-inch vitrified clay pipe. The new septic tank is located about 80 feet west of Building 79 and is completely covered with dirt. The outlet of the septic tank sends the effluent into a distribution box through a 4-inch vitrified clay pipe. The distribution box splits the effluent into 10 4-inch open-joint leach field pipes. The leach field drain trenches are about 2 feet wide and 2.5 feet deep.

Previous Investigations

SWMU 54 was not identified in the RFA. The SWMU was designated as a management unit by the Navy because of the presence of a septic tank that may have released hazardous constituents to the environment.

TOG was detected in a liquid sample collected from the septic tank on August 17, 1993. SVOCs including 1,3-dichlorobenzene and 2,4-dichlorophenol were also detected.

5.23.2 RFA Confirmation Study Sampling

Soils and the septic tank were sampled at SWMU 54. These investigations are discussed below. Groundwater investigation was not proposed at the septic tank sites, except in those cases where significant impacts to soil were found at the depth of groundwater, or at a depth of 15 feet where the depth to groundwater exceeded 15 feet.

Soil

The objective of soil sampling at SWMU 54 was to investigate potential leakage of hazardous wastes from the septic tank and leach field system to nearby subsurface soils. Four soil borings were advanced to depths of 15 to 15.5 feet bgs (54-01, 54-02, 54-03, and 54-04) in the area of the drain fields and septic tanks. All soil samples collected were analyzed for metals, O&G, VOCs, and SVOCs.

Septic Tank

The objective of the septic tank sampling was to determine whether hazardous constituents were present within the tank. A septic tank sewer water sample was collected from both the old and new septic tanks and analyzed for VOCs, SVOCs, metals, and O&G.

5.23.3 Investigation Results

This subsection presents the investigation results. Analytical results are presented in Table 27A and on Figure 35.

Soil

No VOCs or SVOCs were detected except for the SVOC phenol, which was detected at concentrations of up to 2.0 mg/kg in nine of the 12 soil samples analyzed for SVOCs at SWMU 54. For comparison, the EPA residential PRG for phenol is 39,000 mg/kg. No metals were detected at concentrations exceeding both the estimated ambient limit concentrations and residential PRGs. O&G was detected at concentrations of up to 160 mg/kg in 10 of the 12 soil samples analyzed.

Septic Tank

A sample of the septic tank sewer water was collected from each septic tank and a complete list of analytical results is presented in Table 29. A preliminary screening was conducted to determine if the septic tank contents exceeded the state TTLC or STLC or the federal TCLP. The septic tank contents did not exceed the applicable criteria and are therefore considered to be nonhazardous.

The new septic tank sewer water sample did not contain detectable VOCs except for bromodichloromethane, at a concentration of 1 μg/L (estimated). The sample also did not contain detectable SVOCs except for fluoranthene (estimated 0.6 μg/L) and pyrene (estimated 0.5 μg/L). A number of metals were detected; however, there are no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals in septic tank leachate adsorbing to soils. O&G was not detected in the sewer water sample.

The old septic tank sewer water sample did not contain VOCs except for total xylenes at a concentration of 5 μg/L (estimated). SVOC were generally not detected in the sewer water sample except for the following four constituents: 1,2-dichlorobenzene (34 μg/L [estimated]), 1,3-dichlorobenzene (71 μg/L [estimated]), 1,4-dichlorobenzene (1,100 μg/L [estimated]), and naphthalene (1,100 μg/L [estimated]). Metals were detected in the sewer water sample; however there is no applicable screening criteria for septic tank water to evaluate potential environmental impacts from metals in septic tank leachate adsorbing to soils. O&G was detected in the sewer water sample at a concentration of 43.9 μg/L.

5.23.4 Conclusions and Recommendations

The O&G detected in most of the soil samples occurs at relatively low concentrations (160 mg/kg and below). The source of the O&G has not been determined. Because the soil samples were not analyzed for petroleum hydrocarbons, the analyses are inadequate to determine whether the O&G is derived from naturally occurring oils from plant organic matter or from petroleum hydrocarbons. There are no regulatory standards or criteria for evaluation of O&G concentrations in soil; however, empirical evaluation suggests that the concentrations are low and do not suggest a potential for constituent mobility or a threat to receptors of any type.

Phenol was detected at concentrations of up to 2.0 mg/kg in soil samples, which is substantially lower than the EPA residential PRG of 39,000 mg/kg. Because phenol detected at the site does not pose a threat to human health or the environment, no further investigation of phenol is recommended.

No inorganic soil constituents exceeded both the estimated ambient limit concentrations and PRGs. The old and new septic tank sewer water samples contained elevated concentrations of various VOCs, SVOCs, and metals. However, none of these constituents are present in the soil at concentrations of significance. Although the septic tank did not contain hazardous waste and there has been no discernible impact on soil in the vicinity of the septic tank or leach field, the septic tank did contain waste with elevated or potentially elevated concentrations of several constituents. To safeguard the soil in the vicinity septic tank and leach field, the Navy had the contents of the septic tank removed and the septic tank was cleaned. The removal of septic wastes and the septic tank cleaning was completed in March 1997 and is documented in the closure report (CH2M Hill 1997). Because of the low environmental risk associated with the continued operation of the septic tank and leach field system, the site is recommended for no further action under the RCRA corrective action program.

6.0 CONCLUSIONS

The RFA confirmation study included completing the activities outlined in the field sampling and analysis plan at each SWMU site and included collection of soil, surface water, groundwater, and septic tank samples; laboratory analysis of the samples; and evaluation of the analytical results.

Based on the RFA confirmation study results, all 24 SWMU sites are appropriate for no further action under the RCRA corrective action program. Sixteen sites (SWMUs 12/20, 14, 15, 17, 22, 23, 24, 25, 37, 44, 51, 52, 53, and 54) are appropriate for no further action because hazardous soil and groundwater conditions were not discovered. Three sites (SWMU 13, 16, and 40) were cleaned up as part of interim RCRA corrective actions and are now appropriate for no further action. Three sites (SWMU 1, 7, and 50) are appropriate for removal from the RCRA corrective action program and transfer to the Navy's underground storage tank (UST) program because USTs containing petroleum hydrocarbons are or were present. Four sites (SWMUs 2, 5, 7, and 18) are recommended for further action as IRP sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The recommended status of groups of sites is summarized below and a detailed summary for each site is presented in Table 32.

- Nineteen sites are recommended for no further action because significant contamination was not detected or because the sites were cleaned up. Soil and groundwater sites do not contain concentrations of constituents that pose a threat to human health or the environment. Interim RCRA corrective actions were recently completed at SWMUs 13, 16, and 40. The results of the interim RCRA corrective actions are presented in the closure report (CH2M HILL 1997).

- Hydrocarbon-contaminated soils at three SWMU sites (SWMUs 1, 7, and 50) should be addressed under the Navy's UST program. These three sites are appropriate for no further action under the RCRA program.

- Four SWMU sites (SWMUs 2, 5, 7, and 18) are recommended for further investigation under the authority of a CERCLA process investigation to evaluate the groundwater contamination in the Inland Area industrial area.

SWMUs 1, 2, 5, 7, and 18 have hydrocarbon- or VOC-contaminated groundwater (concentrations up to approximately 130,000 μg/L for hydrocarbons at SWMU 7). Although none of the sites are recommended for further action under the RCRA corrective action program, the groundwater conditions at these sites should be investigated to evaluate the source(s) of VOCs and hydrocarbons. The CERCL process investigation in the vicinity of these SWMUs should be conducted upgradient (and possibly downgradient) of each SWMU. A site plan illustrating the location of groundwater samples collected from SWMUs 1, 2, 5, 7, and 18 and a summary of all the groundwater analytical results are presented on Figure 36.

Note that SWMU7 is recommended for transfer to the Navy's UST program for removal of the USTs and for remediation of hydrocarbon impacts to the area. However, because 2 ug/l of dichloroethane was detected in groundwater, the area is also recommended for evaluation in a CERCLA process investigation.

SWMU 13, including the septic tank leach field and storm drain outfall, has been sampled and evaluated. A RCRA interim corrective measure was completed at SWMU 13 to remove the hazardous waste septic tank contents. While this SWMU is recommended for no further action and closure under RCRA, Building IA-25, located adjacent to SWMU 13, has been identified as an area of potential environmental risk requiring further evaluation. Therefore, a CERCLA evaluation or investigation of Building IA-25 is recommended.

REFERENCES

CAL Inc. 1996. “Final Soil Closure Report, Building IA-6, Former Diesel UST Site, Naval Weapons Station Concord” November.

CH2M Hill. 1997. “Closure and Summary Report for the RCRA Corrective Action for SWMUs 13, 16, and 40 and Cleaning of Various Septic Tanks at Naval Weapons Station Concord,” prepared for Department of the Navy, Public Works Center, Oakland, CA. April.

Department of Toxic Substances Control (DTSC). 1992. "RCRA Facility Assessment." Prepared for the U.S. Environmental Protection Agency (EPA) by DTSC. June.

Ecology and Environment, Inc. 1983. "Initial Assessment Study of Naval Weapons Station, Concord, California," NEESA 13-013, Naval Energy and Environmental Support Activity, Port Hueneme, California. June.

EPA. 1993. A Data Quality Objectives Process for Superfund, Interim Final Guidance.

ERM-West. 1989. "1988 Precision Tank Testing, Concord Naval Weapons Station." ERM-West, Rancho Cordova, California.

Fugro-McClelland, Inc. 1993. "Assessment of Hydrocarbon Contaminated Soil and Ground Water Near Building IA-6, Naval Weapons Station Concord, California."

Harding Lawson Associates (HLA). 1995. Final Submittal, Contract N6247-91-D-9582, Phases I and II Subsurface Investigation and Tank Removal Plan, Concord Naval Weapons Station, Concord, California. January 3.

HLA. 1996. 100 Percent Submittal, Contract N62474-94-D-7462, Subsurface Investigation and Tank Removal Plan, Concord Naval Weapons Station, Concord, California.” January 31.

International Technology Corporation. 1989. Draft Final Work Plan for Remedial Investigation at Naval Weapons Station Concord, California, Inland Area Sites. Volumes I through V.

IT Corporation (IT). 1990. "Site Investigation at Building IA-25, Naval Weapons Station Concord, California.

IT. 1992. "Draft Site Investigation Report, Tidal Area Sites, Naval Weapons Station Concord, California."

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. “Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments.” *Environmental Managment.* Volume 19, Number 1. Pages 81-97.

Minter and Fahey Construction Company. 1991. "Removal and Closure of Sixteen Underground Fuel Tanks at the Naval Weapons Station Concord, California," Contract N62474-88-B-6628.

Navy. 1944. Inert Storehouse Plans, Concord, California. Y&D Drawing No. 339325 through 339328. September 18.

Navy. 1957. Conversion of Inert Warehouse 7SH5, Concord, California. Y&D Drawing No. 745216. April 17.

Navy. 1960. Electrical Work for Installation of Environmental Chamber, Concord, California. Y&D Drawing No. 849588. November 11.

Navy. 1975. Construction of Utilities in Building 7SH5 and Improvements to Building 97, Floor Plan & Details, Naval Weapons Station, Concord, California. Sheet 2 of 3. NAVFAC Drawing No. 6029022. January 24.

Navy. 1995. Remedial Project Managers Progress Meeting on Naval Weapons Station Concord Installation Restoration Program, February 27, 1995. Meeting minutes issued March 13.

Pacific Environmental Services, Inc. 1988. "Inventory of Friable Asbestos-Containing Materials (FACM) the Naval Weapons Station at Concord, California," Final Report, Monrovia, California, 8 pp.

PRC Environmental Management, Inc. 1994a. "Draft Summary Investigation Report and Remedial Action Plan for Building 178, Naval Weapons Station Concord."

PRC. 1994b. Solid Waste Management Unit Site Investigation, Draft Final Field Sampling Plan, Naval Weapons Station Concord, Concord, California. Volume I. December 5.

PRC. 1995a. Remedial Investigation/Feasibility Study, Inland Area Sites, Field Sampling Plan, Draft Final, Naval Weapons Station Concord, Naval Facilities Engineering Command, Engineering Field Activity West, San Bruno, California. February 3.

PRC. 1995b. Document of Field Variance from the Solid Waste Management Unit, Site Investigation Field Work Plan, Naval Weapon Station Concord. May 8.

PRC. 1996. Draft Remedial Investigation Report Inland Area Sites 13, 17, 22, 24A, and 27 Naval Weapons Station Concord, California. October.

PRC. 1997. Draft Remedial Investigation Report Tidal Area Sites, Naval Weapons Station Concord, California. April 16.

RWQCB. 1995. Water Quality Goals, Regional Water Quality Control Board, Central Valley Region, State of California. July.

Riedel Environmental Services, Inc. (RES) 1988. "Report of Phase I and Phase I Supplemental Investigations, Naval Weapons Station Concord, RES Project Numbers 4235 and 4406." June 8.

RES. 1989. "Project Report, Subsurface Hydrogeologic Investigation Building IA-6, U.S. Naval Weapons Station, Concord, California." August 31. U.S. Environmental Protection Agency (EPA). 1995. (PRG reference) September

APPENDIX A

NAVY RESPONSES TO U. S. ENVIRONMENTAL PROTECTION AGENCY REGION IX COMMENTS ON THE DRAFT RCRA FACILITY ASSESSMENT CONFIRMATION STUDY, DATED NOVEMBER 4, 1996 NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

(7 Pages)

APPENDIX A

NAVY RESPONSES TO U. S. ENVIRONMENTAL PROTECTION AGENCY REGION IX COMMENTS ON THE DRAFT RCRA FACILITY ASSESSMENT CONFIRMATION STUDY, DATED NOVEMBER 4, 1996 NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

GENERAL COMMENTS

Comment 1. **In several sections of the document, it is recommended that additional investigations should or will occur during the remedial investigation process. What is the mechanism to ensure that this will occur?**

Response: The additional investigations will be conducted under the Navy's Installation Restoration (IR) program using the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, or the Navy's underground storage tank (UST) program. The draft Resource Conservation and Recovery Act (RCRA) Facilities Assessment (RFA) Confirmation Study specifies the Navy programs targeted for these various additional investigations.

The site management plan is the mechanism that insures that IR program sites proceed from investigation through remediation, if required. SWMUs 2, 5, 7, 13, and 18 have been programmed by the Navy RPM as sites requiring funding for the phases and dates indicted on the site management plan. These sites are currently scheduled for CERCLA investigation work plans starting in November 1997.

The UST sites are not included in the site management plan, however these will be investigated as described herein. SWMU 1 is already in the Navy's UST program and remedial activities have been completed. The site groundwater is being monitored on a quarterly basis. After 4 quarters (1 year), a closure request to the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB) will likely be submitted and closure will likely be granted. The USTs at SWMU 7 will be removed during the winter of 1997-98. Investigation of the extent of soil and groundwater hydrocarbon contamination at SWMU 7 will follow the UST removal. SWMU 50 has been transferred to the Navy's UST program and is scheduled for a corrective measures study in December 1997.

Comment 2. **Has there been any public participation or discussion of future public participation as part of the RCRA corrective action process?**

Response: Public participation during the RCRA corrective actions conducted to date includes presentations to the Naval Weapons Station Concord Restoration Advisory Board on the findings of the draft RFA confirmation study report and the RCRA corrective actions proposed (and now completed).

Future RCRA corrective actions for the sites investigated under the RFA Confirmation study are not anticipated. Therefore, future public participation under RCRA is not planned.

Comment 3. **When groundwater is not investigated when characterizing contamination around a SWMU [solid waste management unit], there should be some discussion as to why not.**

Response: The final RFA confirmation study report will be revised to explain why groundwater was not sampled and analyzed at some sites.

Comment 4. **Since the document references the RI [remedial investigation] for Inland Area sites several times, it would be helpful if a drawing depicting both SWMUs and IR sites were provided.**

Response: Figures 2 and 3 in the final RFA confirmation study report will be revised to illustrate the locations of IR sites near SWMUs (IR sites 11, 17, and 22).

Comment 5. **It is stated several times throughout the document that there is "no screening criteria for metals in septic water." The screening criteria should simply be the Toxicity Characteristics Leaching Procedure (TCLP) in order to determine whether the water is hazardous or not.**

Response: The RFA confirmation study report will be revised to indicate that analytical results for septic tank water samples were screened against the state total threshold limit concentration (TTLC) and soluble threshold limit concentration (STLC) and federal TCLP criteria to determine if the water exceeds state and federal hazardous waste criteria for toxicity.

Comment 6. **Although phenol is detected at very low levels, please provide an explanation for why it is detected so frequently.**

Response: The Navy has not determined why phenol was detected frequently but at low concentrations. Since the source is unknown, the final RFA confirmation study report will not be revised. The low concentrations and the uniformity of detection indicate that there is no potential hazard and no further investigation at any of the sites for phenol is warranted.

Comment 7. **The tables in volume two should be tabbed for easier reference. It is very difficult to find the tables when referred to them in the text of the first volume.**

Response: Tabs will be added as requested.

SPECIFIC COMMENTS:

Comment 1. **ES-1, Last two paragraphs: It is stated that no further action was recommended for various sites because soil and/or groundwater samples collected "did not contain concentrations of constituents that pose a threat to human health and the environment." Please explain how this was determined. Were the concentrations compared to PRGs [preliminary remediation goals]?**

Response: The concentrations were compared to PRGs. In general, the concentrations were low, and detected constituents were of limited lateral extent (as evidenced by a low frequency of detection), and the concentrations did not exceed PRGs. The screening conducted and conclusions for each site are discussed in the report. The executive summary is intended to provide only a brief overview of the report and status of each site. Specific explanations of the screening methodologies and when they are applied are presented in the text of the report.

Comment 2. **ES-3, second paragraph: Please describe what the EPA PRGs are and why they are appropriate to use for screening.**

Response: The final RFA confirmation study report will be modified to include the requested description.

Comment 3. **Table ES-1: Please indicate which SWMUs are in the Tidal Area and which are in the Inland area.**

Response: The requested information will be added to the final RFA confirmation study report.

Comment 4. **Table ES-1, SWMU 15, Findings column: The second sentence doesn't make sense. Please reword.**

Response: The table will be corrected in the final RFA confirmation study report. The revised sentence will read as follows:

"This soil sample was collected below a concrete slab at a depth of 4 feet."

Comment 5. **p. 28, Investigation Results: Please describe why it is important to analyze the samples for anions. What impact (if any) do anions have on the environment.**

Response: The samples were analyzed for anions because high concentrations of anions are common in chemicals used for fire fighting. Since SWMU 2 was suspected to be a burn pit used for fire fighting practice, the samples were analyzed for anions. The final RFA Confirmation Study will be revised to clarify why anions were included in the analysis and the interpretation of the results.

Comment 6. **p. 28, Investigation Results: The last sentence in the second to last paragraph says, "At the concentrations detected, the TPH-d [total petroleum hydrocarbons as**

diesel], TPH-mo [total petroleum hydrocarbons as motor oil], and anions are not considered a human or ecological risk." Please describe why this is the case.

Response: The observed distribution of contaminants and the limited mobility of TPH-d and TPH-mo suggest a small release of contaminants and small quantity of soil affected by these constituents. The limited distribution of these constituents limits the contact by potential receptors; therefore, the hazard is judged to be low. In addition, although analysis for volatile organic compounds (VOC) and semivolatile organic compounds (SVOC) was limited, these constituents were not detected in soil samples or grab groundwater samples. These factors are discussed in more detail in the conclusions and recommendations section of the RFA confirmation study report (Section 5.2.4). The statement on page 28 should have been presented in Section 5.2.4, as part of supporting discussions. The final RFA confirmation study report will be revised accordingly.

Comment 7. p. 31, 1st Paragraph: It is stated that follow-up investigations of groundwater should occur as part of the RI for SWMU 2. It may also be appropriate to investigate Seal Creek further, given that chemical residues may have been disposed of in the creek.

Response: According to the RCRA facility assessment, fire extinguisher residues were directly disposed to Seal Creek between 1969 and 1973. The RFA confirmation study work plan, did not propose direct sampling within Seal Creek because of the low probability residues would remain within Seal Creek after 23 years of annual winter creek flows.

Instead of sampling within the Seal Creek drainage, samples were collected between the area of suspected burning and Seal Creek. The sampling results did not indicate significant concentrations of hydrocarbons and metals in soil samples at locations near Seal Creek. Therefore, there is no evidence to suggest that waste disposal occurred in the immediate vicinity of the minor drainage that flows to Seal Creek or that waste was transported downstream toward Seal Creek from the site.

Sediment sampling within the creek remains a possibility, but is not recommended by the Navy as a result of the low probability that any residue remains within the creek.

Comment 8. p. 34 Groundwater: The second sentence states that the data was not screened against specific criteria, but that review of the data did not reveal any indication of site contamination. How was this determined? What criteria were used to make the determination?

Response: There is no screening criteria that is directly applicable for comparing results of unfiltered groundwater samples. Although there is no criteria, empirical review of the data and comparison with other portions of the data set are valid methods for preliminary evaluation of the metals data. Because this empirical evaluation is not statistically or scientifically rigorous it will not be presented in the revised RFA confirmation study report. However, the empirical screening process is briefly summarized in the following paragraphs.

Detected metals in the unfiltered groundwater samples were compared to the EPA PRGs concentrations for tap water. In this comparison, about half of the tap water criteria were exceeded. Metals that did not exceed the criteria were dropped from further evaluation. Metals in groundwater that did exceed the tap water criteria were further evaluated by comparison of the concentrations with entire data set of unfiltered groundwater collected during the RFA Confirmation Study. The range of differences in the concentrations of metals did not clearly suggest contamination of groundwater at any site except for arsenic in one groundwater sample from SWMU 37 (subsequent analysis of a filtered groundwater sample from SWMU 37 did not suggest that arsenic has adversely effected groundwater quality at SWMU 37). Further evaluation of the groundwater samples at each site was performed by reviewing the concentration of metals in soil samples from the same site. A direct comparison between groundwater analytical results and soil analytical results in any given area is meaningless. However, if there is no metals impact to soil at a site, then at least the soil represented by the soil samples is an unlikely source of elevated metals in groundwater.

The results of these empirical screening steps suggests that the groundwater has not been impacted by metals contamination at Naval Weapons Station Concord. Because the evaluations in support of this statement are empirical and not supported with filtered groundwater samples from properly developed wells, additional analysis for metals is necessary to conclusively prove that there are no impacts to groundwater from metals. Because well installations will be necessary during the remedial investigation, metals analysis of groundwater samples will be proposed at that time. However, because there is no evidence to suggest metals contamination of groundwater, only limited metals analysis should be necessary to verify if elevated concentrations of metals are present.

Comment 9. **p. 44, Investigation Results: RFA confirmation sampling included sampling sediments in the drainage channel of Seal Creek, however these results are not discussed in the results section. Please provide a section on sediment sample results.**

Response: The RFA confirmation study did not include sampling sediments within Seal Creek. Sediment samples were collected from Seal Creek under the site investigation (SI) and remedial investigation (RI) at Site 17. The results of sampling within Seal Creek are included in Table 9A. The text of the final RFA confirmation study will be revised to clarify the results of the SI and RI analyses of samples collected in the vicinity of Seal Creek.

Comment 10. **p. 53, Conclusions and Recommendations: The second to last sentence in this section is: "However, none of these constituents is present at concentrations of concern with regard to human health." Please describe why there is no concern. What criteria was used to make this determination?**

Response: This sentence refers to constituents detected in a soil sample located at the ground surface near the storm drain outfall. The sample contained an oil and grease concentration of 920 milligrams per kilogram (mg/kg). There are no criteria or toxicity information that have been developed for oil and grease. However, none of the soil samples from the site contained any VOC or SVOC constituents at concentrations exceeding the detection limit. Although the sample containing the oil and grease also contained detectable concentrations of a pesticide and an explosive compound, the concentrations of both constituents were well below EPA residential PRGs. Since there were no hazardous constituents detected that exceeded the residential PRG criteria, the RFA confirmation study concluded that there were no constituents present at a concentration of concern with regard to human health. The final RFA confirmation study report will be revised to reference the "Investigation Results" section where this information is presented.

Comment 11. p. 97, Septic Tank: It is stated that: "The sludge does not exceed any state or federal hazardous waste criteria and is therefore classified as non-hazardous." Was the TCLP used to make this determination?

Response: The sludge was not subjected to a TCLP analysis. However, since the septic tank water did not contain any detectable VOCs, and the septic tank sludge and water did not contain detectable SVOCs for which there are TCLP criteria, TCLP analysis could not have detected organic constituents exceeding federal hazardous waste criteria.

Regarding inorganic constituents, the TCLP hazardous waste criteria applies to a list of eight metals. The TCLP test method includes a dilution of 20 (that is, total metals will exceed the TCLP analytical results by a factor of 20 if 100 percent of the metals present in the sample are fully leachable in a TCLP extraction). Multiplication of the TCLP criteria by 20 and directly comparing the multiplication product with the total metals analysis of the sludge finds that the indirect measure of the TCLP criteria is not exceeded for any inorganic constituent. The waste is therefore nonhazardous.

Comment 12. Figure 10: This figure shows a hole next to boring 01-03. Was the depth of this hole determined? If the hole is deeper than 15 feet, maybe boring 01-03 should be deeper in order to detect potential contaminants that may have migrated.

Response: The hole illustrated on the site plan was found during a site visit to inspect the area. The hole is approximately 1 foot deep. The hole may be associated with a six inch diameter horizontal pipeline found approximately 1 foot below the ground surface within the hole. The hole is likely due to placement of or repairs to the pipeline. The hole could also be due to leakage from the pipeline. The hole and its relation to the site are discussed on page 20 of the final report.

Comment 13. Figure 12: Is the oil/water separator shown in this figure in use? If not, it should be removed and visually inspected for cracks.

Response: The oil/water separator was constructed in 1975 of cast-in-place, steel-reinforced concrete. The oil/water separator is currently in service with a connection to the sanitary sewer and operates under the Naval Weapons Station Industrial Waste

Discharge Permit issued by the Contra Costa County Sanitary District. Under the permit, the tank is pumped out and cleaned once per year and is inspected twice per year. The separator was last pumped out on September 23, 1996, and was last inspected on January 21, 1997. The oil/water separator is not known to have leaked during its operational history. The text of the final RFA confirmation study report will be revised to incorporate this additional information.

APPENDIX B

NAVY RESPONSES TO CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, REGIONAL WATER QUALITY CONTROL BOARD, SAN FRANCISCO BAY REGION, COMMENTS ON THE DRAFT RCRA FACILITY ASSESSMENT CONFIRMATION STUDY, DATED NOVEMBER 4, 1996 NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

(19 Pages)

APPENDIX B

NAVY RESPONSES TO CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, REGIONAL WATER QUALITY CONTROL BOARD, SAN FRANCISCO BAY REGION, COMMENTS ON THE DRAFT RCRA FACILITY ASSESSMENT CONFIRMATION STUDY, DATED NOVEMBER 4, 1996 NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

GENERAL COMMENTS

Comment 1. **SWMUs 5, 7, and 18 were identified for a "regional" groundwater investigation due to the presence of TPH and VOCs. A number of metals were also detected in groundwater above drinking water standards - federal and state Maximum Contaminant Levels (MCLs). RWQCB staff will require that metals, as well as the identified organics, be included in the regional groundwater investigation.**

Response: The Navy is aware that there may have been impacts from inorganic constituents at one or more of the sites. Therefore, it is reasonable to include inorganic analysis in future investigations. However, because there is no clear indication that metals have contaminated groundwater, the cost of metals analysis at every sampling location may not be an appropriate use of funds. The Navy will consider this request when preparing the field sampling and analysis plan for the groundwater investigation in the vicinity of SWMUs 2, 5, 7, and 18.

Comment 2. **RWQCB staff recommend that SWMU 2, in conjunction with SWMUs 5, 7, and 18 be carried through to the CERCLA process until the source of the VOCs and metals in groundwater can be determined. SWMU 2 is in close proximity to the other sites and cannot yet be ruled out as a potential source(s). VOCs were not analyzed in every soil sample, especially not at the hazardous waste storage area, and only analyzed for in two groundwater grab samples. In addition, BTEX [benzene, toluene, ethylbenzene and xylenes] was detected in soil and/or groundwater at six boring locations. Until further investigation and proper monitoring wells are installed, it is inappropriate to consider no further action for this site.**

Response: The RFA confirmation study suggests that the soil investigation of SWMU 2 has been adequate to conclude that the immediate area of the site (where the alleged burning pit was reportedly located) is not contributing to constituents detected in groundwater.

Other sources are possible, and the draft RFA confirmation study recommends further CERCLA investigations to evaluate the source of impacts to groundwater. As such, the Navy agrees that SWMU 2 cannot be closed and that further investigation of the site is warranted. The text of the RFA confirmation study will be revised to indicate that a CERCLA investigation of the groundwater conditions should be pursued.

EPA's RCRA Facility Assessment (RFA) identified Building IA-7 as a burn area and as a hazardous waste accumulation area. The History of Release section of that report focuses on releases that may have occurred due to burning activities and does not mention suspected releases associated with the hazardous waste accumulation area. Consequently, the field work plan and site investigation focused on the area of the suspected burn pit.

VOCs were investigated within the area of the suspected burn pit and none were detected. Grab groundwater samples were collected from the site and VOCs were not detected. The CERCLA investigation of groundwater will require installation of wells. The location of wells and list of proposed constituents for analysis will be determined when the field sampling analysis plan is prepared.

Comment 3. Further investigation is required at SWMU 13, especially along the sewer pipe that leads to the septic tank. Because the tank had hazardous levels of contaminants and because previous investigations beneath the building indicated the presence of numerous contaminants, there is an information and data gap with respect to possible releases.

Response: This response addresses the two issues raised in the comment. The first issue is regarding the adequacy of the investigation of the SWMU site and the second issue is regarding the draft RFA confirmation study report discussion of detected contamination below Building IA-25, that discharges to the septic tank.

The SWMU, defined in the EPA's RFA and in the RFA confirmation study work plan, consists of the septic system and the nearby storm drain outfall. The Navy contends that the investigation of the SWMU site, including the septic tank, leach field, and storm drain outfall all located north of Building IA-25 has been adequate for closure of the SWMU site. On the other hand, evaluation of the environmental conditions at Building IA-25 has not been completed.

Sanitary sewers that distribute waste to septic tanks are designed as tight lines (without intentional leakage). Even in the event that the sanitary sewer has been disturbed and now leaks, it is unlikely that leakage and infiltration to the soil can approach the design infiltration rate of a leach field due to the rock backfill surrounding leach field pipelines. Regardless of the state of the sanitary sewer, the borings placed to investigate soils downgradient of the leach field are also located downgradient from the sanitary sewer. Because hazardous constituents were not detected in the soils downgradient of the leach field and sewer pipeline, the Navy believes that the leach field system has not caused a detectable impact on soils at the site. However, the Navy also acknowledges that the RWQCB believes there is still a potential for leakage from the sewer pipe to cause impacts to the site.

The status of the environmental investigations at Building IA-25 are summarized as follows. Although the RFA prepared by EPA stated that there was no history of releases from Building IA-25 adjacent to SWMU 13, releases were documented in the January 1990 report, "Site Investigation at Building IA-25 Naval Weapons Station Concord, California" prepared by IT Corporation. The IT Corporation report includes a focused evaluation of risk to on-site workers and concludes that "no long-term health effects are anticipated from either remodeling activities at Building IA-25 or the regular maintenance of the structure." The RFA confirmation study field work plan was focused upon the investigation of the septic tank and leach field and nearby surface discharge of storm water from a pipeline at the site.

Previous sampling below Building IA-25 by the Navy and IT Corporation detected beryllium, cadmium, chromium, lead, and benzo(a)pyrene at concentrations exceeding residential or industrial PRGs. Although the focused risk assessment by IT Corporation evaluated risk to a specific group of workers at Naval Weapons Station Concord, a risk assessment has never been conducted for Building IA-25 following EPA guidelines appropriate for investigation of potential hazardous waste sites under CERCLA. As such, the IT Corporation risk assessment does not support evaluation of the site according to the CERCLA process. The Navy plans to conduct a CERCLA investigation of Building IA-25 to collect additional soil samples, if necessary, and to conduct a human health risk assessment to evaluate the site risk in accordance with CERCLA process guidelines. The issue of potential leakage from the sewer line to the septic tank will also be revisited during the CERCLA process of evaluating Building IA-25. Based on the results of the risk assessment either a feasibility study or record of decision will likely be prepared according to the CERCLA process. The Navy will recommend closing out SWMU 13 (including the septic tank, leach field, and storm drain outfall), and adding a new CERCLA SI site for the evaluation of Building IA-25.

Comment 4. **RWQCB recommends that septic tank contents at all the sites be pumped and rinsed out according to routine maintenance requirements. Although there was no evidence of contaminant migration to soil at most sites, almost all of the tanks indicated the presence of VOCs, SVOCs, and/or metals in liquid and/or sludge. To minimize the possibility of impact to groundwater from infiltration through the leach field, clean out of septic tanks is a good preventive measure. A letter from RWQCB staff to James Pinasco of DTSC dated January 29, 1996 indicated that whether or not the tanks remain in use, they must be operated and maintained according to Contra Costa County requirements (copy of letter attached).**

Response: There is no established Contra Costa County requirement or regulation that addresses maintenance procedures for septic tanks. However, wastes were removed and septic tanks rinsed at SWMU sites 12/20, 13, 14, 17, 23, 24, 44, and 54 in March 1997.

Comment 5. **At almost every septic tank, previous sampling was performed in either 1990, in 1993, or in both years. The Navy should indicate whether contents were removed from any of the septic tanks after sampling was performed.**

Response: There is no record that septic tank wastes were removed prior to 1997.

Comment 6. **For a number of the SWMUs which indicated the presence of oil and grease in soils, the Navy states that the concentrations of oil and grease do not pose a potential threat to receptors of any type, or that there is no evidence that it is harmful. This statement is misleading and should be modified where ever it appears in the document. It gives the impression that there are standards or criteria for oil and grease in soil for human or ecological receptors, which there are not. If the Navy wishes to include a discussion of degradation of oil and grease limiting exposure and possibly risk, this would be acceptable.**

Response: Due to their low toxicity, low mobility, and in some cases, the low frequency of detection, the Navy believes that the oil and grease do not pose a threat at these SWMU sites. However, since no criteria or standards are available for comparison, the text will be revised in each instance to discuss the absence of regulatory criteria, mobility, toxicity, and frequency of detection, as applicable.

Comment 7. **Volume 2: Tables of laboratory analytical results should highlight exceedances of screening criteria for MCLs for groundwater samples and ambient (background) values for metals in soils.**

Response: The groundwater samples are grab samples from probe holes. Since the samples were not filtered, a significant portion of the detected metals is likely the result of soil particulates within the water sample. Even if the samples had been filtered, MCLs still may not be the most appropriate screening criteria.

The estimated ambient (or background) metals concentrations in soils are discussed in detail in Section 4.2.3 of the RFA confirmation study. Concentrations in all samples that exceed both the PRG and ambient (background) criteria are listed.

In the interest in saving the time and effort to reprogram and reprint the data, the requested change will not be incorporated in the final RFA confirmation study report.

SPECIFIC COMMENTS

Comment 1. **Page ES-2, first and second bullets: The Navy should provide the current status of the removal of the septic tanks contents at SWMUs 13 and 14. The text indicates was scheduled in 1996, however we understand there was a delay in completing this activity.**

Response: The activity was completed in 1997 and the report will be updated as requested.

Comment 2. **Section 4.2, SWMU Analytical Results and Evaluation, Inorganic Constituents in Soil: The second paragraph states that if the data falls into category (1) inorganic constituents without EPA PRGs, or category (2) analytical results do not exceed residential PRGs, then the results indicate there is no environmental concern. These sentences should be modified to reflect that if results fall into category (1) then it is unknown if there is a concern to human receptors (except Ca, Fe, Mg, K,**

and Na as described). If results fall into category (2) then there is no concern to human receptors. Residential PRGs do not address exposure to ecological receptors, therefore using the phrase "no environmental concern" is not an appropriate conclusion.

Response: The analysis for inorganic constituents includes a list of 24 metals. Nineteen of these have EPA PRGs and the remaining 5 are essential nutrients, as described. Category 1 therefore consists only of the essential nutrients.

The text of the report will be modified to indicate that there is no concern to human receptors if the results of the evaluation fall into either of the first two categories discussed in Section 4.2 of the RFA confirmation study report.

Comment 3. Section 4.2.3, Inorganic Constituents that Exceed PRGs: The Navy should define "estimated ambient limit concentrations." It is our understanding the those metals concentrations referred by the Navy as ambient actually represent background. We also disagree with the Navy's use of the terminology indicating that ambient is the same as background or naturally-occurring. The Navy should modify this discussion. It is generally accepted that background refers to metals concentrations which are naturally-occurring. However, ambient refers to chemical concentrations present due to anthropogenic sources (and may include background levels) unrelated to site activities. These issues were also raised in our comments to the Navy dated January 27, 1997 regarding the Internal Draft Remedial Investigation Report for Inland Area Sites.

The Navy should also delete the third sentence in this section which states that "Potentially harmful contamination by inorganic constituents is suspected only when estimated ambient limit concentrations are exceeded." This statement is too broad and may not be true for every chemical. A chemical may exceed ambient and also exceed the PRG or other health-related criteria.

Lastly, the Navy should provide the reference or include a copy of the document indicating how the "estimated ambient limit concentrations" were derived. If this data is the same as that described as "Technical Memorandum, Estimation of Background Metals Concentrations in Inland Area Soils" dated July 9, 1996, it should be included as an appendix to this document. (We assume there is a similar memo for Tidal Area Soils.)

Response: The Navy agrees that ambient concentrations of constituents refer to the sum of background concentrations and concentrations due to anthropogenic sources unrelated to site activities. The text of the RFA confirmation study will be revised to clarify the definition of the estimated ambient limit concentrations.

The text of the RFA confirmation study report will be revised to include the following statement: "Potentially harmful site-related contamination by inorganic constituents is generally not suspected when estimated ambient limit concentrations are not exceeded."

The technical memoranda will be appended to the RFA confirmation study report as appendices C and D.

Comment 4. **Section 4.2.3, Inorganic Constituents that Exceed PRGs - Arsenic, page 13: In the last full paragraph the Navy should clarify what is meant by "Few of the PRG exeedences are likely to represent site contamination because the estimated ambient limit concentrations were only slightly exceeded." Describe specifically what is meant by "slightly exceeded" and what an "acceptable" exceedance would be. The arsenic concentration at SWMU 52 is 65.4 mg/kg, where the estimated ambient limit concentration is 15 mg/kg. The Navy should also take into account what other sample locations exceeded the ambient limit, not just isolated locations, to determine whether the arsenic is related to contamination or can be attributed to ambient (or background).**

Response: Because some of the arsenic concentrations detected may represent site contamination, the sentence has been removed from the text to avoid confusion. Discussions of criteria used to evaluate whether concentrations in soil samples exceed ambient limit concentrations appear in the site-specific discussions of each SWMU.

Comment 5. **Section 4.2.3, Inorganic Constituents that Exceed PRGs - Beryllium, page 14: The sentence immediately below the table, typo? Beryllium concentration of 0.41 mg/kg does not exceed the ambient value of 0.56 mg/kg. Please see also Specific Comment #4 regarding what is considered an "acceptable" exceedance of ambient.**

Response: The estimated ambient limit concentration for beryllium for Inland Area sites on the sedimentary rock formation was correctly reported in the text of the report but incorrectly reported in the table. The table will be corrected. In addition, sample results exceeding the estimated ambient limit concentration for beryllium will be added to the table.

The estimated ambient limit concentration for the Tidal Area sites and for the Inland Area sites on the sedimentary rock formation is 0.12 mg/kg. The estimated ambient limit concentration for Inland Area sites on the Los Mendanos Hills formation is 0.56 mg/kg. Concentrations in all samples exceeding the estimated ambient limit concentrations are located within either the Tidal Area or the Inland Area on the sedimentary rock formation and contain concentrations of beryllium less than 0.56 mg/kg (the estimated ambient limit for the Los Mendanos Hills formation).

Empirical evaluation of the sample results, rather than a rigorous evaluation process, is used to determine a slight exceedence of estimated ambient limit concentration criteria. As such, the evaluation relies on: (1) comparison of the concentration of the constituent relative to the estimated ambient concentration, (2) the location of the samples exceeding the criteria, (3) the concentration of the constituent in nearby samples, (4) the known current or former operations at the SWMU site, and (5) an evaluation of the concentration of the constituent in the septic tank water, if applicable.

Regarding the concentrations of beryllium that exceed the estimated ambient limit concentrations, the following text is proposed for Section 4.2.3 of the RFA confirmation study report,

> *The concentration of beryllium in the samples listed above is not necessarily representative of site contamination since the exceedence over the estimated ambient limit concentration is minimal (less than 0.3 mg/kg), the distribution of samples exceeding the estimated ambient limit is random, and there are no known uses of beryllium at the sites.*

Comment 6. **Section 4.2.3, Inorganic Constituents that Exceed PRGs - Thallium, page 17: The Navy should provide the reference and describe the methodology used to calculate a residential PRG for metallic thallium.**

Response: The following description will be added to the RFA confirmation study report. (The thallium PRG calculation was also used during the Navy's investigation of Mare Island, and the following paragraph also appeared in the Navy's Remedial Investigation of Operable Unit 3 at Mare Island by PRC dated January, 1997).

> *EPA Region 9 lists PRGs for various thallium salts but not for thallium as a metal. Because the soil analytical data are reported for thallium as a metal, a PRG for the metal was calculated. A reference dose (RfD) for thallium was first calculated from the RfD for thallium sulfate, using a molecular weight conversion factor. Using the same equations EPA Region 9 used for the derivation of its listed PRGs and the thallium RfD (0.00007 mg/kg per day), the PRG for thallium was calculated at 5.4 mg/kg.*

SWMU 1 - Building IA-6, Boiler House

Comment 7. **Site Description, page 19: In the last paragraph, the Navy should indicate when the observation occurred that a 10 by 20 foot area was saturated and had ponded water.**

Response: The date of the observation of the ponded water is unknown.

Comment 8. **Previous Investigations, page 20 - 21: The Navy should provide the specific concentrations of petroleum hydrocarbons and VOCs that were detected in groundwater monitoring wells, if that data is available. This is especially of interest to determine if concentrations have increased or decreased since the earlier sampling.**

Response: In late 1997 or early 1998, the results of 1 year of quarterly monitoring will be submitted with a request for UST site closure. The site remediation for TPH constituents and the quarterly groundwater monitoring for TPH were beyond the scope of the RFA confirmation study report and are addressed under a separate contract to Naval Weapons Station Concord.

The concentrations of VOCs measured at the site have not changed significantly from previous measurements. The historical VOC analyses will be incorporated in the investigation field work plan and investigation report as the site is evaluated under CERCLA. Revision of the text of the RFA confirmation study report is not proposed in response to this comment.

Comment 9. **Previous Investigations, page 21: The Navy should indicate the location and when the 100 tons of diesel-contaminated soil was excavated. They should also provide the details of the location and when the additional excavation took place in 1996. (Please see also Conclusions and Recommendations, page 24.)**

Response: The location and date of final excavation of diesel contaminated soil from the site have been added to RFA confirmation study report. The location and concentration of total petroleum hydrocarbons as diesel (TPH-d) in the final confirmation samples has also been added to the site plan.

Comment 10. **Previous Investigations, page 21: The Navy should modify the last sentence in this section. The UST case will not automatically be closed by RWQCB if there is little or no impact to groundwater. The Navy must request closure based on the results of the 1-year quarterly groundwater monitoring. (Please see also Conclusions and Recommendations section, page 25.)**

Response: The text will be revised as requested.

Comment 11. **RFA Confirmation Study Sampling - Soil, page 21: The Navy should modify the discussion of the objective for recent sampling. This section does not mention the VOCs analysis that was performed for soils.**

Response: The text will be modified to elaborate on the objective of the sampling.

Comment 12. **Investigations Results, page 22: The Navy should indicate whether the area of borings 01-04, 01-05, and 01-06 is the same area where soil was removed in 1996. It would be useful to have the boundaries of the soil excavation areas included on Figure 10.**

Response: The text and figure will be modified to indicate the boundaries of the excavation.

<u>**SWMU 2 - Building IA-7, Fire Station**</u>

Comment 13. **Site Background, page 26: The Navy states that between 1969 and 1973 fire fighting residues were scraped from the practice burn pit and disposed of in Seal Creek. The Navy should indicate if Seal Creek was ever sampled for these residues**

and if not, why not. A similar question applies to the storm drainage ditch leading from the site into Seal Creek (page 27).

Response: The RFA confirmation study field work plan included sampling in the storm drainage ditch between the practice burn pit and Seal Creek. Samples from these locations were collected at depths ranging from the surface to 4.5 feet. None of the samples from locations 02-01, 02-02, 02-03, and 02-04 contained concentrations of constituents to suggest that surface deposition of eroded material or dumping has occurred between Seal Creek and the site.

The RCRA facility assessment conducted by EPA in 1992 reported direct disposal of fire extinguisher residues to Seal Creek between 1969 and 1973. This statement also appears in the RFA confirmation study, although the basis and accuracy of this statement have not been confirmed. The RFA confirmation study work plan did not propose direct sampling within Seal Creek because of the low probability that any residues would remain within Seal Creek after 23 years of winter creek flows. Visual inspection of the area near SWMU 2 did not reveal depositional areas within the Seal Creek channel that appear to have accumulated waste material or debris. Sediment sampling within the creek remains a possibility, but is not recommended due to the low probability that any residue remains within the creek.

Comment 14. Site Background, page 27 and Figure 11: To enable better review of the issues at this SWMU, the Navy should provide a map indicating the relationship of SWMU 2 and Seal Creek. Drawings depicting the configuration of the drainage system over time from the aerial photographs would also be useful.

Response: Figure 11 will be revised to indicate the distance to the Seal Creek drainage channel.

Historical research, such as review of aerial photographs, is usually conducted when the work plan is prepared to evaluate appropriate locations for sampling and analysis. Often the review of detailed aerial photographs cannot provide conclusive information regarding depositional or erosional history of a creek channel such as the drainage at Seal Creek. Most of the drainage area is obscured from overhead view by mature evergreen trees lining both of the embankments of Seal Creek. Due to the expense of conducting a thorough research of the aerial photographic record, the cost of mobilizing an additional sampling effort, and the low probability that debris within the channel could have survived 23 years of annual creek flow, evaluation of aerial photographs of the site and sampling of the creek channel is not proposed at this time.

Comment 15. Investigation Results, page 28: Surface soil results at boring 02-06 had elevated concentrations of TPH-mo and anions, as well as metals exceeding one or more of PRGs, ER-Ls [effects range-low], ER-Ms [effects range-median] or ambient. The Navy states that at these concentrations they are not considered a human or ecological risk. The Navy should describe what standards or criteria cause them to make this statement. Is there significance in co-occurrence of elevated anions and metals?

Response: The Navy's statement regarding potential risk at the site is based on the limited lateral extent of these detected constituents. Nearby samples both vertically and horizontally did not contain significant concentrations of these constituents. Because risk is a product of concentration and exposure, a small volume of material with potentially significant concentrations can cause significant risk only if the receptor is in contact with that specific material on a repeated basis. Due to the limited extent of the material in question, the Navy believes that there is a low environmental risk because of the slight possibility of repeated contact by humans or animal species of concern.

The Navy's opinion is not based on determination of the volume of contaminated soil or a detailed evaluation of residence time of any receptor. Although these have not been quantitated, the limited mobility of the detected constituents has been shown to be less than 4 feet (vertically) based on the second sample recovered from boring 02-06. The Navy's opinion is based upon professional judgment and the belief that a more rigorous evaluation of the site would reach the same conclusion.

SWMU 2 is recommended for further evaluation under CERCLA due to constituents detected in groundwater. A draft work plan/field sampling plan will be provided to the regulatory agencies for evaluation and comment before any future field work begins.

Comment 16. Conclusions and Recommendations, page 30: The Navy should cite the reference to TPH cleanup goals of 500 to 1,000 mg/kg negotiated at various sites in the past.

Response: The text of the report will remove reference to TPH cleanup goals of 500 to 1,000 mg/kg. Although the Navy is aware of cleanup goals in this general range that have been negotiated, the conditions of the sites for which the cleanup goals were developed (industrial setting, geology, and depth to groundwater) are dissimilar to those found at SWMU 2.

Comment 17. Conclusions and Recommendations, page 30: There is insufficient information to support the conclusion that no further action is required at this SWMU. There was limited VOC analyses performed in soil and groundwater (two of fourteen soil samples had VOC analysis and only two groundwater grab samples were taken); no VOCs were analyzed for at the locations of the hazardous waste storage area. Additionally, the two groundwater grab sample locations showed the presence of BTEX in both soil and in groundwater, as well as four other boring locations where BTEX was detected in soil. This SWMU should be carried through to the regional groundwater investigation until the source of the VOCs in groundwater have been identified.

Response: The text will be revised to indicate that SWMU 2 will be included in a CERCLA investigation.

SWMU 5 - Building IA-12, Locomotive Repair Shop and USTs

Comment 18. Site Background, page 31: The Navy should clarify if the activities of draining battery acids and rinsing and neutralizing casings is currently ongoing. If so, they should indicate if samples were taken in the areas where this activity occurs or occurred.

Response: The practice of draining, rinsing, and neutralizing batteries at the site was performed prior to about 1985. Batteries are currently recycled intact (including the intact casings, battery acid, and internal components).

Comment 19. Site Background, page 32: The Navy should clarify if the 10,000-gallon diesel fuel UST is still in use. They should also provide information with regard to any soil testing and excavation during the removal of the 500-gallon waste oil UST. This information may be relevant to determining the source of VOCs and metals in groundwater.

Response: The 10,000-gallon diesel fuel tank is still active. This tank, two nearby 10,000-gallon gasoline tanks, and an additional 10,000-gallon diesel tank will be removed after the new fuel filling station is constructed (near Building IA-11). The new filling station is scheduled for completion by December 25, 1997, and the USTs are scheduled for removal immediately thereafter.

The "500 gallon" waste oil UST is erroneously identified in the draft RFA confirmation study report. The waste oil tank was actually a 6,000-gallon waste oil UST. The waste oil tank was removed on November 4, 1994. The soil samples collected at the time of the UST removal did not contain detectable volatile organic constituents, polynuclear aromatic hydrocarbons, total extractable petroleum hydrocarbons as diesel, benzene, toluene, ethylbenzene, xylenes, fluoride, or asbestos. The samples contained low concentrations of total extractable petroleum hydrocarbons as motor oil. Metals were detected, but were not judged to be the result of contamination.

After the UST was removed, a small additional volume of soil (36 cubic yards) was excavated and confirmation samples were collected at the limits of the excavation. One analytical test result from the final confirmation soil samples contained petroleum hydrocarbons at a concentration of 25 mg/kg. The remaining three soil samples did not contain detectable hydrocarbons. A request for clean closure of the UST was submitted by the Navy to the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) on June 2, 1994. The UST was certified closed in a March 21, 1995 letter by Mr. Lester Kaufman of DTSC.

The above additional information and sample results will be included in the final RFA confirmation study report.

Comment 20. Investigation Results - Groundwater, page 34: This section states that metals were detected in groundwater, but did not reveal any site contamination. The Navy

should re-evaluate this data. The appropriate screening criteria for metals in groundwater at this site may be state and federal MCLs. In every groundwater sample, there are a number of metals which exceed MCLs. The Navy should determine if (1) the groundwater beneath the site would be considered a potential drinking water source, as per State Water Resources Control Board Resolution No. 88-63 and the San Francisco Bay RWQCB Basin Plan, (2) compare soil and groundwater data to determine a possible source, and (3) compare groundwater data from SWMU 5 to other groundwater data from the Inland Area with similar lithology to determine whether these are concentrations of concern.

Response: Future investigation of the site is proposed for CERCLA investigation. Please see response to RWQCB general comment number 1.

Comment 21. Conclusions and Recommendations, page 35: Based on the information presented in this document, the RWQCB will request that the metals in groundwater, as well as the organics, be carried through to the regional groundwater investigation.

Response: Please see response to RWQCB general comment number 1.

SWMU 7 - Building IA-16, Paint Shop and USTs

Comment 22. RFA Confirmation Study Sampling - Groundwater, page 38: The first sentence indicates that the objective of groundwater sampling was to investigate impacts from the documented hydrocarbon release. The Navy should clarify if this release refers to the USTs at SWMU 7 or some other site. The earlier text was not clear that a hydrocarbon release had been documented for this site.

Response: The text has been revised to clarify the objective of groundwater sampling.

Comment 23. Investigation Results - Groundwater, page 39: The Navy has not indicated that metals concentrations in groundwater exceed MCLs for arsenic, barium, chromium, copper, lead, mercury, and thallium. These results should be evaluated and discussed as described in Specific Comment # 20.

Response: Please see response to RWQCB general comment number 1.

Comment 24. Conclusions and Recommendations, page 40: Based on the information presented in this document, the RWQCB will request that the metals in groundwater, as well as the organics, be carried through to the regional groundwater investigation.

Response: Please see response to RWQCB general comment number 1.

SWMU 12/20 - Buildings IA-24 and IA-56, Septic Tanks at Forklift Maintenance and Tools and Supplies

Comment 25. Previous Investigations, page 43: The Navy should provide the specific concentrations of contaminants detected at ACS-06-SB temporary well and at ACS-01-SFC and ACS-2-SFC during the SI of 1992.

Response: The requested analytical results will be added to the RFA confirmation study report.

Comment 26. Investigation Results - Soil, page 45: The Navy should indicate which IR Site 17 sample location had TPH-mo at 4,100 mg/kg.

Response: The sampling location will be added to the text of the RFA confirmation study report.

Comment 27. Investigation Results - Septic Tanks, page 46: The Navy should expand on the discussion of how the results from the septic tank water and the soils metals concentrations were analyzed to conclude that there is no correlation between the two.

Response: The metals results for the septic tank water from SWMU 12/20 were compared to the results from all other septic tanks as well as the metals results from soil. The following paragraphs discuss the metals that exceeded the estimated ambient concentrations and residential PRGs in soil samples. In each case, the Navy concludes that the metals in soil do not appear to be related to the same metals detected in the septic tank water.

Manganese — Manganese exceeding the residential PRG at SWMU 12/20 was detected in only one soil sample at a depth of 15 feet, in a location where results for shallower soil samples did not exceed the residential PRG. In addition, manganese exceeding the PRG was not detected in any soil samples collected at locations closer to the leach field. In the septic tank water at SWMU 12/20, the concentration of manganese was 1,800 micrograms per liter (μg/L). The manganese concentration in all other septic tank sewer water samples ranged from 59.3 to 6,620 μg/L. Although manganese in the sewer water at SWMU 12/20 was not the highest detected, the concentration of manganese in soil samples did not exceed the residential PRG at any other SWMU site containing a septic tank.

Thallium — Thallium was detected above the residential PRG in the same soil sample that contained the elevated concentration of manganese. However, thallium was not detected in the septic tank water sample.

Nickel — The maximum concentration of nickel in soil at SWMU 12/20 (from boring 12-02 at a depth of 5 feet) was 165 mg/kg. As discussed in the text of the RFA confirmation study report, the concentration of nickel in that sample exceeded the estimated ambient limit concentration (86 mg/kg) and the State of California modified PRG (150 mg/kg). No other soil samples analyzed for SWMU 12/20 exceeded these criteria for nickel. The concentration of nickel detected in septic tank sewer water at

SWMU 12/20 was 350 $\mu g/L$ (the maximum concentration of nickel detected in any septic tank water sample).

Lead was also detected in the septic tank sewer water sample at SWMU 12/20 at a concentration of 3,310 $\mu g/L$. The concentration of lead in the septic tank water is approximately 10 times the concentration of nickel. Because the fate and transport of nickel and lead are expected to be similar, the impacts to soil from lead and nickel should be similar. However, these impacts were not observed in the soil sample containing the 165 mg/kg of nickel. Lead in the sample from boring 12-02 at 5 feet deep was detected only at a concentration of 8.6 mg/kg, which is less than the estimated ambient limit of 18 mg/kg.

This result suggests that the elevated concentration of nickel in the soil sample is not associated with contamination from the septic tank sewer water. This conclusion is supported by similar observations regarding the concentrations of other metals (including copper and zinc) in septic tank sewer water compared to the concentrations of these constituents detected in the soil sample from boring S12-02 at 5 feet. Also, the conclusion that elevated nickel is not due to the septic tank sewer water is further supported by the fact that elevated concentrations of nickel were not detected in any other soil samples collected near the septic tank leach field.

Based on the above evaluation of the concentrations of manganese, thallium, and nickel detected in soil at SWMU 12/20, the Navy concludes that there is no correlation between the concentrations of these metals detected in soil samples and those detected in the septic tank sewage water samples.

SWMU 13 - Building IA-25, Pilot-Scale Development of Munitions, Septic Tank

Comment 28. Previous Investigations, page 50: This section states that the Navy sampled soil from beneath the building in 1988 and again in 1989, but has not described further actions in this area. Elevated concentrations of explosives-related compounds, VOCs, SVOCs, and pesticides were detected, as well as lead, zinc, and chromium at TTLC levels. The Navy should indicate what the outcome was of sampling beneath the building and why the area was not addressed as part of the RFA confirmation sampling.

In addition, the Navy has not indicated why these elevated chemical concentrations were detected beneath the building. Is (or were) there leaking pipe connections from storm and sanitary sewer lines? Vitrified clay pipe can be expected to develop cracks and leaks over time. Any additional information regarding past practices at this site would be useful.

Response: The area beneath Building IA-25 was not addressed as part of the RFA confirmation study report because the RFA confirmation study focused on investigation of the septic tank, leach field, and surface water discharge at the storm drain outfall, as described in the field work plan. Please refer to response to RWQCB general comment number 3.

Comment 29. **Previous Investigations, page 50: The Navy should indicate what the current operations and practices are at this site. The RFA confirmation sampling indicated a number of chemicals at high levels in the 1995 septic tank sampling. Improper disposal of chemicals to the sewer lines requires additional sampling elsewhere in the upper end of the system, not just at the tank and leachfield.**

Response: Current operations at this building involve various types of ordnance workloads including electronic X-ray nondestructive testing. The Navy does not propose additional soil sampling adjacent to the sewer line that is connected to the septic tank as part of the RFA confirmation study. Please see response to RWQCB general comment number 3.

Comment 30. **RFA Confirmation Study Sampling - Soil, page 51: Typo in last sentence of this section: Soil samples from borings 13-01 and 13-03, not 13-02 were also analyzed for pesticides.**

Response: The error will be corrected in the final RFA confirmation study report.

Comment 31. **Investigation Results - Septic Tank, page 52: Septic tank sludge contained a number of pesticides, as well as other VOCs, SVOCs, and metals. Based on site operations, it is unclear as to how numerous pesticides, albeit at relatively low concentrations, would be present in the septic system. As noted above, the Navy should provide as much information about past practices at this site as is available.**

Response: Past practices at Building IA-25 include the activities listed in the draft RFA confirmation study report. A description of current practices (see response to RWQCB comment 29) will be added to the final RFA confirmation study report. The source of the pesticides in the septic tank has not been determined.

Comment 32. **Conclusions and Recommendations, page 53-54: The RWQCB does not find adequate information to support the conclusion that no further action at this site is required once the septic tank is cleaned out. The Navy has presented information with respect to soil sampling results beneath the building that indicate contamination may still be present at the site. Nor have they provided sufficient information as to the outcome of that earlier sampling, or sufficient detail of past practices and the physical layout of the facility to explain the presence and location of these contaminants. The presence of hazardous constituents in the septic tank sludge leads us to be concerned about the lines leading from the building to the tank. While we agree that sampling at the leach field seems to indicate no migration of contaminants from the septic tank, we remain concerned about the any contaminants migrating from the building, storm or sewer lines prior to the septic tank.**

Response: Please see response to general RWQCB comment number 3.

SWMU 17 - Building IA-50, Transfer Station for Ordnance Materials, Septic Tank

Comment 33. RFA Confirmation Study Sampling, page 66: The text states that boring 17-01 was located between the drain field and Seal Creek, however, Figure 20 depicts that boring to be in the leachfield, not downgradient from it. The Navy should clarify this point.

Response: The text of the RFA confirmation study report will be corrected.

SWMU 18 - Building IA-51, Steam Cleaning for Locomotives, Vehicles

Comment 34. Site Background, page 69: This section states that chromates were detected in Seal Creek in 1978. The Navy should provide additional historical information on why the sampling took place and the outcome of that effort. They should also specify the concentrations detected and the specific location(s), if known.

Response: The 1992 EPA RFA report indicates that chromates were detected in Seal Creek, but the source of that information is not referenced and additional information regarding the location of samples and concentrations detected has not been found.

Comment 35. RFA Confirmation Study Sampling, page 70-71: Although the storm drainage outfall to Seal Creek was sampled, the Navy should explain why the creek bed itself was not sampled.

Response: The Seal Creek bed was not sampled because residual contamination within the creek bed is unlikely after the approximately 10 years of intermittent creek flushing and drying cycles that have occurred since the time of the reported release. Because contaminants were not suspected in the creek bed, sampling was not proposed in the field work plan. The drainage above the creek, closer to the potential source, was judged to be a more likely area of contamination. However, sampling in the tributary drainage above Seal Creek did not detect contaminants.

Comment 36. Conclusions and Recommendations, page 73: A number of metals were detected in grab groundwater samples which exceeded their respective MCLs. The Navy states that the samples were unfiltered and may represent falsely elevated concentrations of metals in groundwater. However, to verify this assumption, RWQCB staff will require that metals, as well as the organics identified, be carried through in the regional groundwater investigation.

Response: Please refer to response to RWQCB general comment 1.

SWMU 25 - Building 97, Ordnance Assembly and Maintenance

Comment 37. RFA Confirmation Study Sampling - Soil, page 86: The document indicates that soil borings 25-01 and 25-03 could not be completed because they met refusal at 8

and 14 feet, respectively. The Navy should provide some discussion as to why they believe this occurred.

Response: The text of the RFA confirmation study report will be revised to indicate that the borings met refusal on bedrock.

<u>SWMU 37 - Building A-29, Dunnage Area</u>

Comment 38. Site Background, page 88: The Navy should describe why SWMU 37 was historically separated from the surrounding IR Site 11, since the potential source of contamination is the same for both.

Response: The Wood Hogger site (Site 11) was identified in the June 1983 Initial Assessment Study prepared by Ecology and Environment, Inc., as a wetland disposal site for chipped wood. In contrast, SWMU 37 is a dry fill area that was actively used for stockpiling and storage of wood and wood chips rather than for disposal. The text of the RFA confirmation study report will be revised to clarify this distinction between the two sites.

Comment 39. Site Background and Investigation Results, page 91: The Navy should note in the document that this SWMU site is adjacent to a diked wetland habitat and is bounded by Otter Sluice on two sides. Because the SWMU is adjacent to a sensitive habitat, soil and groundwater results should be screened against criteria relevant to ecological receptors, not just human receptors. Our cursory screening of the soil data against ER-Ls and ER-Ms have not revealed any significant exceedences of these benchmarks. However, we noted that a number of metals in groundwater exceeded chronic Ambient Water Quality Criteria for marine life.

Response: The site description in the RFA confirmation study report will be revised to describe the surrounding areas.

The report will be revised to include screening relative to the ecological effects range low (ER-L) and effects range median (ER-M) criteria.

Because groundwater sample results at SWMU 37 were not filtered or obtained from a standard well installation, groundwater analytical results cannot be screened against any published criteria. However, in comparison with other unfiltered groundwater results from Naval Weapons Station Concord, the groundwater results (and the results from all soil samples at SWMU 37) do not suggest that there have been impacts to groundwater at SWMU 37. Based on review of the data, there do not appear to be impacts to the site from organic or inorganic contaminants.

Comment 40. Conclusions and Recommendations, page 92: While we agree that the data from the site support the conclusion for no further action, RWQCB staff will request that the soil and groundwater data be carried through and used in the evaluation of IR Site 11. The data from SWMU 37 fills a gap for the Wood Hogger area.

Response: The data from SWMU 37 is incorporated into the remedial investigation evaluation of the Wood Hogger site (Site 11).

<u>**SWMU 52 - Building IA-51, Steam Cleaning for Locomotives, Vehicles**</u>

Comment 41. Previous Investigations, page 109 and 110: Typo on page 109, third paragraph Site 17 should be Site 22.

UST investigation, last sentence: please confirm the date of UST removal; we believe it actually occurred in 1997, not 1996, as scheduled.

Response: The RFA confirmation study report will be revised as requested.

APPENDIX C

INLAND AREA ESTIMATED AMBIENT LIMIT CONCENTRATIONS
(48 Pages)

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN I)

Northern and Central California, Nevada, and Utah

Number N62474-88-D-5086

Contract Task Order 0303

Prepared For

DEPARTMENT OF THE NAVY

Ronald Yee, Remedial Project Manager

Engineering Field Activity West

Naval Facilities Engineering Command

San Bruno, California

TECHNICAL MEMORANDUM
ESTIMATION OF BACKGROUND METAL CONCENTRATIONS IN THE INLAND AREA SOILS

NAVAL WEAPONS STATION

CONCORD, CALIFORNIA

July 9, 1996

Prepared By

PRC ENVIRONMENTAL MANAGEMENT, INC.

135 Main Street, Suite 1800

San Francisco, CA 94105

(415) 543-4880

Lynn Valdivia, Project Manager

CONTENTS

FIGURES

Figure

FIGURES
(Continued)

FIGURES
(Continued)

TABLES

1.0 INTRODUCTION

This technical memorandum, prepared by PRC Environmental Management, Inc. (PRC), presents the approach for estimating background metal concentration limits in the Inland Area soils at Naval Weapons Station (WPNSTA) Concord, California (Figure 1). The estimated background concentration limits are intended for use in the baseline human health risk assessment, ecological risk assessment, and remedial investigation (RI) of WPNSTA Concord Installation Restoration Program sites.

The purpose of estimating background concentrations is to have a basis to assess whether the detection of a constituent indicates site-related contamination or may be attributed to naturally occurring or non-site-related anthropogenic sources. To evaluate the effects of site activities on the environment, constituent concentrations detected at a site are typically compared to the background concentrations, and the difference between the detected concentrations and background concentrations is assumed to be the impact of site activities.

Background metal levels were determined by collecting soil samples from each site, in areas considered unaffected by Navy operations or other industrial activities. The estimated background levels of metals in soils will be used to identify contaminants of potential concern at the sites.

This report is organized into the following sections. Section 2.0 discusses the conceptual model that summarizes the Inland Area geology and describes the rationale for using two separate groups of sites in determining metal background levels. Section 3.0 describes background sampling in the Inland Area sites. Section 4.0 explains the statistical procedures that were used to estimate background concentration levels of metals in soil. The results of the estimation are summarized in Section 5.0 and Tables 1 and 2.

2.0 CONCEPTUAL MODEL

The conceptual model developed for this task is a generalized representation of soil conditions based on published materials and the examination of boring logs from the Inland Area sites. Additionally, this model is used to substantiate the evaluation of the metals background levels for two different groups of sites.

WPNSTA Concord is the major naval transshipment facility on the west coast and is located in the north-central portion of Contra Costa County, California, approximately 30 miles from San Francisco. The facility, which encompasses approximately 13,000 acres, is bounded by Suisun Bay to the north and by the city of Concord to the south and west (Figure 1). Currently, the facility contains three main separate holdings: the Tidal Area, the Inland Area, and a radiography facility in Pittsburg, California. The Inland Area, which is separated from the Tidal Area by a range of hills not owned by the Navy, encompasses approximately 6,200 acres.

The regional geologic features include several north-trending fault systems that divide Contra Costa County into large blocks of rocks. Up-thrown blocks form the hills and down-thrown blocks form broad lowlands floored with thick, unconsolidated, Pleistocene-age deposits eroded from the up-thrown blocks.

The geology of the Inland Area is shown in Figure 2. Consolidated Tertiary rock formations are exposed along the eastern edge of the Inland Area in the Los Medanos Hills (Dibblee 1981). These rock formations are composed of interbedded units of sandstone, siltstone, and shale. The adjacent low-lying flatlands are covered by a veneer of younger Quaternary alluvium overlying basement rocks at depth. Older alluvium outcrops in the middle of the Inland Area in a north plunging anticline. Both younger and older alluvium consist of beds of sandy, silty, and clayey deposits. Silty and clayey deposits appear to predominate.

At the Inland Area sites, the uppermost several feet of soil from top to bottom are composed of coarse-grained sands and gravels grading to silty, sandy clay and to a more cohesive clay at a depth of over 10 feet. From depths of 10 to over 100 feet, the profile is largely undifferentiated sands and gravels interfingered with more than 10-foot-thick layers of silty clays.

Shallow sediments in the Inland Area have either alluvial/estuarine origin or represent materials eroded and deposited in the vicinity of Los Medanos Hills (colluvial deposits). Based on that, two groups of sites were initially identified. First group included Sites 13 and 22; Sites 17 and 24A formed a second group. Site 27, which is not discussed in this document because of no soil samples for metals were collected for this site, is likely to be included in the second group of sites. The shallow deposits that underlie the Sites 13 and 22 were formed in the alluvial depositional environment. The shallow deposits underlying the Site 17 and especially Site 24A more likely consist of the erosional remnants of bedrock from adjacent Los

Medanos Hills. The soil boring logs did not show a significant difference in lithology between the two groups of sites. However, it was assumed that these two groups of sites would differ because the sediments underlying these sites seem to be composed of different mineralized source materials.

To help to decide whether the evaluation of metals background levels should be performed separately for each group of sites, the soil metals data from all the four Inland Area sites were analyzed. Specifically, the histograms and probability plots of data sets for individual metals were prepared. The data sets contained the analytical results from background sampling locations of the four sites. For this analysis, metals detectable in all soil analyses were used. The concentrations of some metals (particularly, chromium, manganese, and vanadium) displayed two distinct populations: one population corresponded to the data from Sites 17 and 24A, and another population was formed by the data from Sites 13 and 22. The concentrations of lead, nickel, and copper formed less distinct populations, but also corresponded well to the two groups of sites. Figure 3 provides an example on how the two populations of chromium concentrations were depicted by a histogram and a probability plot.

Based on these findings, background levels of metals in soils were estimated using two different data sets: (1) from Sites 13 and 22 and (2) from Sites 17 and 24A. The background sampling and estimation procedures are discussed in Sections 3.0 and 4.0, respectively.

3.0 BACKGROUND SAMPLING

The determination of background metal levels at Site 13 (the Burn Area), Site 22 (Building 7SH5), Site 17 (Building IA-24), and Site 24A (the Pistol Firing Range) began by identifying background sampling locations. The locations were chosen in areas topographically upgradient from each site and not affected by Navy operations or other industrial activities. The areas for background sampling were about 25 feet in width and traversed the length of each site. The locations of soil borings were determined using a stratified random approach. Each background area was divided into four areas of equal size. These areas were further divided into four subareas of equal size, and one of these subareas was randomly selected for sampling.

The process of estimating background metal concentrations must account for analytical results reported as nondetects. Similar to the treatment of nondetectable results in the risk assessment, a value of one-half the reported detection limit was substituted for each nondetect data point. For several metals, including antimony, beryllium, cadmium, and thallium nondetect results constitute a significant percentage (nearly 50 percent or more) of the data set. For molybdenum, selenium, and silver the entire data set consists of nondetected results (see Tables 1 and 2).

For graphical analysis of soil metal data, the probability plots and histograms were prepared with Geo-EAS geostatistical software (EPA 1991). The probability plot is a graph of the ranked variable values, plotted against their cumulative percentiles. The vertical axis is scaled in units of the variable (metal concentrations), and the horizontal axis is scaled in units of cumulative percent. If the normal probability plot is a straight line, it is evidence of underlying normal distribution. A straight line on a lognormal probability plot (for which the vertical axis is scaled in units of the logarithm of the metal concentrations) suggests that the lognormal distribution is a better model. The histogram provides a more detailed look at a data set, while presenting an overall shape of the data set distribution (that is, whether it is symmetrical or skewed and unimodal or polymodal). Figure 3 is an example of probability plots and histograms.

To evaluate whether it was necessary to transform a specific data set to logarithms to approximate a normal distribution or to aid in visualizing the data, summary statistics, including the mean, standard deviation, coefficient of variation, skewness, and kurtosis were calculated. In particular, the values of skewness and kurtosis were useful indicators of the need for data set transformation. The skewness coefficient sums the deviations from the mean raised to the third power and indicates the asymmetry of the data set distribution. A normal distribution has a skewness coefficient of 0. The kurtosis coefficient sums the deviations from the mean raised to the fourth power and indicates the peakedness of the data set distribution. A normal distribution has a kurtosis coefficient of 3.

The statistical means described above may be less efficient for small data sets, as is the case for a data set from Sites 17 and 24A. The preparation procedures for each metal concentrations data set were completed after excluding anomalously high or low values and testing the distribution as described in Section 4.2.

4.2 EXCLUSION OF OUTLIERS AND NORMALITY TESTING

In performing frequency distribution analysis, a few metal concentrations may be significantly greater or lower than the concentrations of the main population. These outliers can be initially identified on histograms and probability plots but are defined more rigorously as concentrations greater than 3 times the standard deviation from the mean (for normally or lognormally distributed data). The outliers were removed from the data sets to reduce their impact on the estimates of background levels. It should be noted that because the data points considered as anomalously high concentrations may also represent extreme values of actual background concentrations, their exclusion may lead to conservative (that is, low) estimates of ambient limits. The simultaneous exclusion of anomalously low or nondetect values from the data sets may partially compensate for this bias. Tables 1 and 2 provide information on the number of the data points excluded from each metal data set.

Among all the metals evaluated for each group of sites, only arsenic displayed a high variation. In four shallow samples from Site 22 borings 7SHSB13, 7SHSB14, 7SHSB21, and 7SHSB22 (at 0.5-foot and 1-foot depths) and one deep sample from boring 7SHSB22 (at 10.5-foot depth), the extreme arsenic concentrations ranged from 72.3 to 250 mg/kg. These anomalously high values were excluded from background data set as outliers.

After making final adjustments to the background data sets as described previously, a probability plot was prepared for each metal of interest to confirm the effectiveness of the preparation procedures and to proceed with estimation of background limits as described below.

4.3 ESTIMATION OF BACKGROUND METAL CONCENTRATION LIMITS

All metal data sets from naturally occurring soils at Sites 13 and 22 consisted of more than 20 and less than 50 values: thus, the upper limits of background concentrations for this group of sites were estimated using a nonparametric formula to calculate the $LCL_{80,95}$. For data sets from Sites 17 and 24A, a background concentration limit was estimated as maximum detected concentration for each individual metal.

A step-by-step procedure to determine the datum that corresponds to the calculated $LCL_{80,95}$ is discussed in detail below (Gilbert 1987).

Step 1. Rank the data from minimum to maximum to obtain the sample order statistics:

$$x_1 \leq x_2 \leq \ldots \leq x_k \ldots \leq x_n$$

Step 2. Calculate l:

$$l = p\,(n + 1) - Z_{1-\alpha}\sqrt{np(1 - p)}$$

Where

p = 0.95

α = 0.20 = significance level

n = number of values in the data set

$Z_{1-\alpha}$ = $Z_{0.80}$ = 0.845, as obtained from Table A-1 (Gilbert 1987)

The simplified formula is as follows:

$$l = 0.95\,(\,n + 1\,) - 0.184\sqrt{n}$$

Step 3. If the calculated l is an integer, then the $LCL_{80,95}$ is the lth largest datum (among the ranked concentrations) in the data set. If l is not an integer, estimate the $LCL_{80,95}$ by linear interpolation between the two concentrations closest to l.

5.0 SUMMARY OF FINDINGS

The background concentration limits in naturally occurring soils of two groups of sites (Sites 13, 22 and Sites 17, 24A) estimated for metals in soils as described in Section 4.0 are presented in Tables 1 and 2. The tables include EPA Region IX PRGs (EPA 1995) for comparison purposes. The estimated limits for arsenic and beryllium exceeded this criterion, as indicated in the tables by an asterisk.

Probability plots that support the estimations are shown on Figures 4 through 34. The plots include only the data points that remained in the data set after the exclusion of outliers; the number of data points used corresponds to the data set size column shown in Tables 1 and 2. The plots also provide summary statistics including the mean, standard deviation, coefficient of variation, skewness, and kurtosis. The population of nondetectable results is indicated on the plots as "ND" where significant. The type of underlying data set distribution (normal, lognormal, and nonparametric) is also noted. For some data sets with nonparametric distribution, the plots are given in logarithmic scale to facilitate their examination.

FIGURES

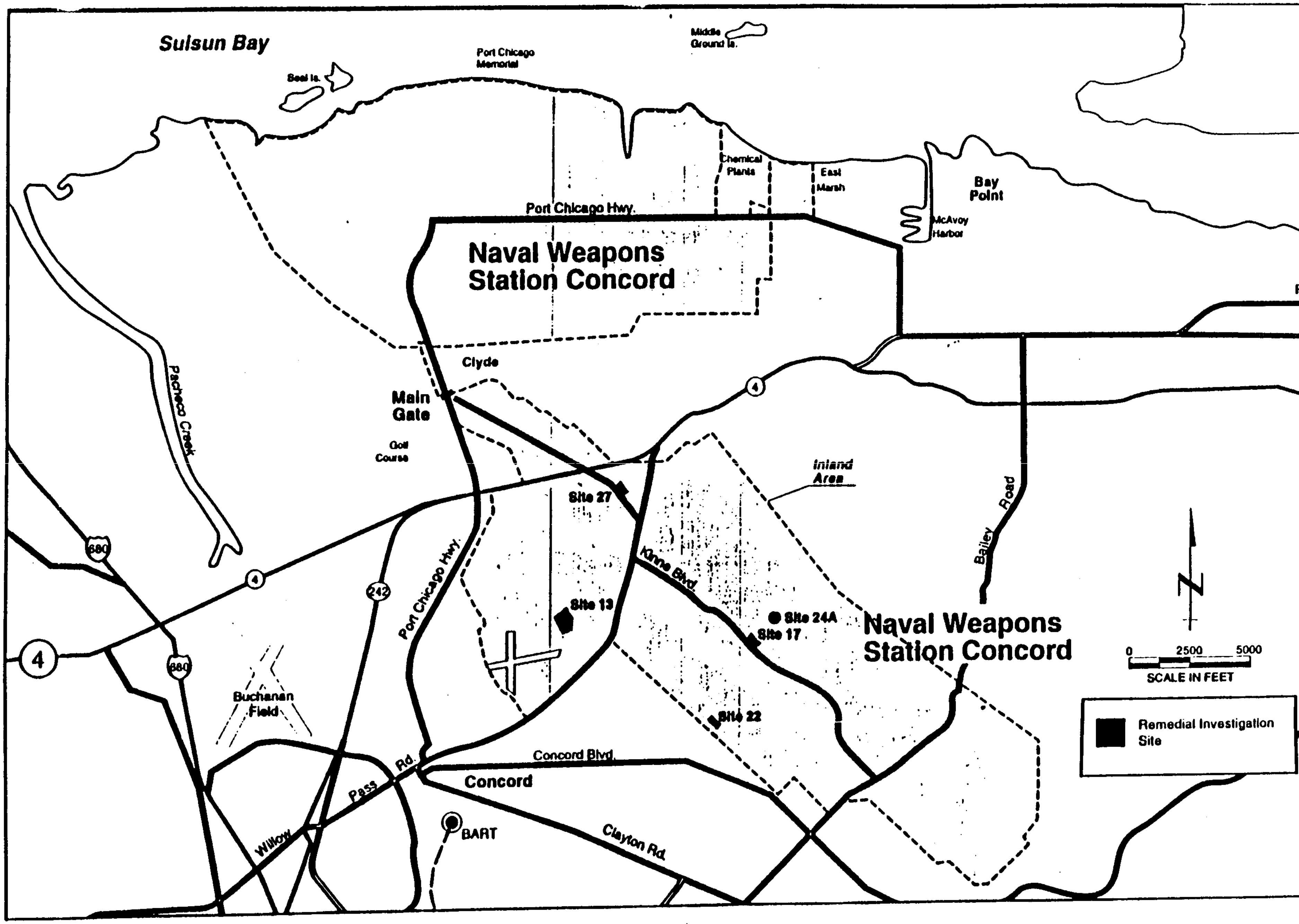
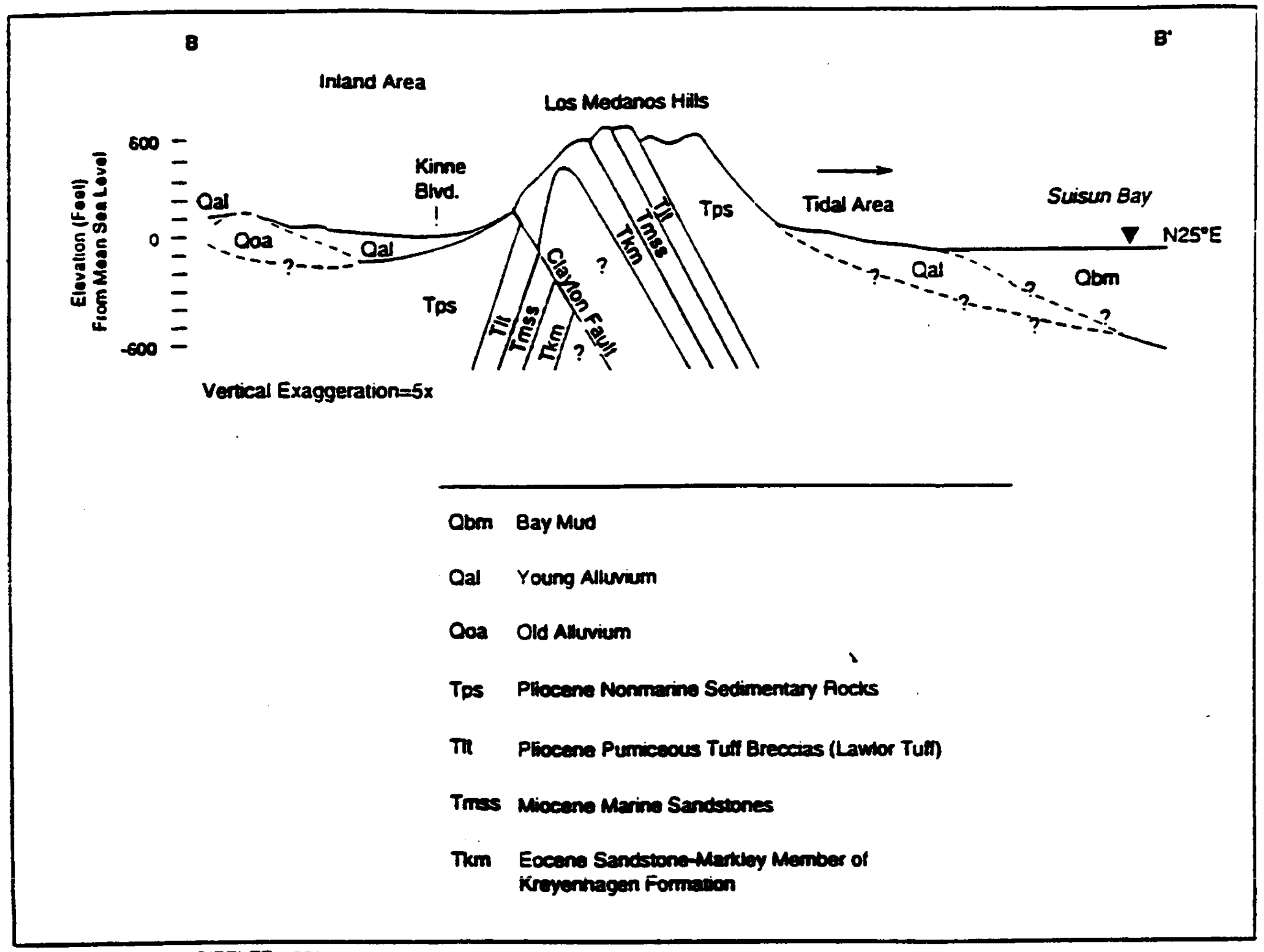
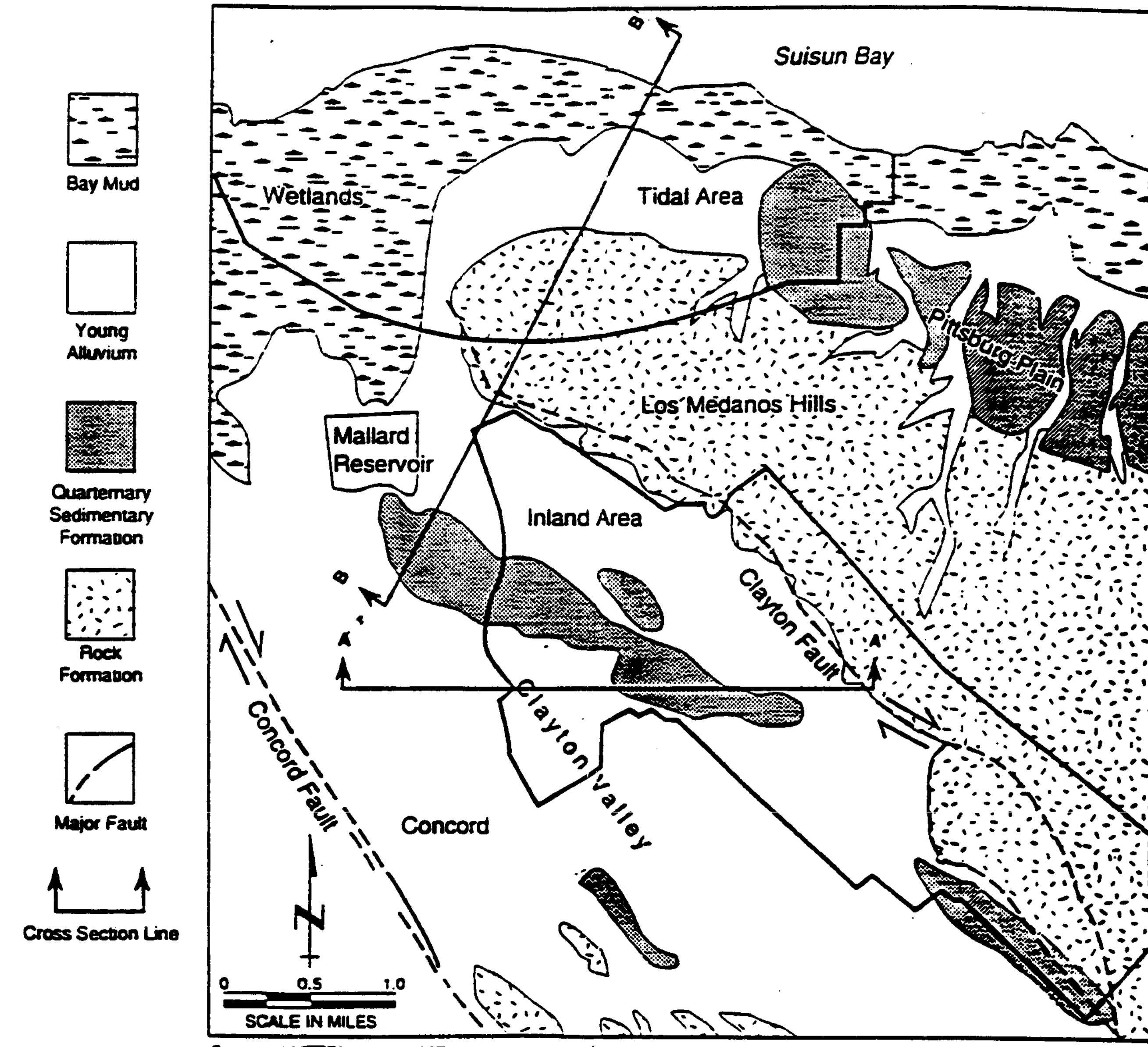


FIGURE 1
INLAND AREA INVESTIGATION SITES
NAVAL WEAPONS STATION CONCORD



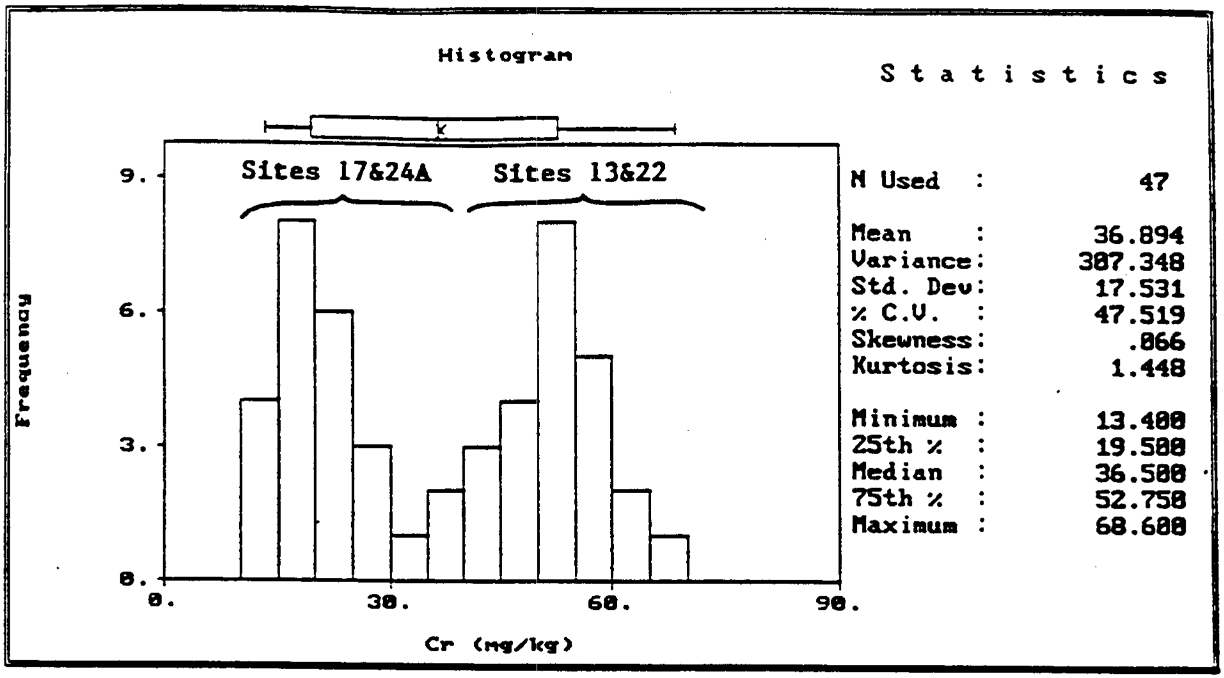
Source: Adapted from DIBBLEE, 1981

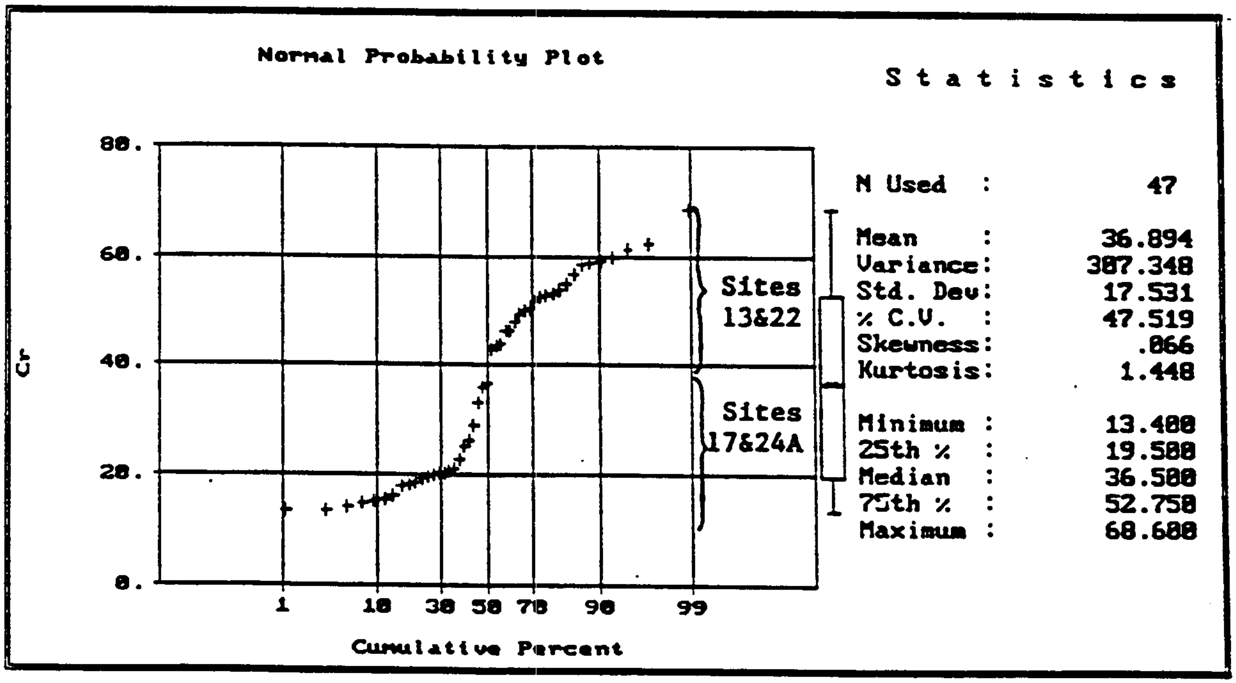


Source: LUTTON, et. al., 1987
DIBBLEE, 1980a,b,c, 1981

GEOLOGY OF WPNSTA CONCORD

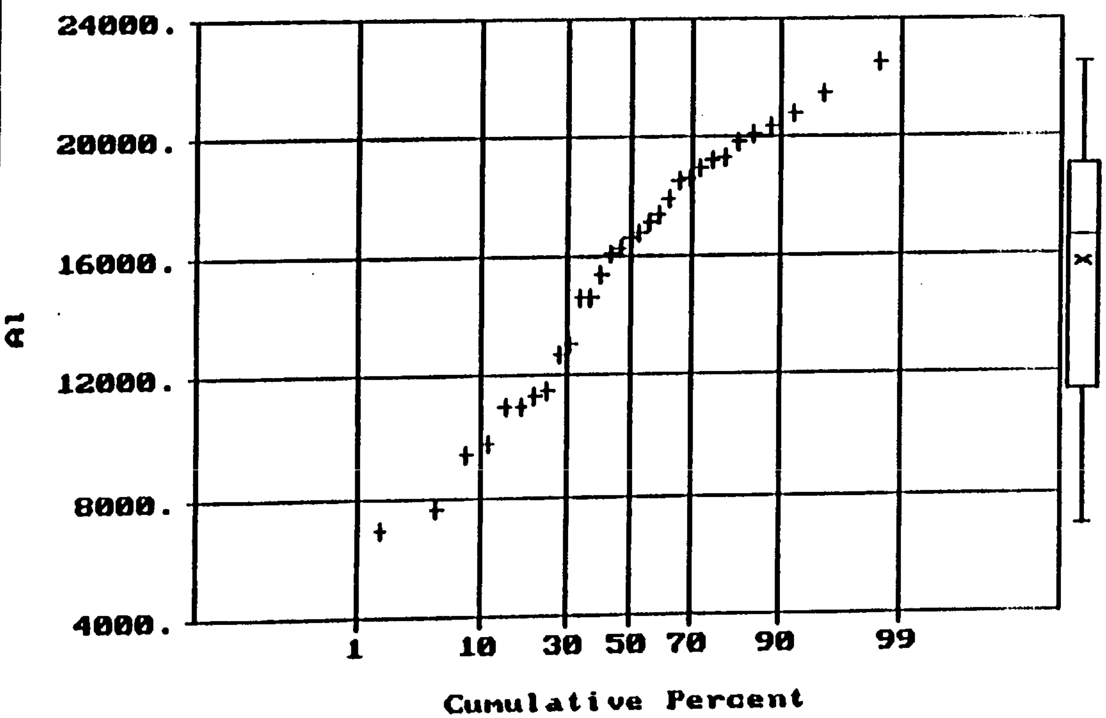
FIGURE 2





Notes: Both plots illustrate distribution of chromium concentrations in soils of Sites 13, 22, 17, and 24A. Two groups of concentrations, shown with brackets on the plots, indicate the difference between two groups of sites (13 and 22; 17 and 24A).

FIGURE 3
HISTOGRAM AND PROBABILITY PLOT OF CHROMIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13, 22, 17, AND 24A
NAVAL WEAPONS STATION CONCORD

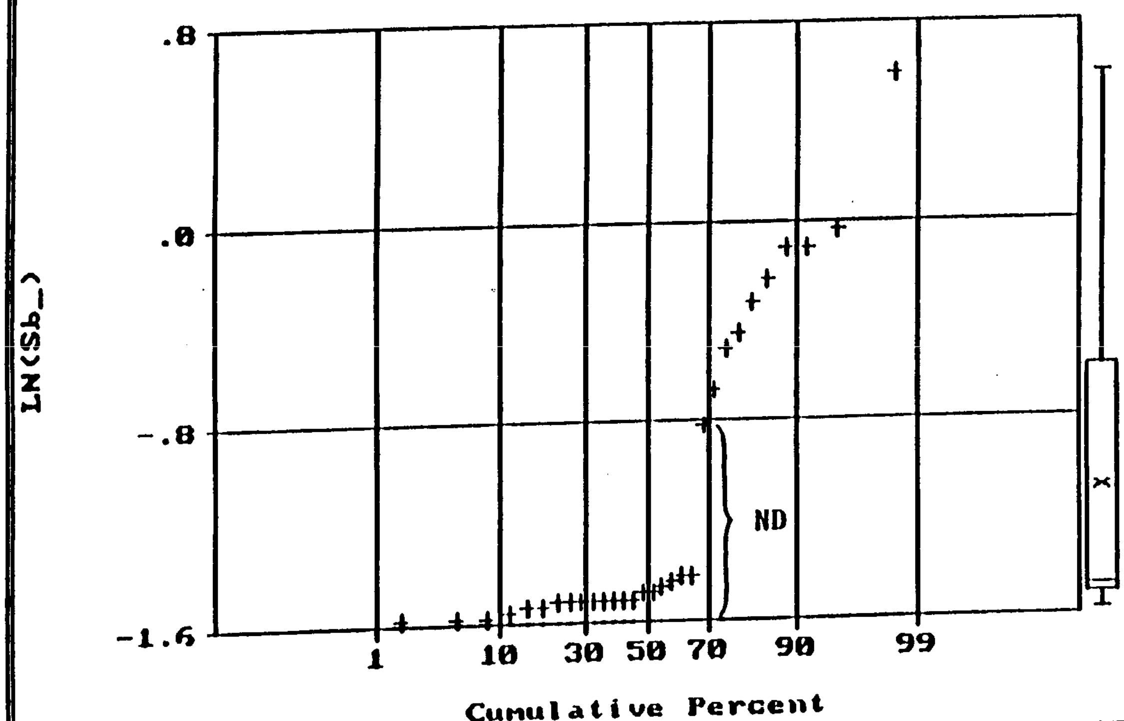


Statistics

N Used	:	31
Mean	:	15700.320
Variance	:	18152940.000
Std. Dev	:	4260.627
% C.V.	:	27.137
Skewness	:	-.435
Kurtosis	:	2.143
Minimum	:	6920.000
25th %	:	11450.000
Median	:	16600.000
75th %	:	19050.000
Maximum	:	22500.000

Note: The data set distribution is normal.

FIGURE 4
PROBABILITY PLOT OF BACKGROUND ALUMINUM CONCENTRATIONS IN SOILS OF THE INLAND AREA SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

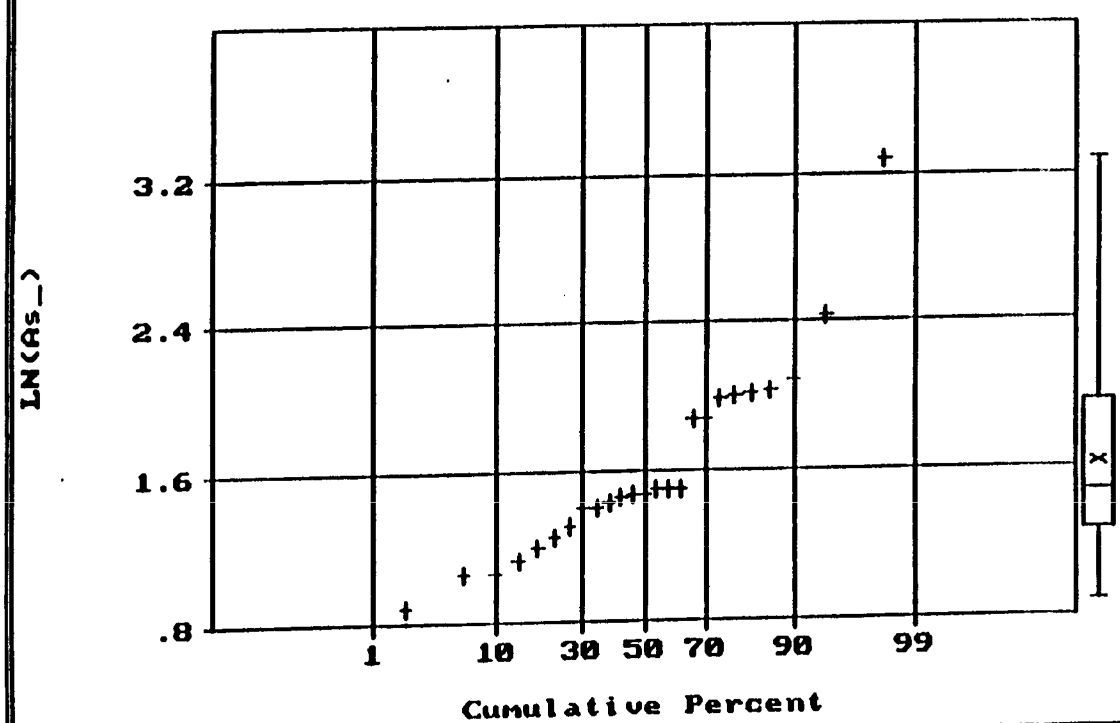


Statistics

N Used :	30
Mean :	-1.098
Variance:	.407
Std. Dev:	.638
% C.V. :	58.113
Skewness:	1.101
Kurtosis:	2.840
Minimum :	-1.585
25th % :	-1.514
Median :	-1.492
75th % :	-.592
Maximum :	.588

Note: The data set distribution is nonparametric.

FIGURE 5
PROBABILITY PLOT OF BACKGROUND ANTIMONY
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

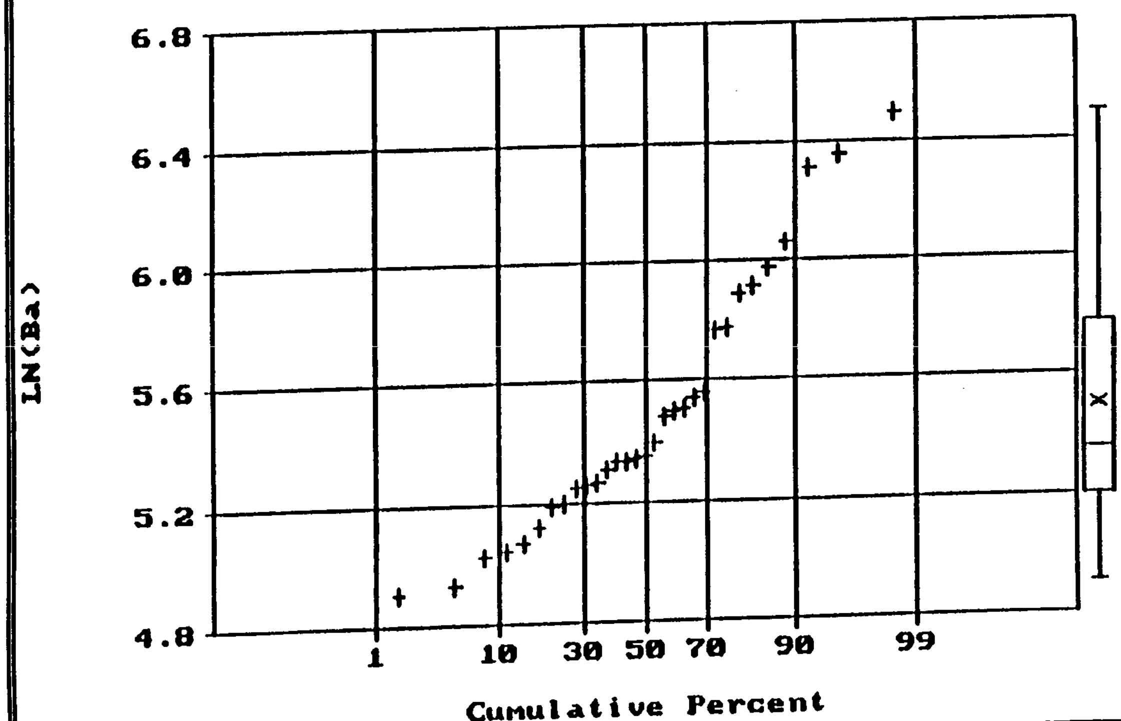


Statistics

N Used :	25
Mean :	1.626
Variance:	.267
Std. Dev:	.516
% C.V. :	31.755
Skewness:	1.326
Kurtosis:	5.314
Minimum :	.875
25th % :	1.267
Median :	1.482
75th % :	1.959
Maximum :	3.281

Note: The data set distribution is nonparametric.

FIGURE 6
PROBABILITY PLOT OF BACKGROUND ARSENIC
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

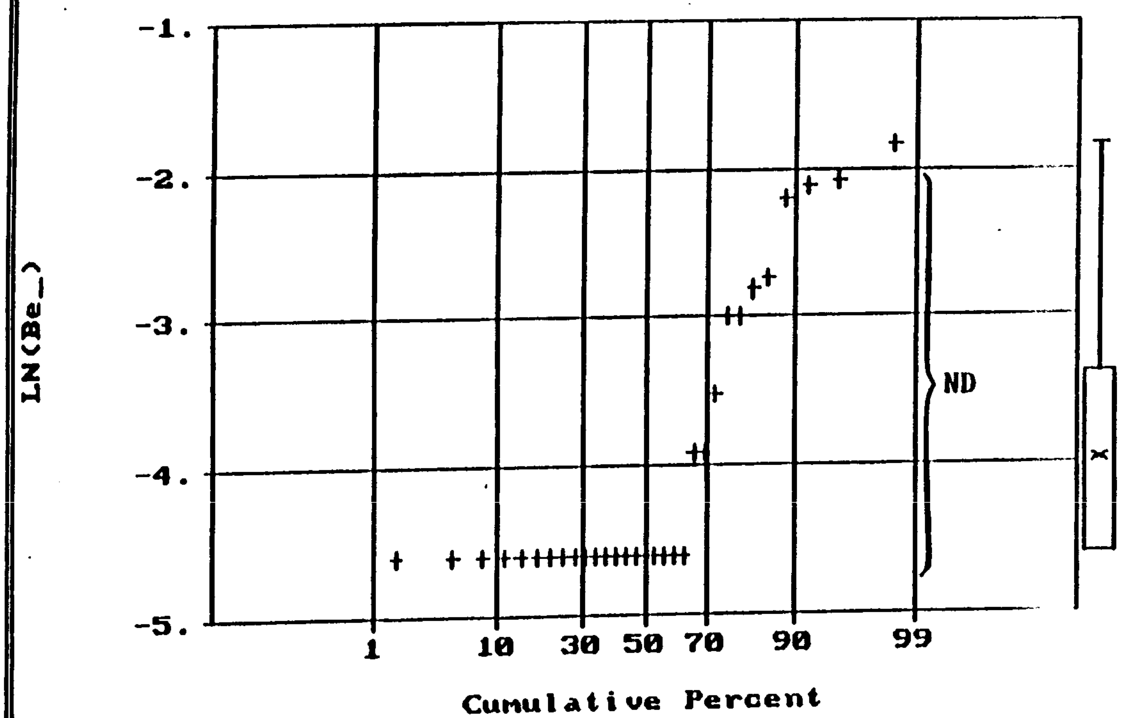


Statistics

N Used :	31
Mean :	5.499
Variance:	.179
Std. Dev:	.423
% C.V. :	7.691
Skewness:	.785
Kurtosis:	2.784
Minimum :	4.905
25th % :	5.196
Median :	5.357
75th % :	5.773
Maximum :	6.491

Note: The data set distribution is nonparametric.

FIGURE 7
PROBABILITY PLOT OF BACKGROUND BARIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

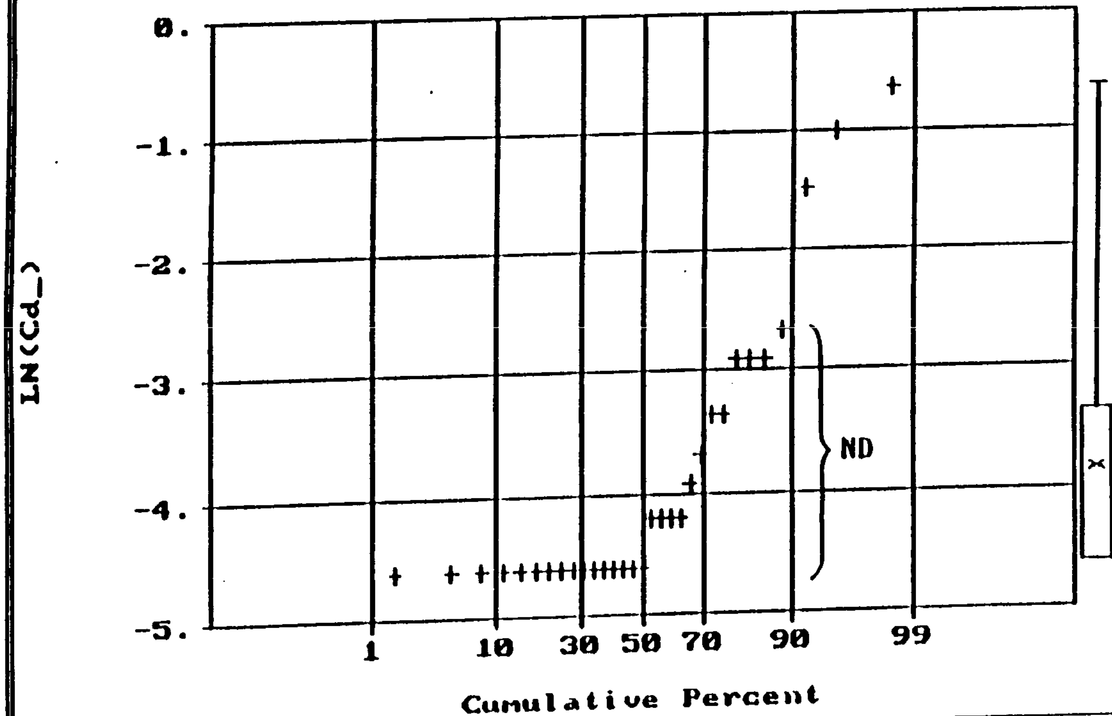


S t a t i s t i c s

N Used :	31
Mean :	-3.975
Variance:	.924
Std. Dev:	.961
% C.V. :	24.188
Skewness:	1.105
Kurtosis:	2.612
Minimum :	-4.605
25th % :	-4.605
Median :	-4.605
75th % :	-3.379
Maximum :	-1.833

Note: The data set distribution is nonparametric.

FIGURE 8
PROBABILITY PLOT OF BACKGROUND BERYLLIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

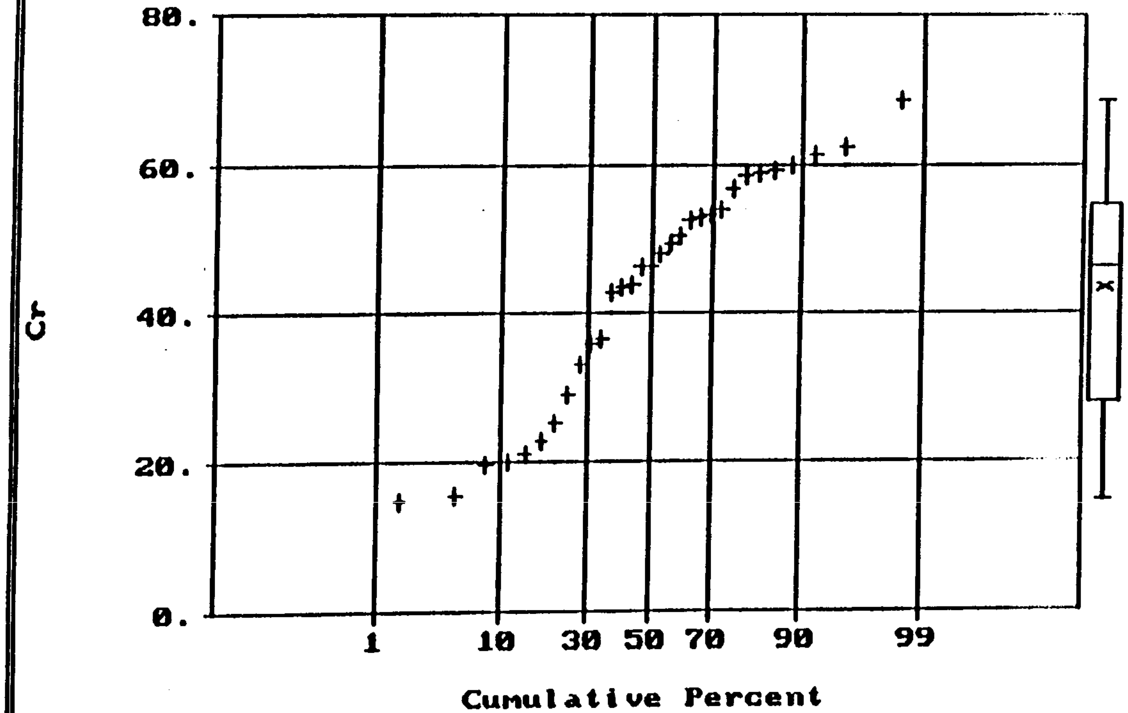


Statistics

N Used :	31
Mean :	-3.847
Variance:	1.281
Std. Dev:	1.132
% C.V. :	29.419
Skewness:	1.568
Kurtosis:	4.503
Minimum :	-4.605
25th % :	-4.605
Median :	-4.605
75th % :	-3.352
Maximum :	-.635

Note: The data set distribution is nonparametric.

FIGURE 9
PROBABILITY PLOT OF BACKGROUND CADMIUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

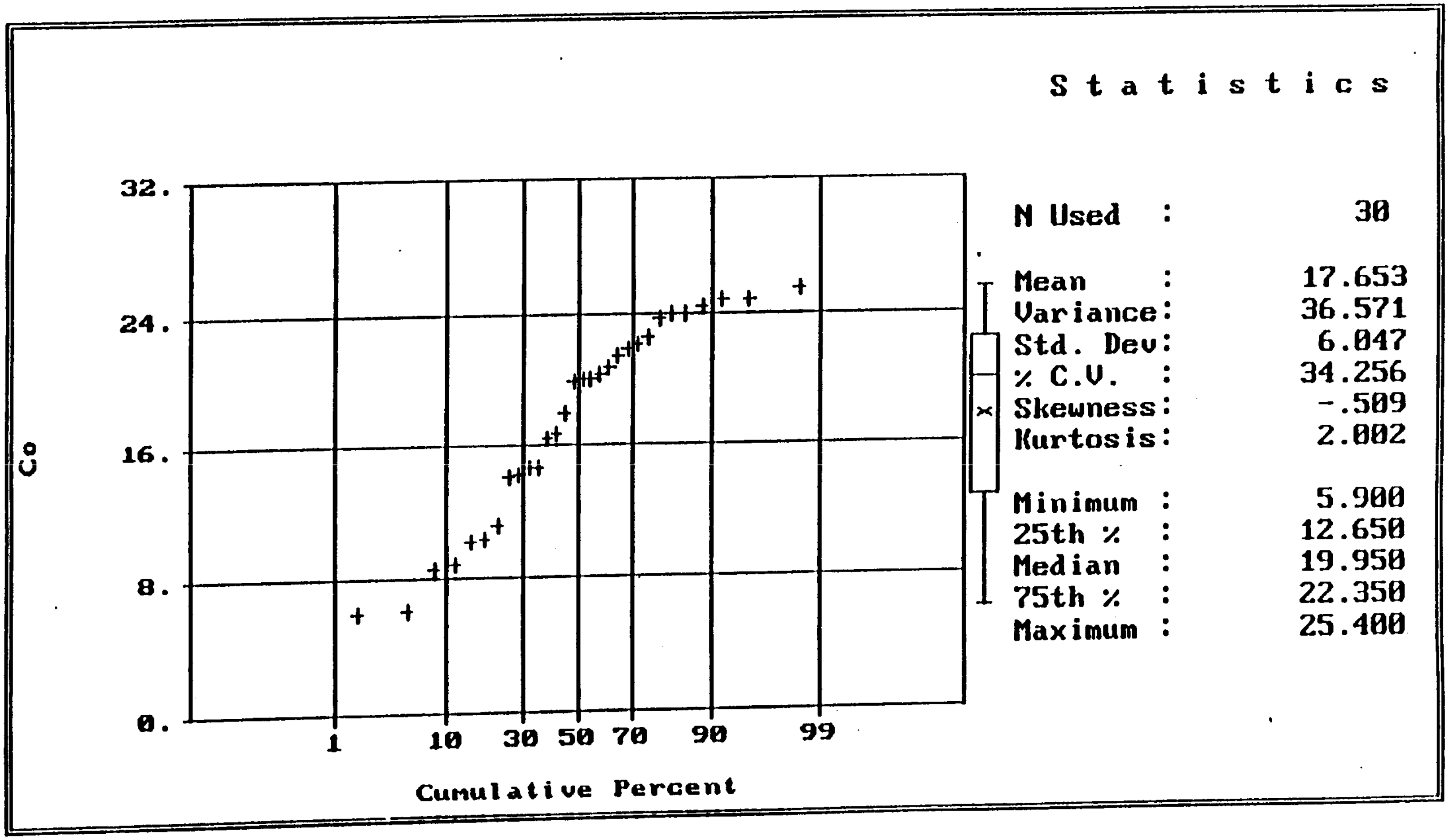


Statistics

N Used :	31
Mean :	43.303
Variance:	245.051
Std. Dev:	15.654
% C.V. :	36.150
Skewness:	-.437
Kurtosis:	1.957
Minimum :	14.900
25th % :	28.050
Median :	46.400
75th % :	54.500
Maximum :	68.600

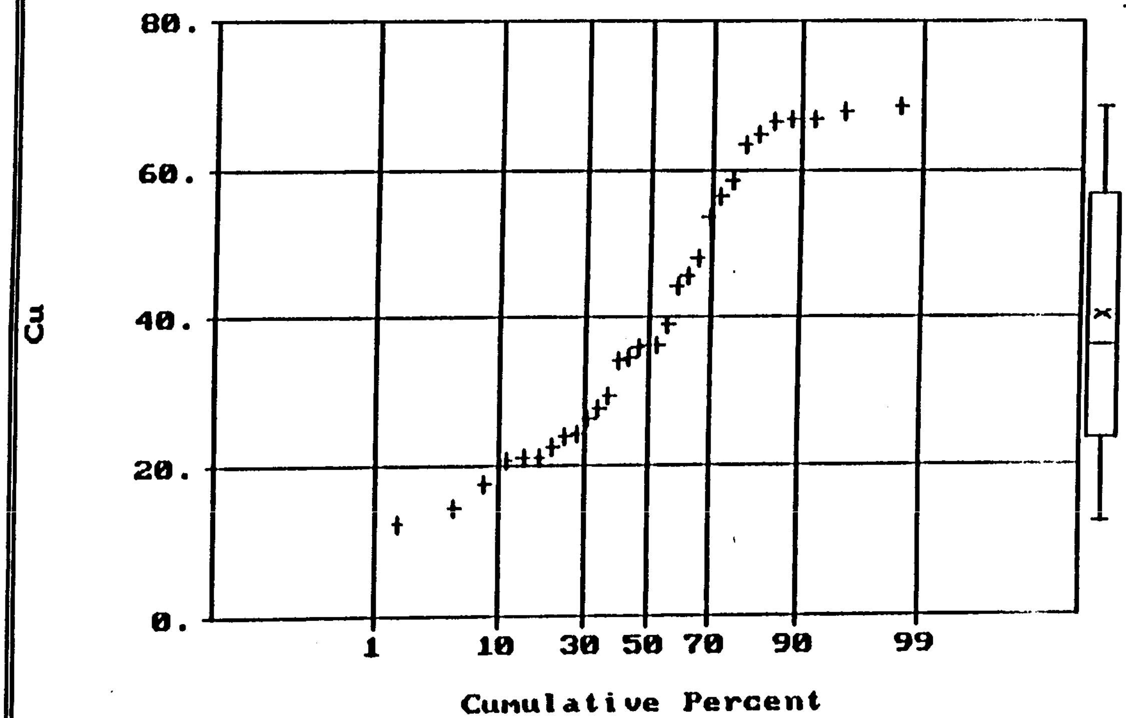
Note: The data set distribution is nonparametric.

FIGURE 10
PROBABILITY PLOT OF BACKGROUND CHROMIUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD



Note: The data set distribution is nonparametric.

FIGURE 11
PROBABILITY PLOT OF BACKGROUND COBALT CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

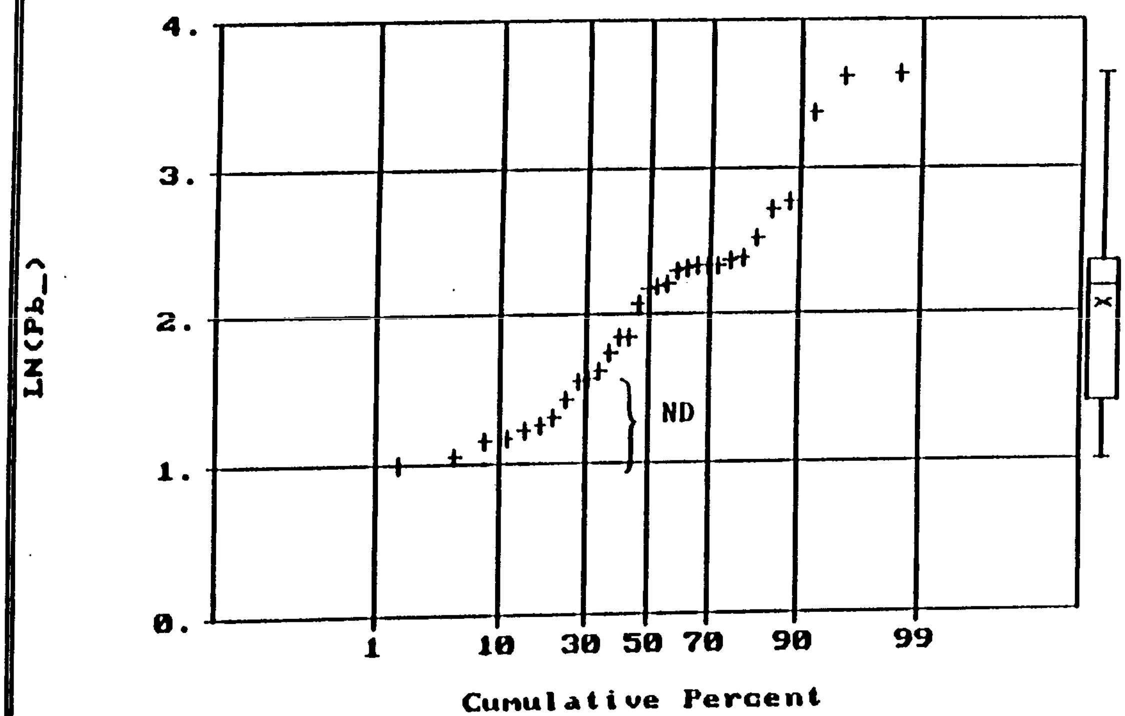


Statistics

N Used	:	31
Mean	:	40.261
Variance	:	339.307
Std. Dev	:	18.420
% C.V.	:	45.752
Skewness	:	.251
Kurtosis	:	1.672
Minimum	:	12.400
25th %	:	23.375
Median	:	36.300
75th %	:	56.800
Maximum	:	68.600

Note: The data set distribution is normal.

FIGURE 12
PROBABILITY PLOT OF BACKGROUND COPPER
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

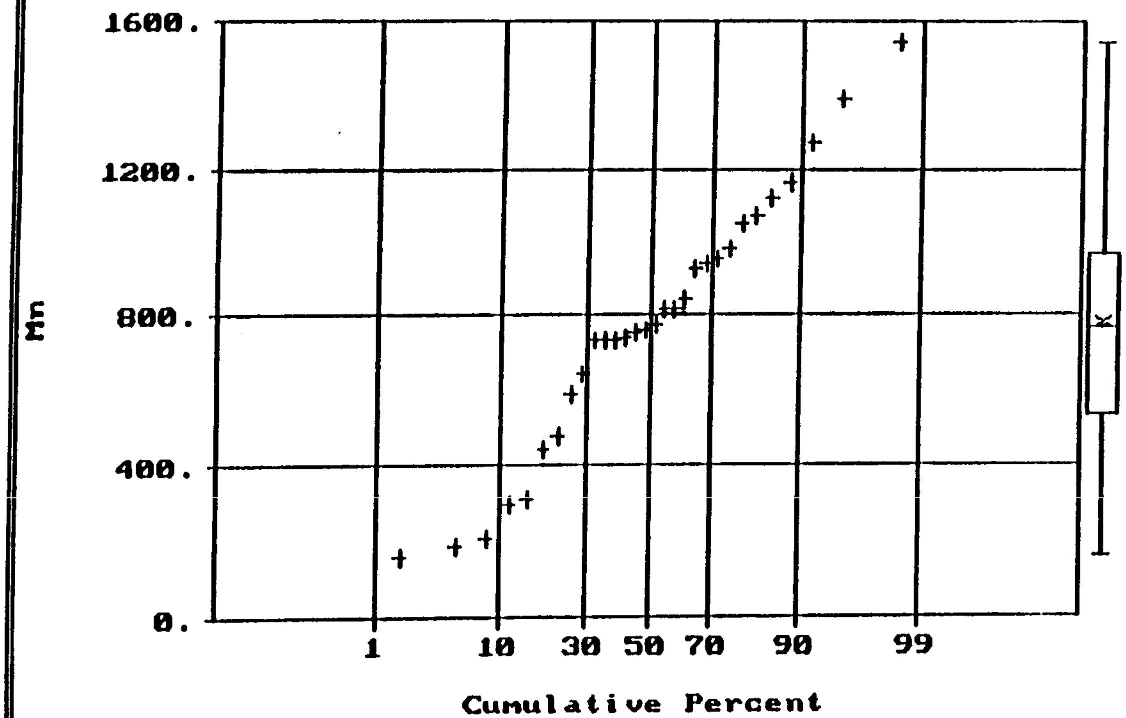


Statistics

N Used	:	31
Mean	:	2.047
Variance	:	.509
Std. Dev	:	.713
% C.V.	:	34.849
Skewness	:	.520
Kurtosis	:	2.773
Minimum	:	.993
25th %	:	1.403
Median	:	2.175
75th %	:	2.349
Maximum	:	3.630

Note: The data set distribution is lognormal.

FIGURE 13
PROBABILITY PLOT OF BACKGROUND LEAD
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

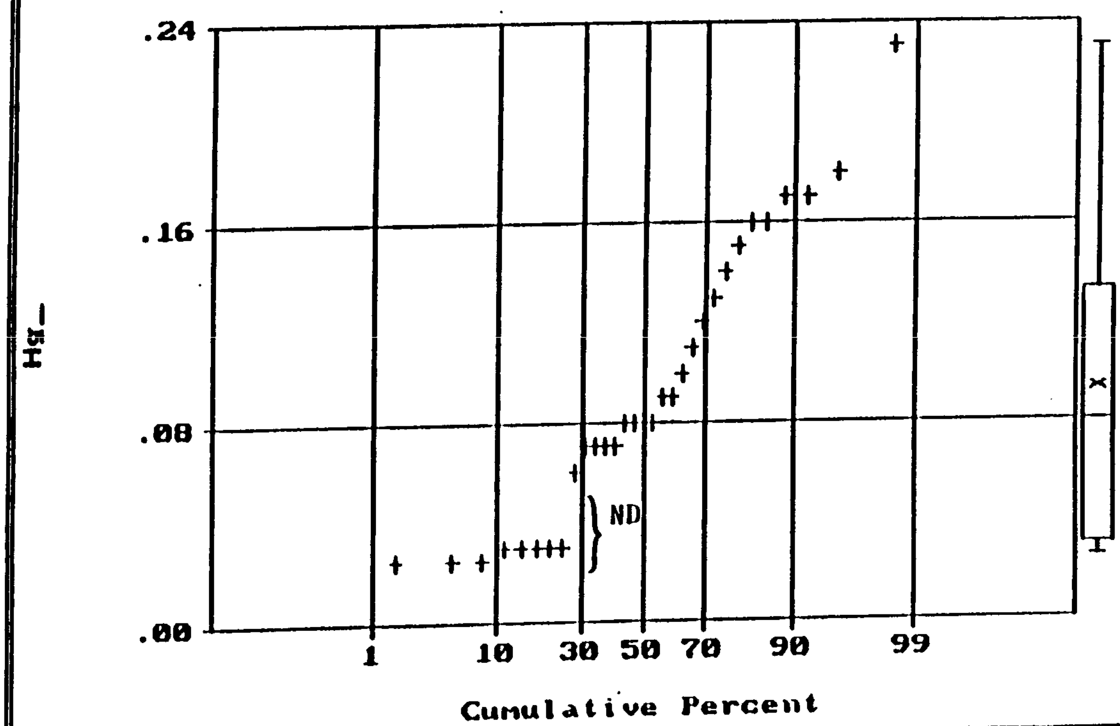


Statistics

N Used	:	30
Mean	:	780.667
Variance	:	121586.900
Std. Dev	:	348.693
% C.V.	:	44.666
Skewness	:	.004
Kurtosis	:	2.626
Minimum	:	161.000
25th %	:	530.000
Median	:	768.500
75th %	:	969.000
Maximum	:	1540.000

Note: The data set distribution is normal.

FIGURE 14
PROBABILITY PLOT OF BACKGROUND MANGANESE CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

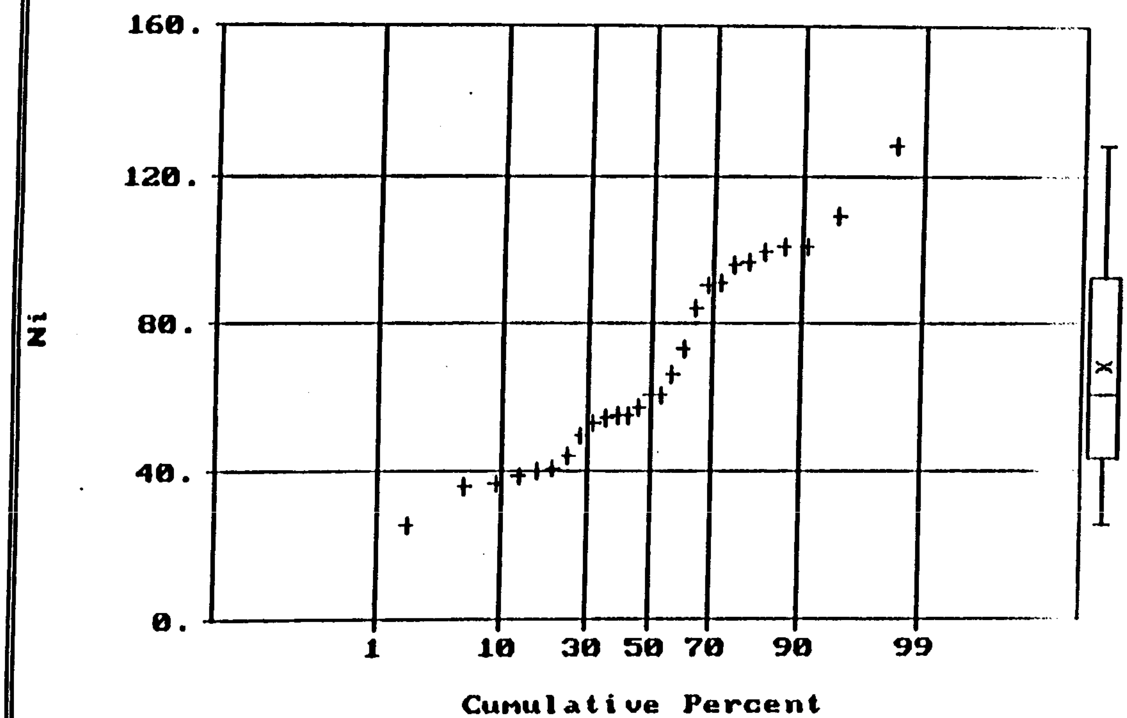


Statistics

N Used :	31
Mean :	.093
Variance:	.003
Std. Dev:	.056
% C.V. :	59.725
Skewness:	.553
Kurtosis:	2.464
Minimum :	.025
25th % :	.030
Median :	.080
75th % :	.132
Maximum :	.230

Note: The data set distribution is nonparametric.

FIGURE 15
PROBABILITY PLOT OF BACKGROUND MERCURY
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

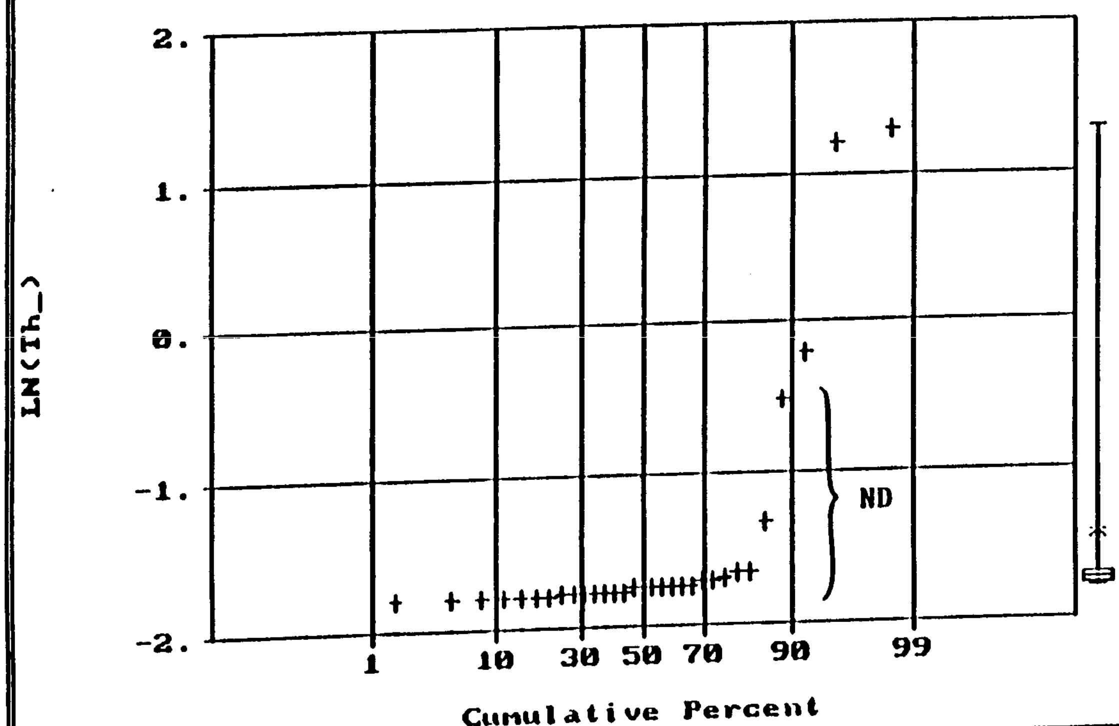


Statistics

N Used :	27
Mean :	68.356
Variance:	752.422
Std. Dev:	27.430
% C.V. :	40.129
Skewness:	.380
Kurtosis:	2.028
Minimum :	25.200
25th % :	43.500
Median :	61.000
75th % :	92.575
Maximum :	128.000

Note: The data set distribution is normal.

FIGURE 16
PROBABILITY PLOT OF BACKGROUND NICKEL
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

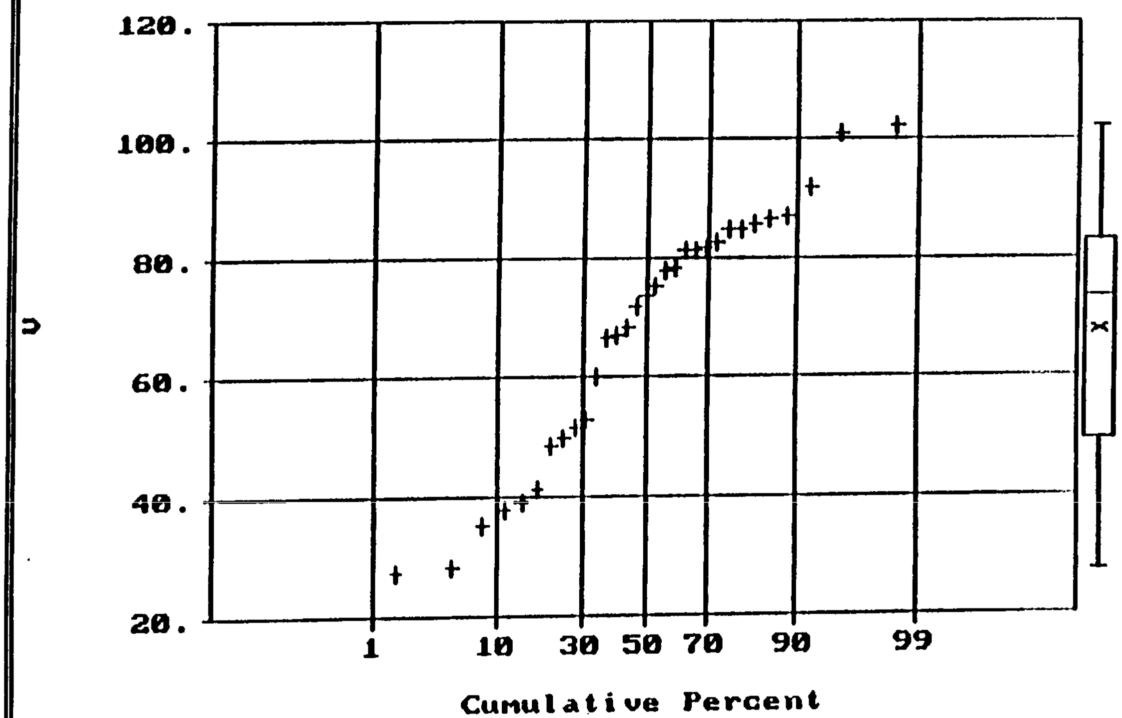


S t a t i s t i c s

N Used :	31
Mean :	-1.459
Variance:	.645
Std. Dev:	.803
% C.V. :	55.054
Skewness:	2.702
Kurtosis:	9.048
Minimum :	-1.802
25th % :	-1.779
Median :	-1.743
75th % :	-1.708
Maximum :	1.281

Note: The data set distribution is nonparametric.

FIGURE 17
PROBABILITY PLOT OF BACKGROUND THALLIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

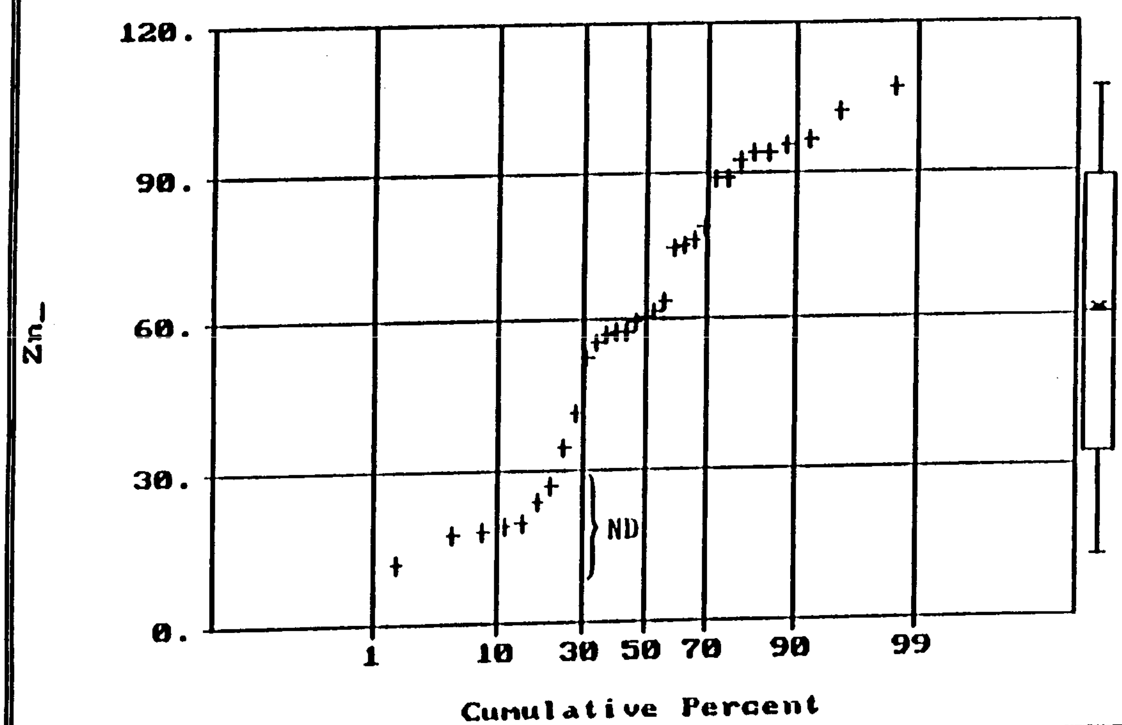


Statistics

N Used :	31
Mean :	67.774
Variance:	451.219
Std. Dev:	21.242
% C.V. :	31.342
Skewness:	-.425
Kurtosis:	2.076
Minimum :	27.400
25th % :	49.400
Median :	73.600
75th % :	83.125
Maximum :	102.000

Note: The data set distribution is normal.

FIGURE 18
PROBABILITY PLOT OF BACKGROUND VANADIUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

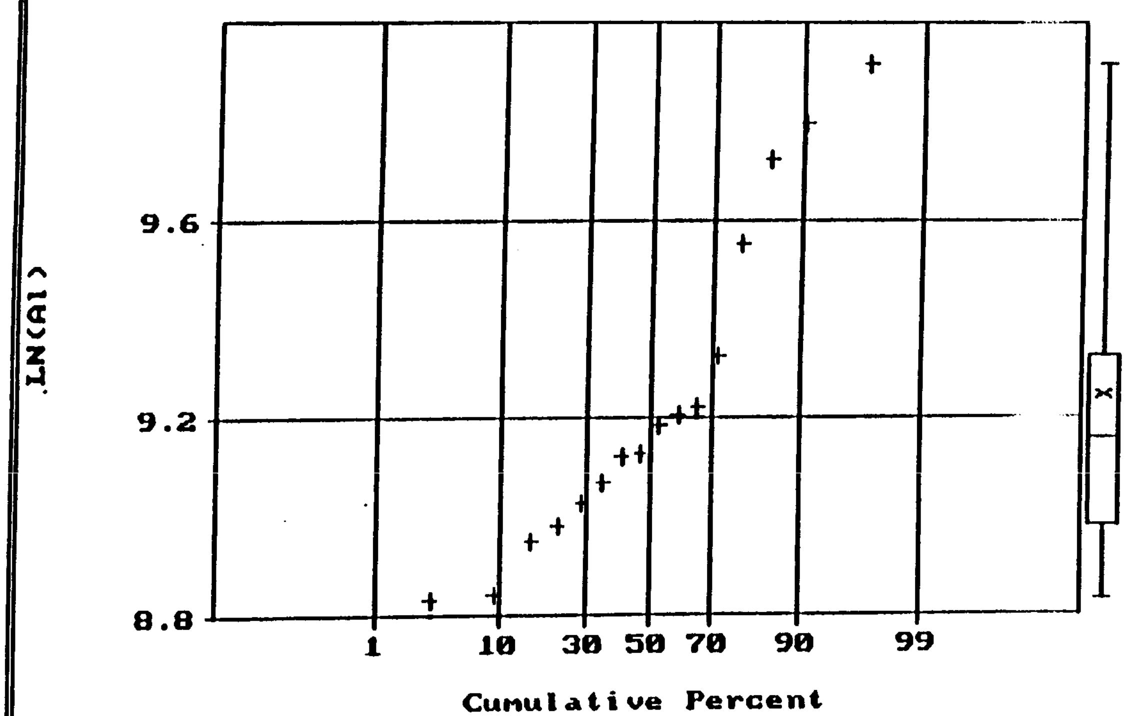


Statistics

N Used :	31
Mean :	61.352
Variance:	844.157
Std. Dev:	29.054
% C.V. :	47.357
Skewness:	-.219
Kurtosis:	1.843
Minimum :	11.800
25th % :	32.575
Median :	60.500
75th % :	88.600
Maximum :	107.000

Note: The data set distribution is nonparametric.

FIGURE 19
PROBABILITY PLOT OF BACKGROUND ZINC
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 13 AND 22
NAVAL WEAPONS STATION CONCORD

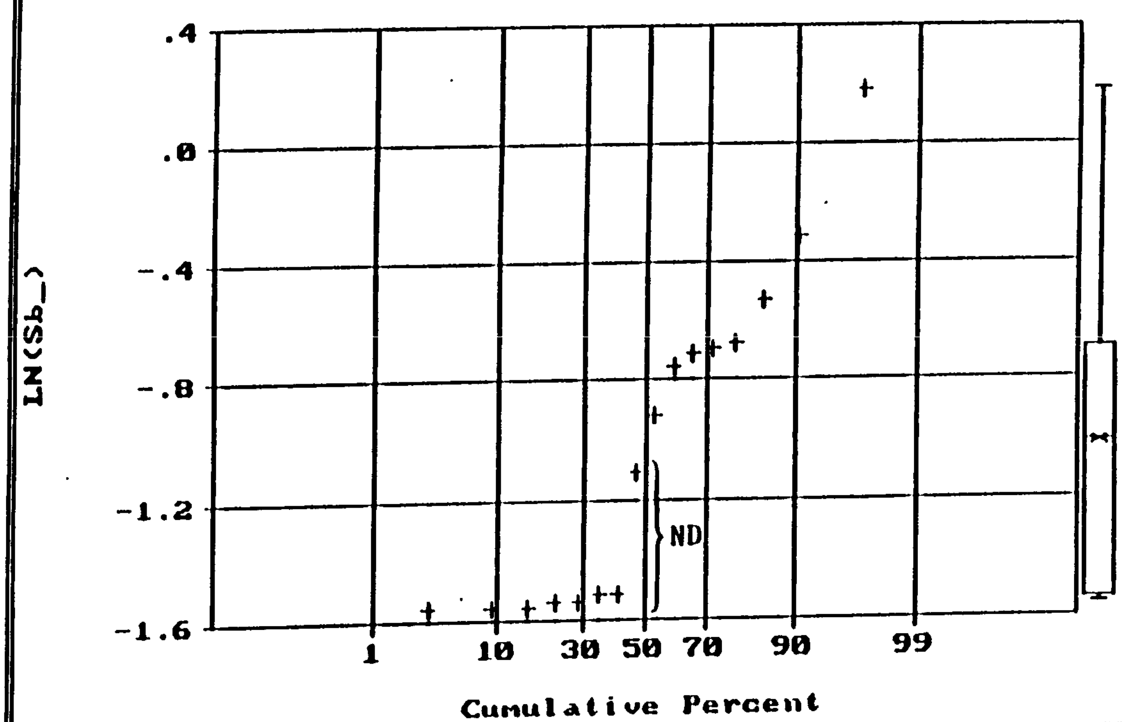


S t a t i s t i c s

N Used :	16
Mean :	9.241
Variance:	.113
Std. Dev:	.336
% C.V. :	3.634
Skewness:	.768
Kurtosis:	2.424
Minimum :	8.829
25th % :	8.981
Median :	9.155
75th % :	9.324
Maximum :	9.913

Note: The data set distribution is lognormal.

FIGURE 20
PROBABILITY PLOT OF BACKGROUND ALUMINUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD



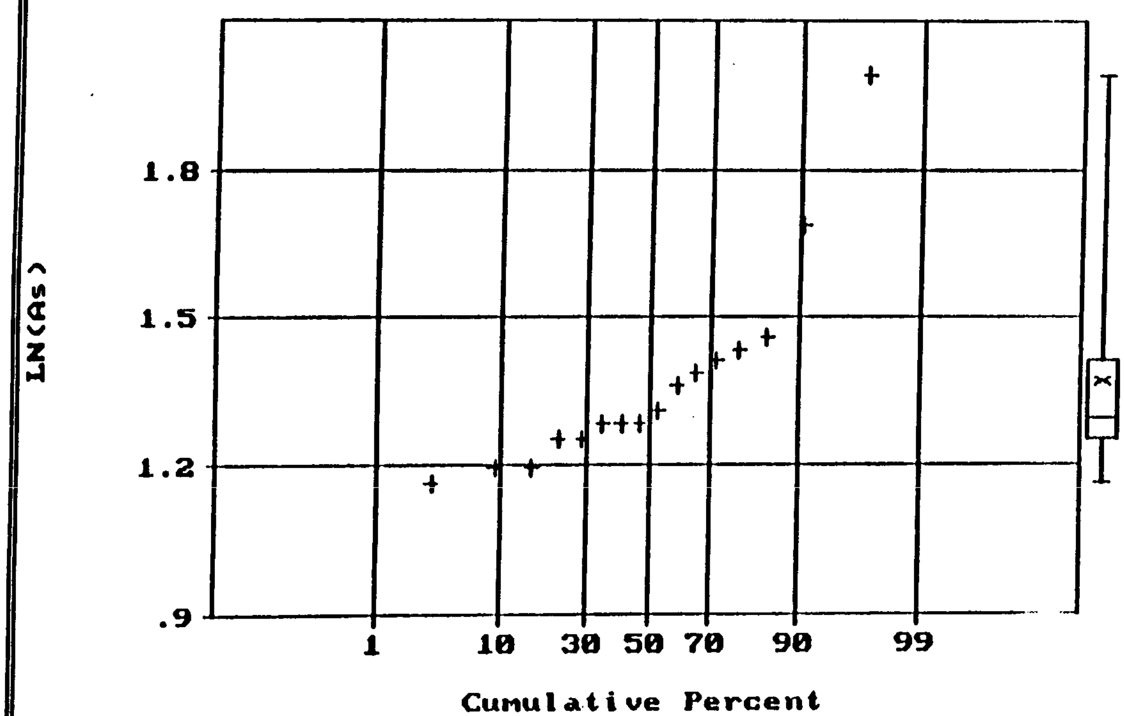
Statistics

N Used :	16
Mean :	-1.019
Variance:	.300
Std. Dev:	.547
% C.V. :	53.722
Skewness:	.557
Kurtosis:	2.335
Minimum :	-1.561
25th % :	-1.537
Median :	-1.012
75th % :	-.693
Maximum :	.182

Note: The data set distribution is nonparametric.

FIGURE 21
PROBABILITY PLOT OF BACKGROUND ANTIMONY CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

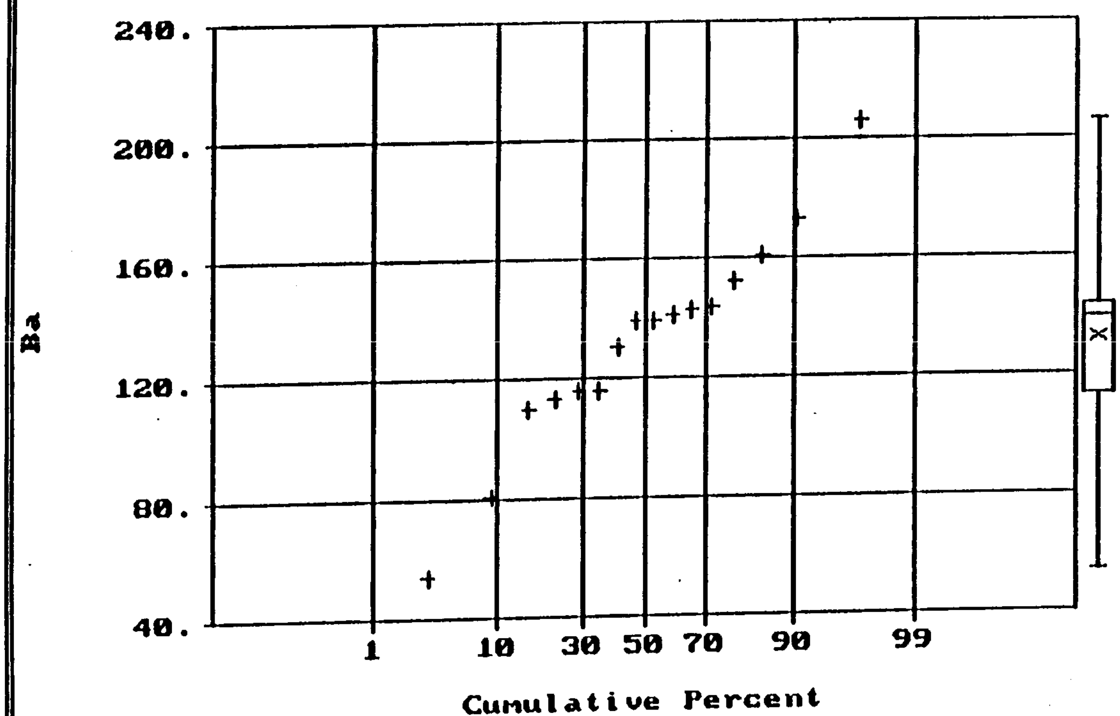
Statistics



N Used	:	16
Mean	:	1.371
Variance	:	.044
Std. Dev	:	.209
% C.V.	:	15.253
Skewness	:	1.819
Kurtosis	:	5.927
Minimum	:	1.163
25th %	:	1.253
Median	:	1.295
75th %	:	1.411
Maximum	:	1.988

Note: The data set distribution is nonparametric.

FIGURE 22
PROBABILITY PLOT OF BACKGROUND ARSENIC
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

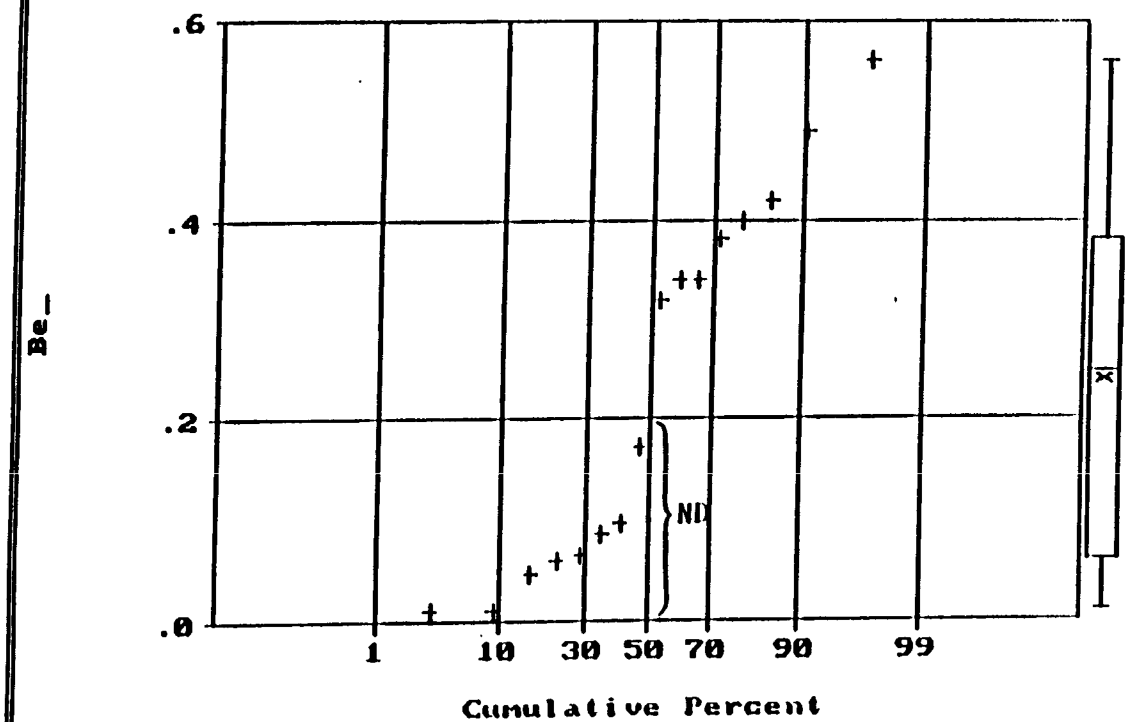


Statistics

N Used :	16
Mean :	132.375
Variance:	1267.483
Std. Dev:	35.602
% C.V. :	26.895
Skewness:	-.239
Kurtosis:	3.517
Minimum :	53.500
25th % :	113.000
Median :	139.000
75th % :	144.000
Maximum :	206.000

Note: The data set distribution is normal.

FIGURE 23
PROBABILITY PLOT OF BACKGROUND BARIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

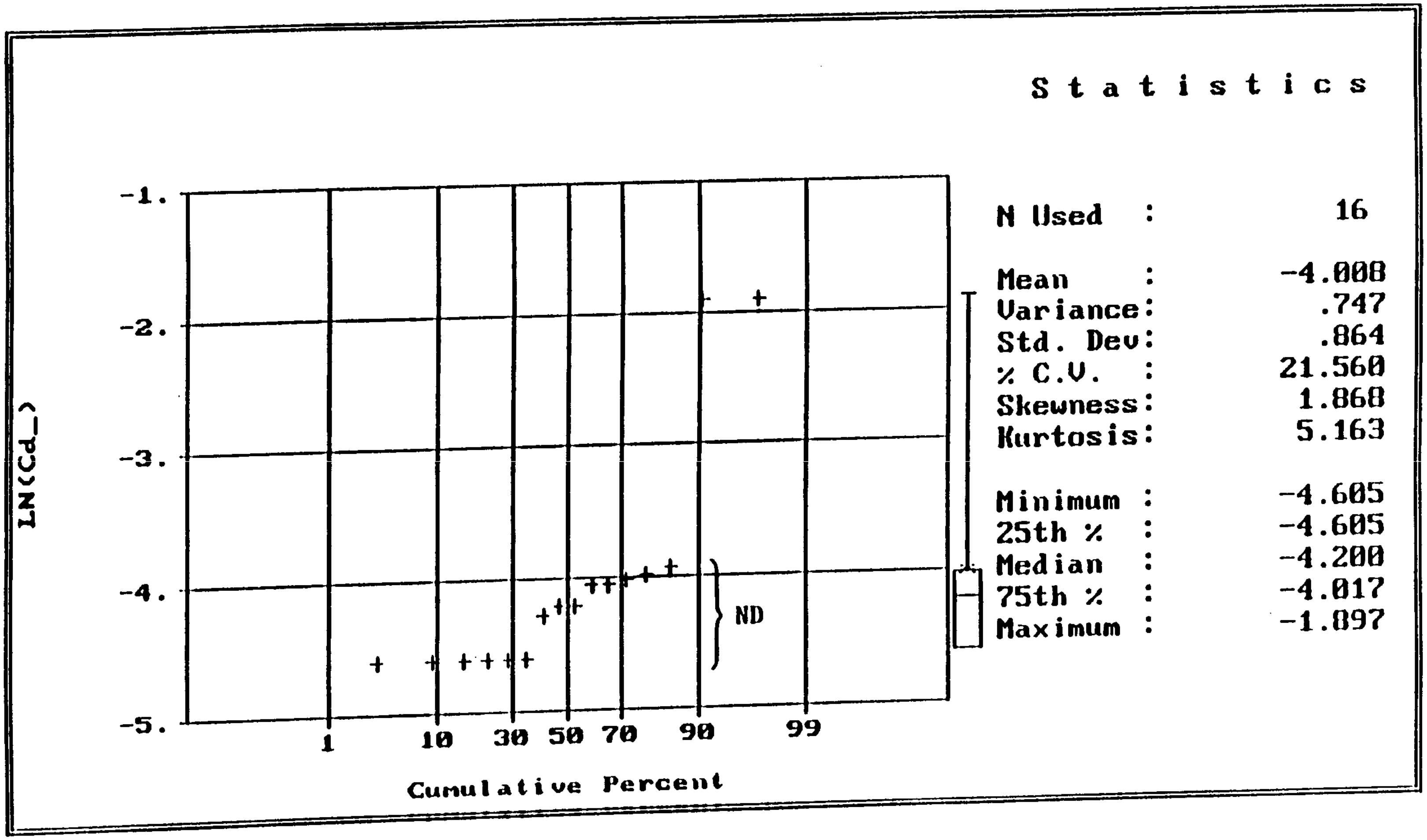


Statistics

N Used	:	16
Mean	:	.237
Variance	:	.035
Std. Dev	:	.187
% C.V.	:	79.020
Skewness	:	.194
Kurtosis	:	1.564
Minimum	:	.010
25th %	:	.060
Median	:	.245
75th %	:	.300
Maximum	:	.560

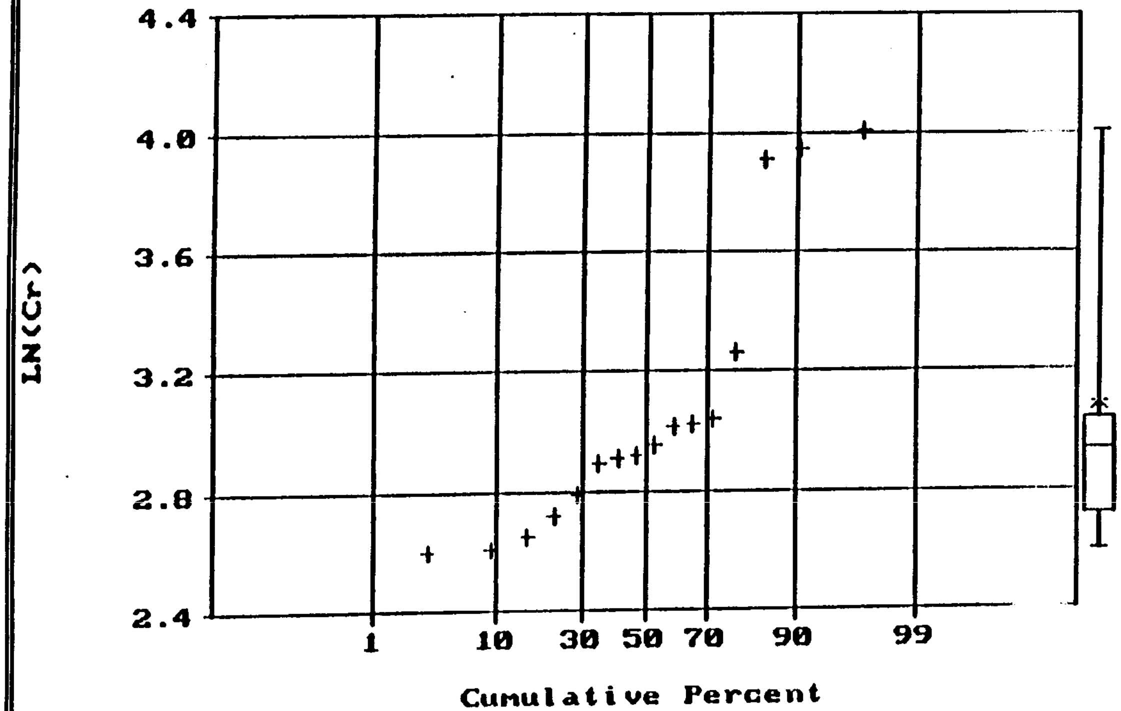
Note: The data set distribution is normal.

FIGURE 24
PROBABILITY PLOT OF BACKGROUND BERYLLIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD



Note: The data set distribution is nonparametric.

FIGURE 25
PROBABILITY PLOT OF BACKGROUND CADMIUM
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD



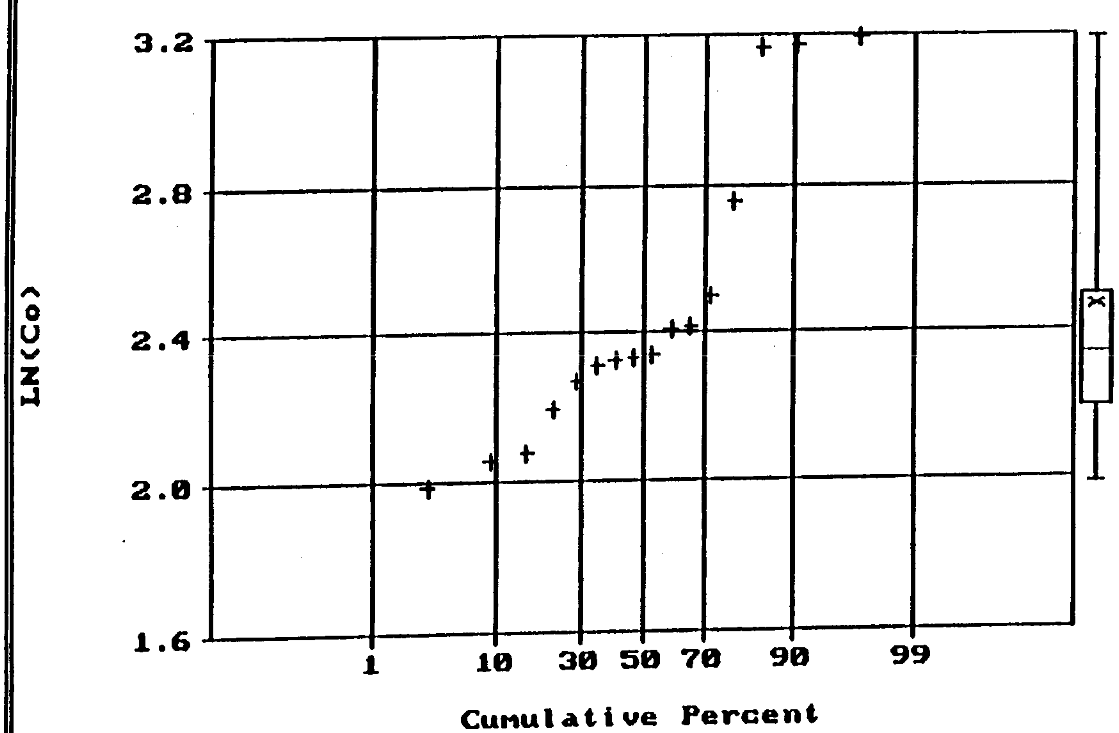
Statistics

N Used	:	16
Mean	:	3.078
Variance	:	.222
Std. Dev	:	.471
% C.V.	:	15.305
Skewness	:	1.109
Kurtosis	:	2.874
Minimum	:	2.595
25th %	:	2.715
Median	:	2.936
75th %	:	3.035
Maximum	:	4.007

Note: The data set distribution is nonparametric.

FIGURE 26
PROBABILITY PLOT OF BACKGROUND CHROMIUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

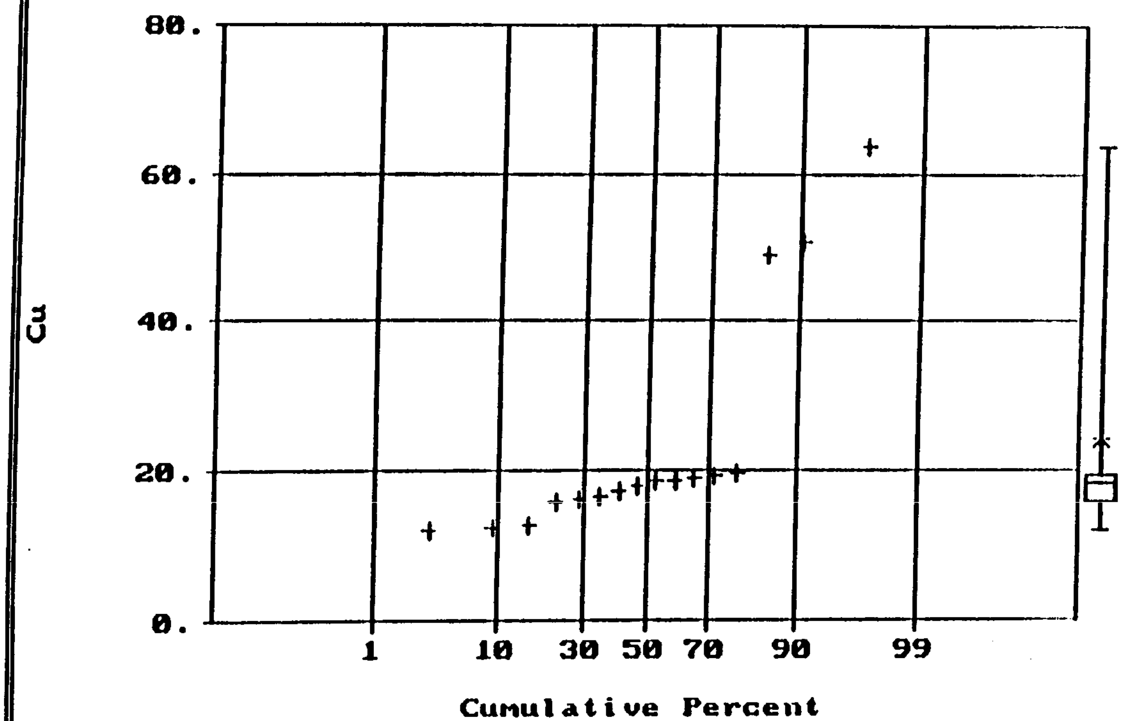
Statistics



N Used	:	16
Mean	:	2.469
Variance	:	.156
Std. Dev	:	.395
% C.V.	:	15.996
Skewness	:	.898
Kurtosis	:	2.555
Minimum	:	1.988
25th %	:	2.197
Median	:	2.337
75th %	:	2.501
Maximum	:	3.195

Note: The data set distribution is nonparametric.

FIGURE 27
PROBABILITY PLOT OF BACKGROUND COBALT
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

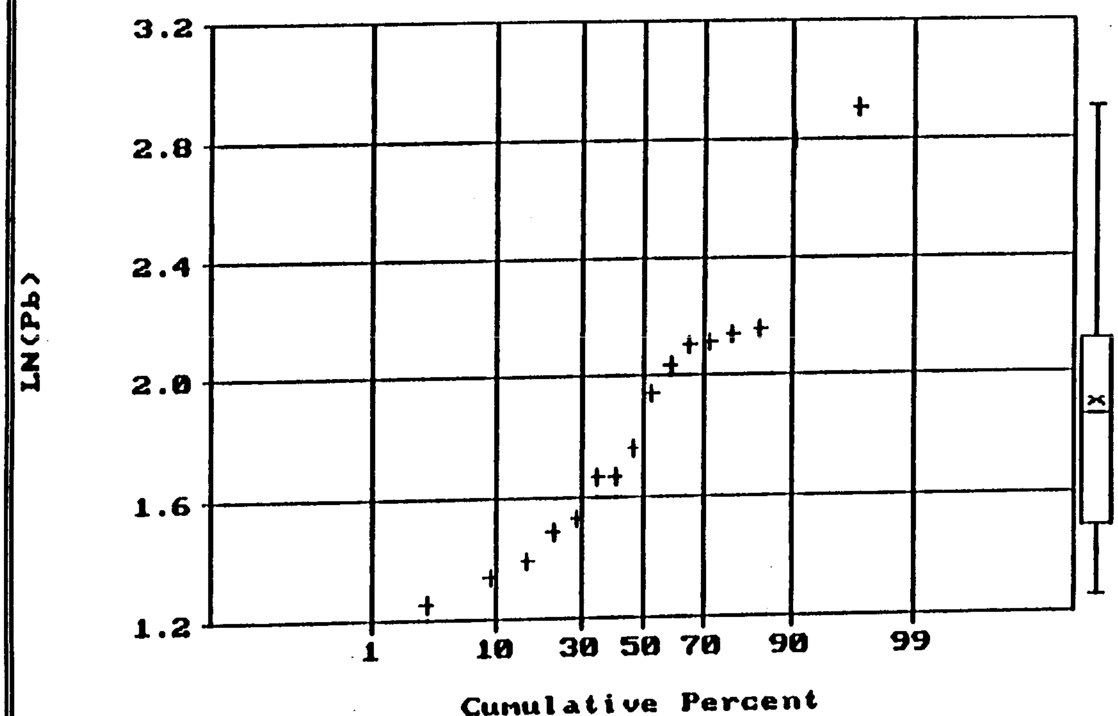


Statistics

N Used :	16
Mean :	23.731
Variance:	248.184
Std. Dev:	15.754
% C.V. :	66.384
Skewness:	1.648
Kurtosis:	4.128
Minimum :	12.100
25th % :	15.900
Median :	18.150
75th % :	19.200
Maximum :	63.700

Note: The data set distribution is nonparametric.

FIGURE 28
PROBABILITY PLOT OF BACKGROUND COPPER CONCENTRATIONS IN SOILS OF THE INLAND AREA SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

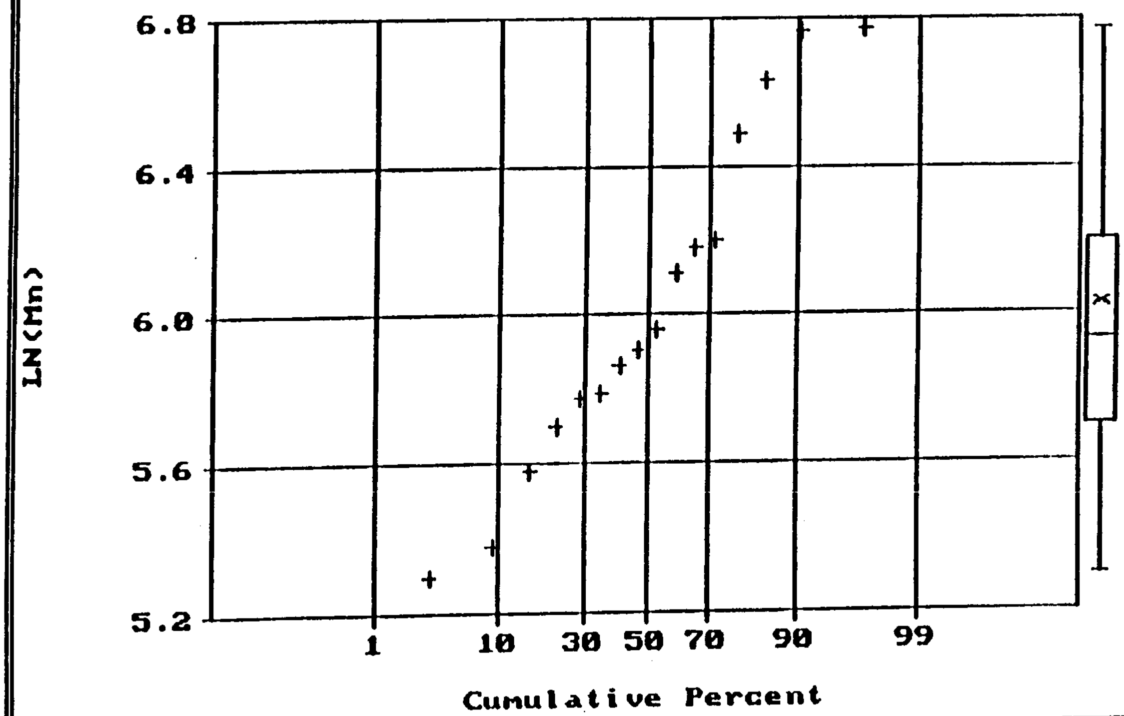


S t a t i s t i c s

N Used :	16
Mean :	1.893
Variance:	.233
Std. Dev:	.482
% C.V. :	25.483
Skewness:	.684
Kurtosis:	2.760
Minimum :	1.253
25th % :	1.482
Median :	1.852
75th % :	2.116
Maximum :	2.901

Note: The data set distribution is lognormal.

FIGURE 29
PROBABILITY PLOT OF BACKGROUND LEAD
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

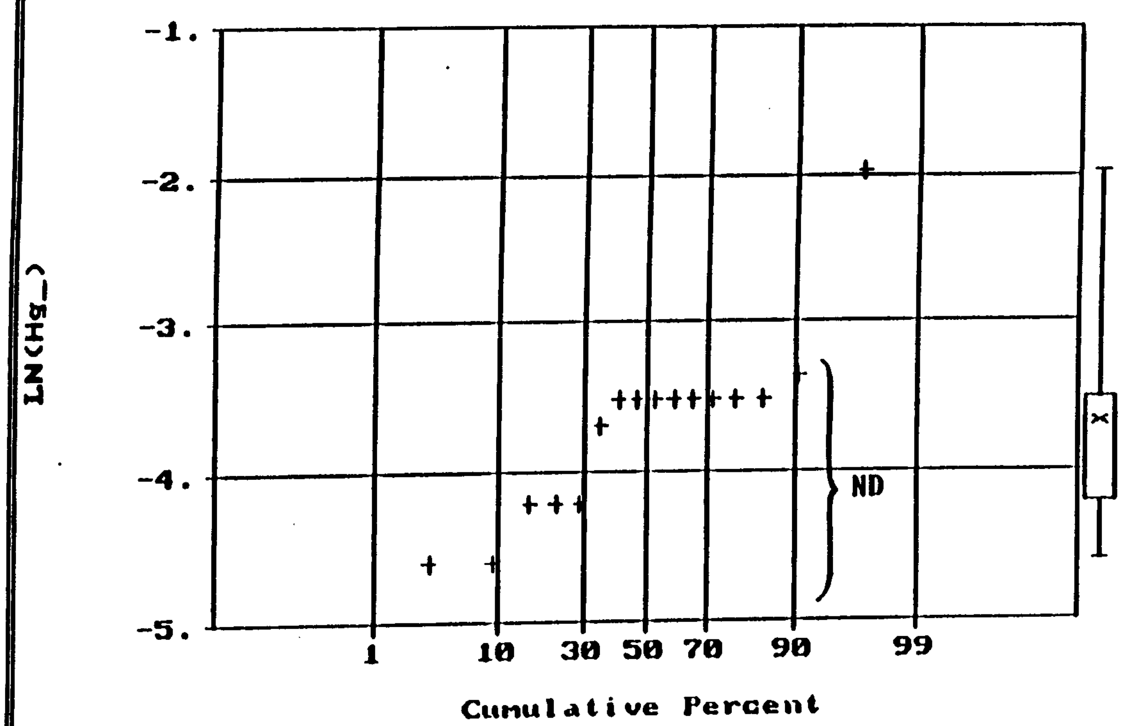


Statistics

N Used	:	16
Mean	:	6.024
Variance	:	.211
Std. Dev	:	.460
% C.V.	:	7.630
Skewness	:	.239
Kurtosis	:	2.079
Minimum	:	5.298
25th %	:	5.697
Median	:	5.932
75th %	:	6.201
Maximum	:	6.768

Note: The data set distribution is lognormal.

FIGURE 30
PROBABILITY PLOT OF BACKGROUND MANGANESE CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD



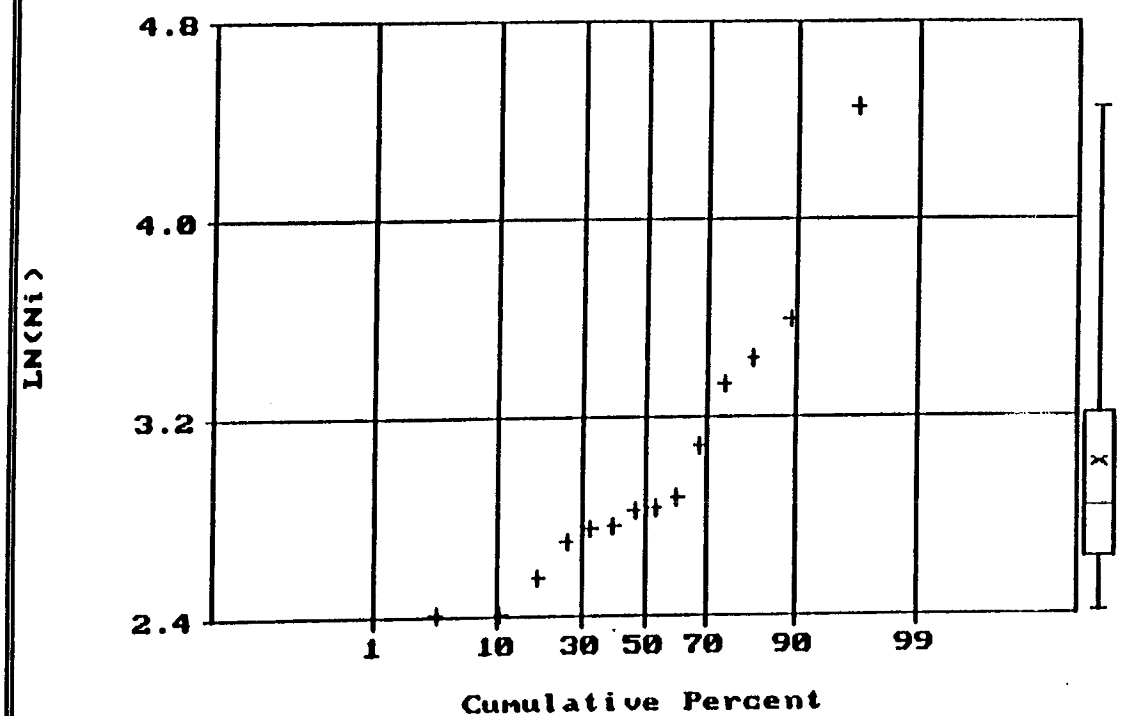
S t a t i s t i c s

N Used	:	16
Mean	:	-3.679
Variance	:	.387
Std. Dev	:	.622
% C.V.	:	16.912
Skewness	:	.884
Kurtosis	:	4.897
Minimum	:	-4.605
25th %	:	-4.200
Median	:	-3.507
75th %	:	-3.507
Maximum	:	-1.966

Note: The data set distribution is nonparametric.

FIGURE 31
PROBABILITY PLOT OF BACKGROUND MERCURY CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

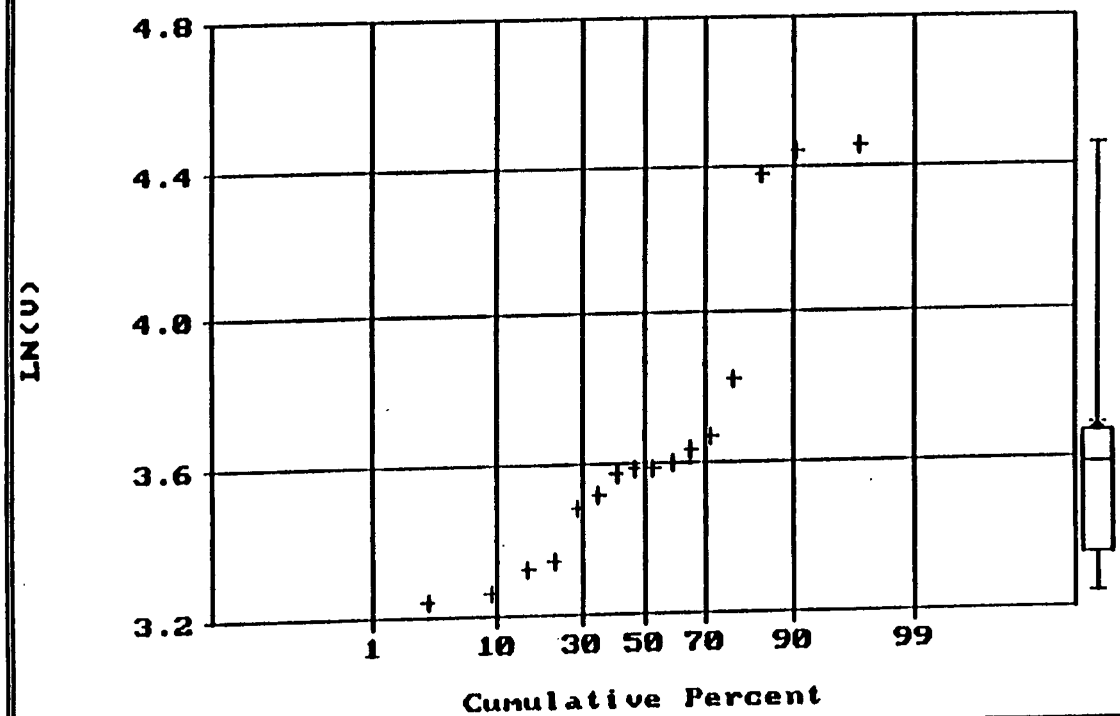
Statistics



N Used :	14
Mean :	3.002
Variance:	.304
Std. Dev:	.551
% C.V. :	18.372
Skewness:	1.345
Kurtosis:	4.438
Minimum :	2.407
25th % :	2.629
Median :	2.830
75th % :	3.208
Maximum :	4.457

Note: The data set distribution is nonparametric.

FIGURE 32
PROBABILITY PLOT OF BACKGROUND NICKEL
CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

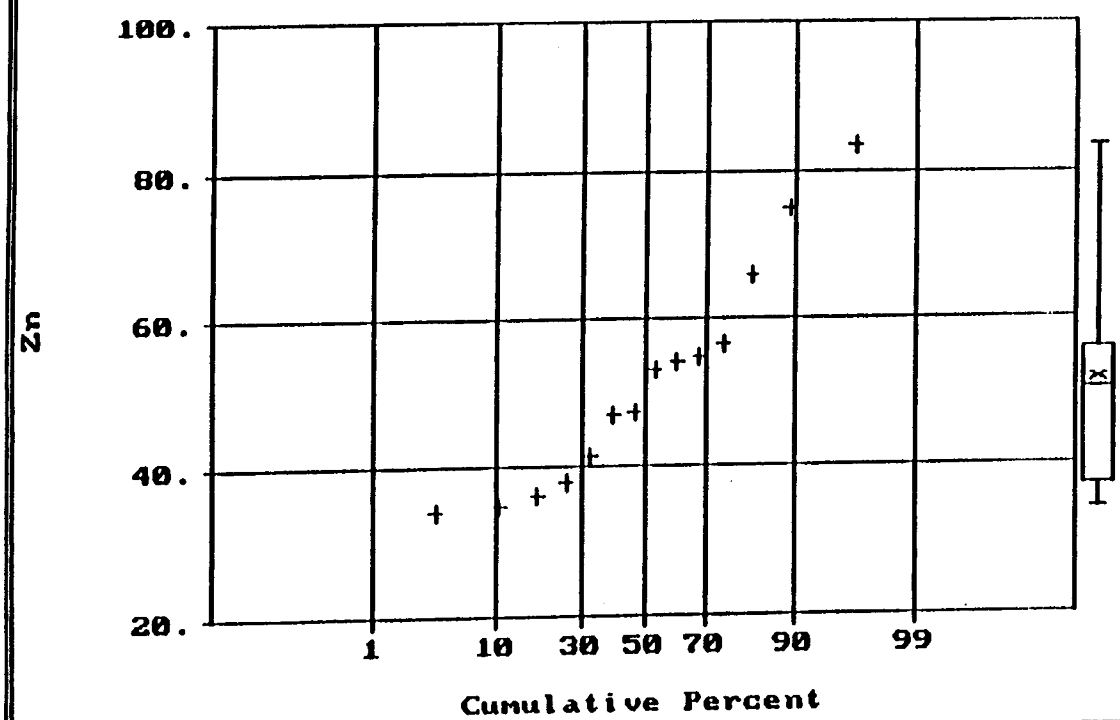


Statistics

N Used :	16
Mean :	3.681
Variance:	.160
Std. Dev:	.400
% C.V. :	10.855
Skewness:	1.056
Kurtosis:	2.855
Minimum :	3.239
25th % :	3.346
Median :	3.584
75th % :	3.666
Maximum :	4.451

Note: The data set distribution is nonparametric.

FIGURE 33
PROBABILITY PLOT OF BACKGROUND VANADIUM CONCENTRATIONS IN SOILS OF THE INLAND AREA
SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD



Statistics

N Used :	14
Mean :	51.586
Variance:	227.740
Std. Dev:	15.091
% C.V. :	29.254
Skewness:	.711
Kurtosis:	2.618
Minimum :	34.100
25th % :	37.150
Median :	50.250
75th % :	55.800
Maximum :	83.400

Note: The data set distribution is normal.

FIGURE 34
PROBABILITY PLOT OF BACKGROUND ZINC CONCENTRATIONS IN SOILS OF THE INLAND AREA SITES 17 AND 24A
NAVAL WEAPONS STATION CONCORD

TABLES

TABLE 1

BACKGROUND METALS CONCENTRATIONS IN SOILS OF THE INLAND AREA SITES 13 AND 22 NAVAL WEAPONS STATION CONCORD

Metal	Number of Detections/ Samples Analyzed	Values Excluded		Background Data Set Size[a]	Background Data Set Distribution	Soil Metal Concentration Statistics for Background Data Sets (mg/kg)			U.S. EPA PRG[f] (mg/kg)
		Too Low	Too High			Minimum Detected[b]	Maximum Detected[c]	80% LCL on 95th p^{d} (Background Level)	
Aluminum	31/31	0	0	31	Normal	6,920.0	22,500.0	21,000	77,000
Antimony	9/30	0	0	30	Nonparam.	0.44	1.8	0.9	31
Arsenic	30/31	1	5	25	Nonparam.	2.4	26.6	15[*]	0.38[*]
Barium	31/31	0	0	31	Nonparam.	135.0	659.0	560	5,300
Beryllium	1/31	0	0	31	Nonparam	0.16	0.16	0.12	0.14
Cadmium	3/31	0	0	31	Nonparam.	0.23	0.53	0.28	9.0[g]/38
Chromium	31/31	0	0	31	Nonparam.	14.9	68.6	62	210[h]
Cobalt	31/31	0	1	30	Nonparam.	5.9	25.4	25	4,600
Copper	31/31	4	4	23	Normal	21.1	66.5	65	2,800
Lead	21/31	0	0	31	Lognormal	3.4	37.7	32	130[g]/400
Manganese	31/31	0	1	30	Normal	161.0	1,540.0	1,300	3,200
Mercury	23/31	0	0	31	Nonparam.	0.06	0.23	0.17	23[i]
Molybdenum	0/31	0	0	31	Nonparam.	N/A	N/A	DL[e]	380
Nickel	31/31	2	2	27	Normal	25.2	128.0	110	150[g]/1,500
Selenium	0/31	0	0	31	Nonparam.	N/A	N/A	DL[e]	380
Silver	0/31	0	0	31	Nonparam.	N/A	N/A	DL[e]	380
Thallium	3/31	0	0	31	Nonparam.	0.81	3.6	1.4	5.4[k]
Vanadium	31/31	0	0	31	Normal	27.4	102.0	95	540
Zinc	24/31	0	0	31	Nonparam.	34.5	107.0	99	23,000

Notes:

a The background data set consists of both detected and nondetected results. Nondetected results are represented by values of one half the detection limit. The data set excludes anomalously low and high values.

b Minimum detected concentration in background data set, after exclusion of anomalously low values.

c Maximum detected concentration in background data set, after exclusion of anomalously high values.

TABLE 1
(Continued)

d	80% LCL on the 95th percentile of the distribution was calculated using nonparametric formula. Results were rounded to two significant figures.
e	The background limit was set at the detection limit.
f	U.S. Environmental Protection Agency (EPA) Region IX preliminary remediation goals (PRG) for residential use (EPA 1995). Listed PRG for manganese is based on the recently revised value of the oral Reference Dose (EPA 1996).
g	California Environmental Protection Agency PRGs (listed as Cal-modified PRGs in EPA 1995)
h	The PRG for total chromium assumes a one to six ratio of chromium VI/chromium III.
i	PRG for mercuric chloride
k	PRG for thallic oxide
DL	Detection limit
N/A	Not available
*	The background limit exceeds the PRG.

TABLE 2

BACKGROUND METALS CONCENTRATIONS IN SOILS OF THE INLAND AREA SITES 17 AND 24A NAVAL WEAPONS STATION CONCORD

Metal	Number of Detections/ Samples Analyzed	Values Excluded		Background Data Set Size[a]	Background Data Set Distribution	Soil Metal Concentration Statistics for Background Data Sets (mg/kg)			U.S. EPA PRG[f] (mg/kg)
		Too Low	Too High			Minimum Detected[b]	Maximum Detected[c]	Background Level [d]	
Aluminum	16/16	0	0	16	Lognormal	6,830.0	20,200.0	20,000	77,000
Antimony	8/16	0	0	16	Nonparam.	0.4	1.2	1.2	31
Arsenic	16/16	0	0	16	Nonparam.	3.2	7.3	7.3[*]	0.38[*]
Barium	16/16	0	0	16	Normal	53.5	206.0	210	5,300
Beryllium	9/16	0	0	16	Normal	0.17	0.56	0.56[*]	0.14[*]
Cadmium	2/16	0	0	16	Nonparam.	0.15	0.15	0.15	9.0[g]/38
Chromium	16/16	0	0	16	Nonparam.	13.4	55.0	55	210[h]
Cobalt	16/16	0	0	16	Nonparam.	7.3	24.4	24	4,600
Copper	16/16	0	0	16	Nonparam.	12.1	63.7	64	2,800
Lead	16/16	0	0	16	Lognormal	3.5	18.2	18	130[g]/400
Manganese	16/16	0	0	16	Lognormal	200.0	870.0	870	3,200
Mercury	1/16	0	0	16	Nonparam.	0.14	0.14	0.14	23[i]
Molybdenum	0/16	0	0	16	Nonparam.	N/A	N/A	DL[e]	380
Nickel	16/16	1	1	14	Nonparam.	11.1	86.2	86	150[g]/1,500
Selenium	0/16	0	0	16	Nonparam.	N/A	N/A	DL[e]	380
Silver	0/16	0	0	16	Nonparam.	N/A	N/A	DL[e]	380
Thallium	0/16	0	0	16	Nonparam.	N/A	N/A	DL[e]	5.4[k]
Vanadium	16/16	0	0	16	Nonparam.	25.5	85.7	86	540
Zinc	16/16	1	1	14	Normal	34.1	83.4	83	23,000

Notes:

a The background data set consists of both detected and nondetected results. Nondetected results are represented by values of one-half of the detection limit. The data set excludes anomalously low and high values.

b This is the minimum detected concentration in the background data set after exclusion of anomalously low values.

c This is the maximum detected concentration in the background data set after exclusion of anomalously high values.

TABLE 2
(Continued)

d	Background limit was set at the maximum detected concentration after exclusion of outliers. Results were rounded to two significant figures.
e	The background limit was set at the detection limit.
f	U.S. Environmental Protection Agency (EPA) Region IX preliminary remediation goals (PRG) for residential use (EPA 1995). Listed PRG for manganese is based on the recently revised value of the oral Reference Dose (EPA 1996).
g	California Environmental Protection Agency PRGs (listed as Cal-modified PRGs in EPA 1995)
h	The PRG for total chromium assumes a one to six ratio of chromium VI/chromium III.
i	PRG for mercuric chloride
k	PRG for thallic oxide
DL	Detection limit
N/A	Not available
*	The background limit exceeds the PRG.

REFERENCES

Dibblee, T.W., Jr. 1981. Preliminary Geologic Map of the Port Chicago Quadrangle, Solano and Contra Costa Counties, California. Open File Report 81-108. U.S. Geological Survey.

Department of Toxic Substances Control (DTSC). 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities. Office of the Scientific Affairs. July.

DTSC. 1994. Preliminary Endangerment Assessment Guidance Manual. State of California Environmental Protection Agency. January.

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

PRC Environmental Management, Inc. (PRC). 1995. Estimation of Ambient Metal Concentrations in Soils. Mare Island Naval Shipyard, Vallejo. Technical Memorandum. December 15.

U.S. Environmental Protection Agency (EPA). 1989. *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part A.* Prepared by the Office of Emergency and Remedial Response. EPA/540/1-89/002. December.

EPA. 1991. Geo-EAS. EMSL. P.O. Box 93478. Las Vegas, NV 89193-3478.

EPA. 1995. Region IX Preliminary Remediation Goals. Second Half 1995. September 1.

APPENDIX D

TIDAL AREA ESTIMATED AMBIENT LIMIT CONCENTRATIONS

(31 Pages)

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order No. 0281

Navy Engineer-in-Charge: Ronald Yee

PRC Project Manager: Lynn Valdivia

NAVAL WEAPONS STATION
CONCORD, CALIFORNIA

TECHNICAL MEMORANDUM ESTIMATION OF AMBIENT METAL CONCENTRATIONS IN THE TIDAL AREA SOILS

April 12, 1996

Prepared By

PRC ENVIRONMENTAL MANAGEMENT, INC.
135 Main Street, Suite 1800
San Francisco, CA 94105
(415) 543-4880

TECHNICAL MEMORANDUM
ESTIMATION OF AMBIENT METAL CONCENTRATIONS IN THE TIDAL AREA SOILS
NAVAL WEAPONS STATION CONCORD

CONTENTS

FIGURES

FIGURES
(Continued)

TABLES

TECHNICAL MEMORANDUM
ESTIMATION OF AMBIENT METAL CONCENTRATIONS IN THE TIDAL AREA SOILS
NAVAL WEAPONS STATION

1.0 INTRODUCTION

This technical memorandum, prepared by PRC Environmental Management, Inc. (PRC), presents the approach for estimating ambient metal concentration limits in Tidal Area soils at Naval Weapons Station (WPNSTA) Concord, California (Figure 1). The estimated ambient concentration limits are intended for use in the baseline human health risk assessment, ecological risk assessment, and remedial investigation (RI) of WPNSTA Concord Installation Restoration Program sites.

Naturally occurring concentrations of metals in soil, rock, and water are usually referred to as "background" concentrations. To evaluate the effects of site activities on the environment, constituent concentrations found at a site are typically compared to the background concentrations, and the difference between the site and background concentrations is assumed to be the impact of site activities.

In some cases, land development activities that are not associated with the specific Installation Restoration Program site activities being assessed may have resulted in relatively uniform changes to the original background concentrations. These concentrations represent conditions that existed before potential impacts from site-specific activities and will be referred to as "ambient" concentrations.

Because of the proximity of potential contamination sources, such as chemical plants, undisturbed or "true" background conditions are unlikely to occur within or near the Tidal Area. Efforts to identify a background or reference area upgradient from the Tidal Area sites have not been successful. U.S. Environmental Protection Agency (EPA) collected samples from two areas southwest of the Tidal Area sites in an attempt to identify a representative background site. Soil samples from the first area contained elevated levels of metals, specifically lead. Soil and water samples collected from an area farther inland than the first area also contained elevated levels of metals. In addition, petroleum hydrocarbons were observed in shallow soils. Consequently, EPA abandoned this second location. Therefore, in the absence of locations with background conditions within the Tidal Area or adjacent to it, the approach presented in this memorandum entails use of the site-specific soil metals data collected for the RI to estimate upper limits for ambient concentrations.

This document describes the approach, conceptual model, and statistical analysis used in estimating ambient metal concentration limits for the Tidal Area. The results of the estimation are summarized in Table 1 and Figures 3 through 19.

2.0 APPROACH

A step-by-step approach for estimating ambient metal concentration limits is defined as follows:

1. Develop a conceptual model of soils in the Tidal Area and select the RI soil samples to be used in the estimation.

2. Query the database of RI soil analytical results for all metals except essential nutrients. Exclude from the data set the soil samples that may have been affected by site activities.

3. Account for each nondetected result by substituting a value of one half the reported detection limit. Prepare data sets for further evaluation through logarithmic transformations, when necessary, to approximate normal distribution.

4. Perform statistical operations to allow samples affected by site activities to be distinguished and excluded.

5. Use a nonparametric formula to estimate the ambient limits as the 80 percent lower confidence limit (LCL) on the 95th percentile, as was defined in consultation with regulatory agencies (PRC 1995).

3.0 CONCEPTUAL MODEL

The conceptual model developed for this task is a generalized representation of soil conditions and was used to justify the selection of the RI soil samples in estimating ambient limits for inorganic constituents. The model is based on a characterization of the Tidal Area subsurface materials and preliminary analysis of the grain size distribution in soil samples from the four sites.

Subsurface geology of the Tidal Area is best described as a zone of interfingering alluvial and estuarine depositional environments. The Tidal Area is divided into three distinct landforms, all of Quaternary age: foot slopes, flood plains, and marsh or wetlands (Figure 2). The four Tidal Area sites (IR sites 1, 2, 9, and 11) are located within the wetlands adjacent to Suisun Bay and underlain by fine grained silt and clay mixed with organic material that make up bay muds (Lee et al. 1986).

These bay muds have been divided into Younger Bay Mud and Older Bay Mud (McCulley, Frick and Gilman, Inc. 1987). Soil borings drilled at the four Tidal Area sites are confined to the Younger Bay Mud stratigraphic unit. The Younger Bay Mud is an estuarine/marine silty clay that is commonly compacted stiff to semi-hard, and varies in thickness from 15 to 50 feet. Sand lenses occur in the Younger Bay Mud and may represent historic streambeds or outwash deposits. Mineral compositions of bay muds consist of mica, montmorillinite, chlorite, kaolinite, quartz, and feldspar (Goldman 1969).

Soils beneath the four Tidal Area sites are composed of silty, and locally sandy, clay. Silty, fine grained sand lenses were observed in a few soil borings, but the lenses can not be correlated between soil borings (IT Corp. 1992). Based upon a preliminary analysis of the grain size distribution in soil samples collected from the sites during the remedial investigation, the fraction of silt and clay in subsurface materials tends to increase with depth; the sediments with highest ratios of coarse to fine materials are generally confined to the upper 0.5 feet below ground surface (bgs). Thus, due to a general decrease in soil permeability with depth, the leaching of metals downward from potentially affected surface soils is expected to be limited.

Statistical analysis of data on nineteen metals (excluding essential nutrients) from over 200 RI soil samples collected at the four sites has shown that some metals (aluminum, arsenic, chromium, nickel, and vanadium) have similar concentrations regardless of the depth of the sample. However, many other metals exhibit higher concentrations in the surface soils than deep soils. For example, lead concentrations in shallow samples (up to 0.5 feet deep) are, on average, three times higher than in deep samples. Mercury and zinc concentrations in the surface soils are almost twice as high as in the deeper deposits. Using statistical comparisons (t-test and K-S test (Gilbert 1987)), the statistically significant differences in concentrations versus depth were confirmed for antimony, barium, cobalt, copper, lead, manganese, mercury, molybdenum, and zinc.

The consistency of concentrations at different depths and relatively narrow ranges of concentrations of aluminum, arsenic, chromium, nickel, and vanadium suggests they may be naturally occurring. The ranges of concentrations of arsenic, chromium, and nickel observed in the soils in the Tidal Area are comparable with the reported concentrations in the Suisun Bay sediments (San Francisco Estuary Institute 1994).

The elevated concentrations of lead, mercury, zinc, antimony, and copper in the uppermost soils may be related to both natural factors and the potential contamination sources. Relatively high levels of lead (about 200 milligrams per kilogram (mg/kg)) in the upper 0.5 feet of soils may be related to potential contamination releases from surrounding chemical plants. The occurrence of elevated mercury in the uppermost soils is likely attributable to the erosion and deposition of mineralized source materials from Los Medanos Hills. Further, there has been mining activity on the western slope of the Sierra Nevada mountain range since the late 1800s that may have indirectly contributed to accumulation of some metals (iron, copper, and lead) in soils of the Tidal Area. Under this hypothesis, metals dissolved by acid mine drainage or bound to particulates were transported via surface water to the Sacramento/San Joaquin river delta, and ultimately deposited in the Bay. Similarly, some metal compounds might have been deposited directly on the surface within the Tidal Area due to its flooding during high tides.

Because it is difficult to distinguish the influence of natural and anthropogenic factors on concentrations metals encountered in the uppermost soils of the Tidal Area, the evaluation of ambient metal limits is conducted using subsurface soil samples only. These subsurface soil samples used in the evaluation were collected between two and ten feet below ground surface.

Ambient metal concentration limits were estimated for all the metals available in the database of RI soil analytical results, excluding essential nutrients (sodium, potassium, calcium, magnesium, and iron). Several soil samples (from IR sites 1, 2, and 11) expected to be potentially affected by site activities have been excluded from the metal data sets before the evaluation. The size of the resulting data sets was in the order of 60 values (Table 1), which is sufficient to allow estimation of ambient limits using statistical methods that are discussed below.

4.0 STATISTICAL ANALYSIS OF THE SOIL DATA

The following sections describe briefly the statistical methods that are used to estimate ambient concentration limits for soil metals. A more detailed description of specific procedures used in the estimation may be found in the Technical Memorandum on Estimation of Ambient Metal Concentrations in Soils prepared for Mare Island Naval Shipyard in December 1995.

4.1 DATA SET PREPARATION

Before ambient metal concentrations can be estimated, most of the data sets required special preparation. Preparation procedures included steps to account for the nondetectable results and transformation of the data to approximate normal distributions.

The process of estimating ambient metal concentrations must account for analytical results reported as nondetect. For several metals, including antimony, beryllium, cadmium, mercury, molybdenum, and thallium, nondetect results constitute a significant percentage (nearly 50 percent or more) of the data set. The selenium and silver data sets almost entirely consist of nondetect results (Table 1).

Nondetectable results must be treated the same way in the ambient evaluation and in the risk assessment. Accordingly, a value of one-half the reported detection limit was substituted for each nondetect data point. Anomalously low nondetect values were excluded from data sets of some metals if these values were less than three times the standard deviation from the mean.

To evaluate whether it was necessary to transform a specific data set to logarithms to approximate a normal distribution, summary statistics, including the mean, standard deviation, coefficient of variation, skewness, and kurtosis were calculated. In particular, the values of skewness and kurtosis were useful indicators of the need for data set transformation.

Following transformation, if necessary, a working set of histograms and probability plots was built with Geo-EAS geostatistical software (EPA 1991) for interim graphical analysis. These figures were reviewed to evaluate the effectiveness of the data transformations applied, and to identify anomalously high metal concentrations or outliers. These outliers are likely to be associated with site activities and were excluded from ambient data sets as described below.

4.2 EXCLUSION OF ANALYSES INDICATIVE OF SITE RELATED CONTAMINATION

In performing frequency distribution analysis, a few metal concentration data points may be found at concentrations significantly greater than the main population. These outliers can be initially identified on histograms and probability plots, but more rigorously are defined as concentrations greater than three times the standard deviation from the mean. The outliers are generally attributed to site activities and are excluded from the data sets. It should be noted that since the data points considered as outliers may also represent extreme values of actual ambient concentrations, their exclusion may lead to conservative (low) estimates of ambient limits. The simultaneous exclusion of anomalously low or nondetect values from some data sets, as described above, may partially compensate for this bias.

4.3 CALCULATION OF AMBIENT METAL CONCENTRATION LIMITS

After making final adjustments to the ambient data sets as described above, a probability plot is prepared for each metal of interest to confirm the effectiveness of the preparation procedures and to proceed with calculation of ambient limits. For data sets with greater than 20 and less than 300 values, a nonparametric formula (Gilbert 1987) is used to estimate the ambient limits as the 80 percent LCL on the 95th percentile as follows:

(1) Rank the data from minimum to maximum to obtain the sample order statistics:

$$x_1 \le x_2 \le \ldots \le x_k \ldots \le x_n$$

(2) Calculate l:

$$l = p\,(n + 1) - Z_{1-\alpha}\sqrt{np(1 - p)}$$

where: $p = 0.95$,

n = number of values in the data set

$\alpha = 0.20$ = significance level

$Z_{1-\alpha} = Z_{0.80} = 0.845$, as obtained from Table A-1 published by Gilbert (1987)

The simplified formula is as follows:

$$l = 0.95\,(\,n + 1\,) - 0.184\,\sqrt{n}$$

(3) If the calculated l is an integer, the 80 percent LCL on the 95th percentile is the lth largest datum (among the ranked concentrations) in the data set. If l is not an integer, estimate the 80 percent LCL on the 95th percentile by linear interpolation between the two concentrations closest to l.

5.0 SUMMARY OF FINDINGS

The ambient concentration limits estimated for metals in the Tidal Area soils through the procedures described above are presented in Table 1. The table include EPA PRGs and Sediment Screening Criteria (Regional Water Quality Control Board [RWQCB] 1992) for comparison purposes. The estimated ambient limits for arsenic, lead, manganese, and zinc exceeded at least one of these criteria, as indicated in Table 1 by asterisks.

As indicated above, probability plots that support the estimations are attached as Figures 3 through 19. Only the data points are plotted that remained in the data set after exclusion of outliers; the population of the nondetectable results is indicated as ND (where significant), and the type of underlying data set distribution (normal, lognormal, and nonparametric) is noted.

REFERENCES

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

Goldman, H.B. 1969. Geology of San Francisco Bay. In *Geologic and Engineering Aspects of San Francisco Bay Fill.* Edited by H.B. Goldman. California Division of Mines and Geology Special Report 97. pp. 9-30.

IT Corp. 1992. Draft Site Investigation Report, Volume I, Text and Volume II, Appendices A-F. Prepared for the Hazardous Waste Remedial Action Program, Martin Marietta Energy Systems, Inc. Oak Ridge, Tennessee.

Lee, C.R., et al. 1986. Remedial Investigation of Contaminant Mobility at Naval Weapons Station, Concord, California. Miscellaneous Paper EL-86-2. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

McCulley, Frick and Gilman, Inc. 1987. Hydrogeologic Report, IT Corporation, Vine Hill and Baker Facilities, Contra Costa County, California. October 22, 1987.

PRC Environmental Management, Inc. (PRC). 1995. Estimation of Ambient Metal Concentrations in Soils. Mare Island Naval Shipyard, Vallejo. Technical Memorandum. December 15.

Regional Water Quality Control Board (RWQCB). 1992. Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse.

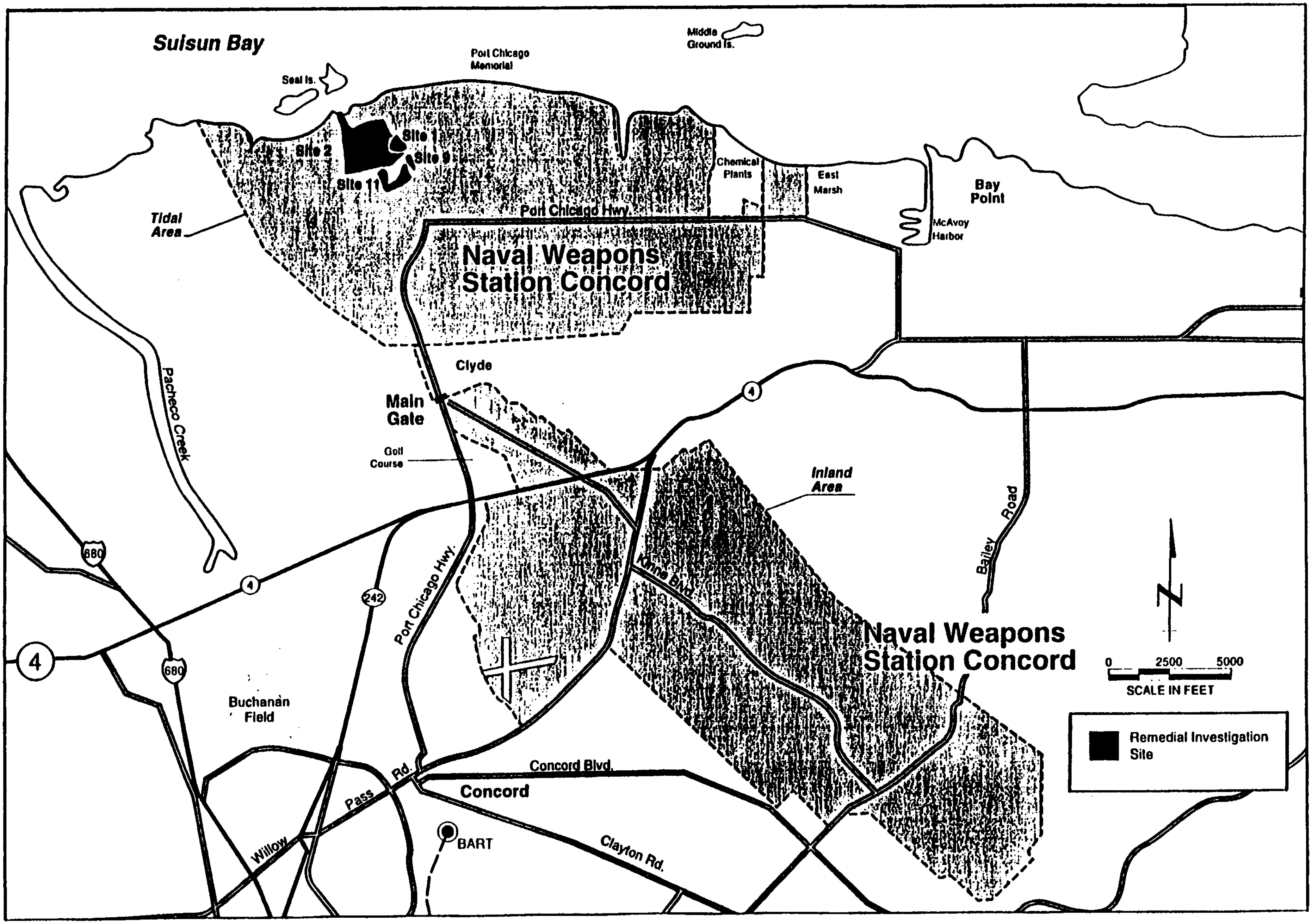
San Francisco Estuary Institute. 1994. San Francisco Estuary Regional Monitoring Program for Trace Substances. 1994 Annual Report.

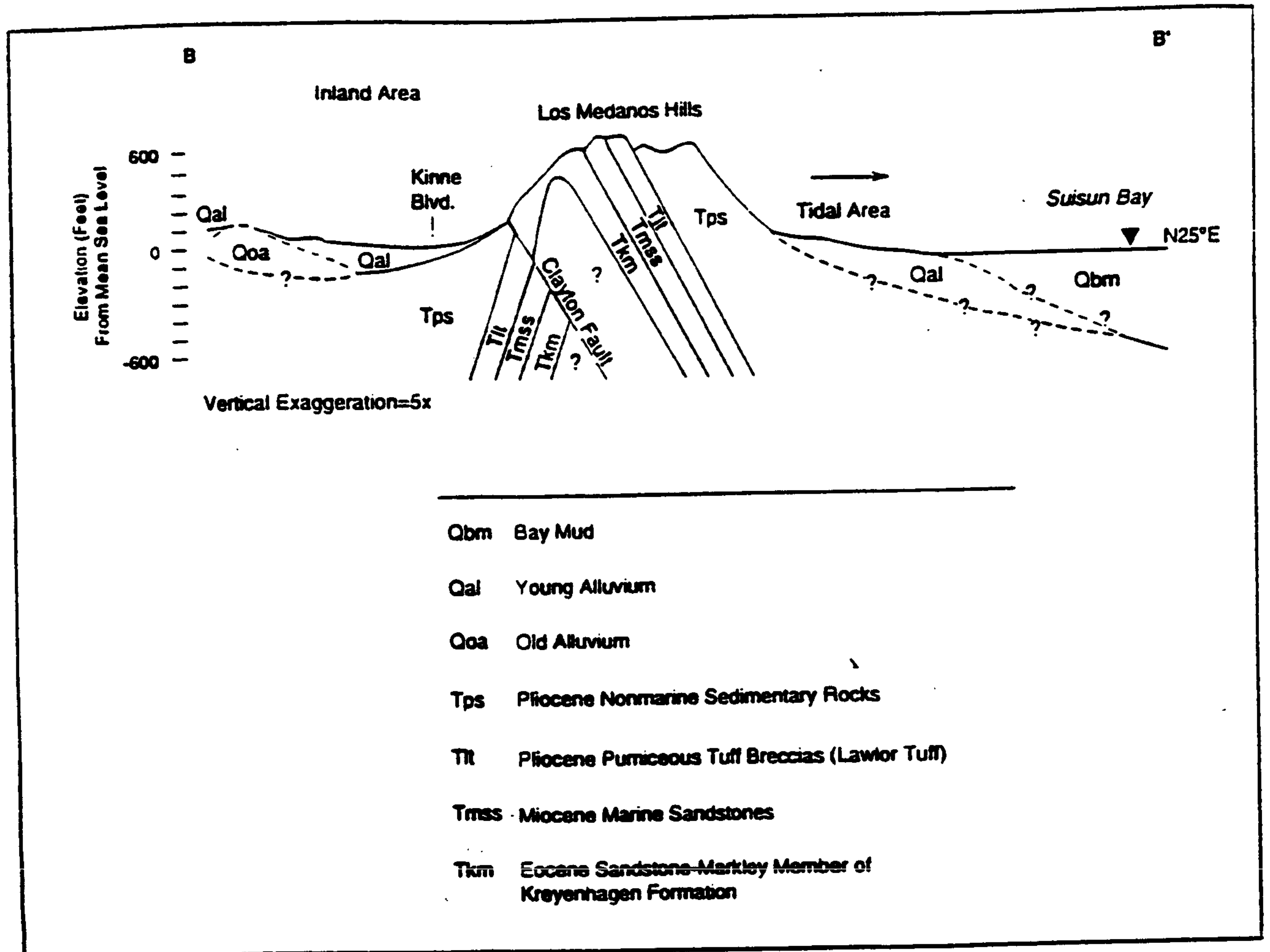
EPA. 1991. Geo-EAS. EMSL. P.O. Box 93478. Las Vegas, NV 89193-3478.

EPA. 1995. Region IX Preliminary Remediation Goals. Second Half 1995. September 1.

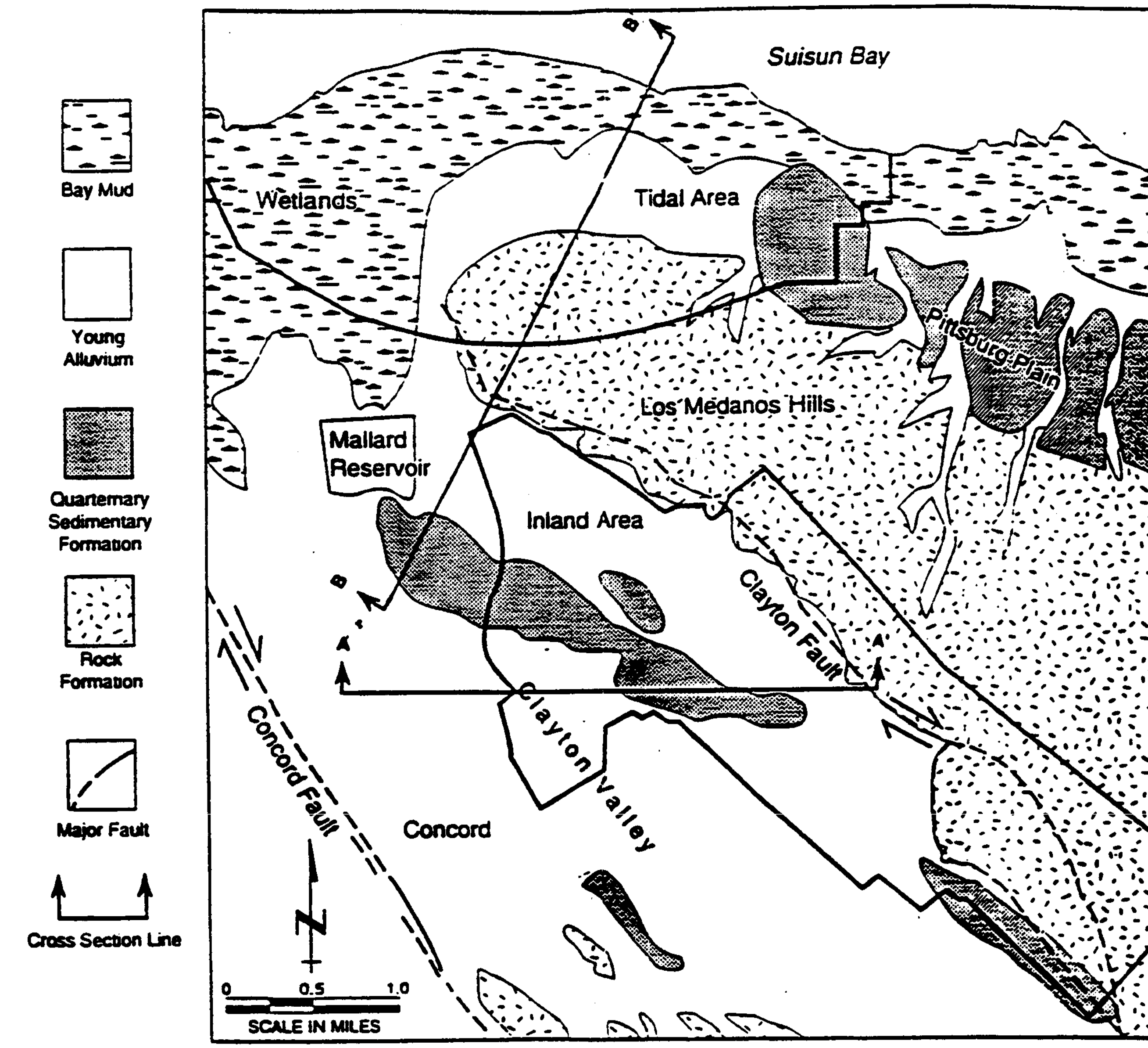
FIGURES

Figure 1: Tidal Area Investigations Sites. Naval Weapons Station Concord





Source: Adapted from DIBBLEE, 1981

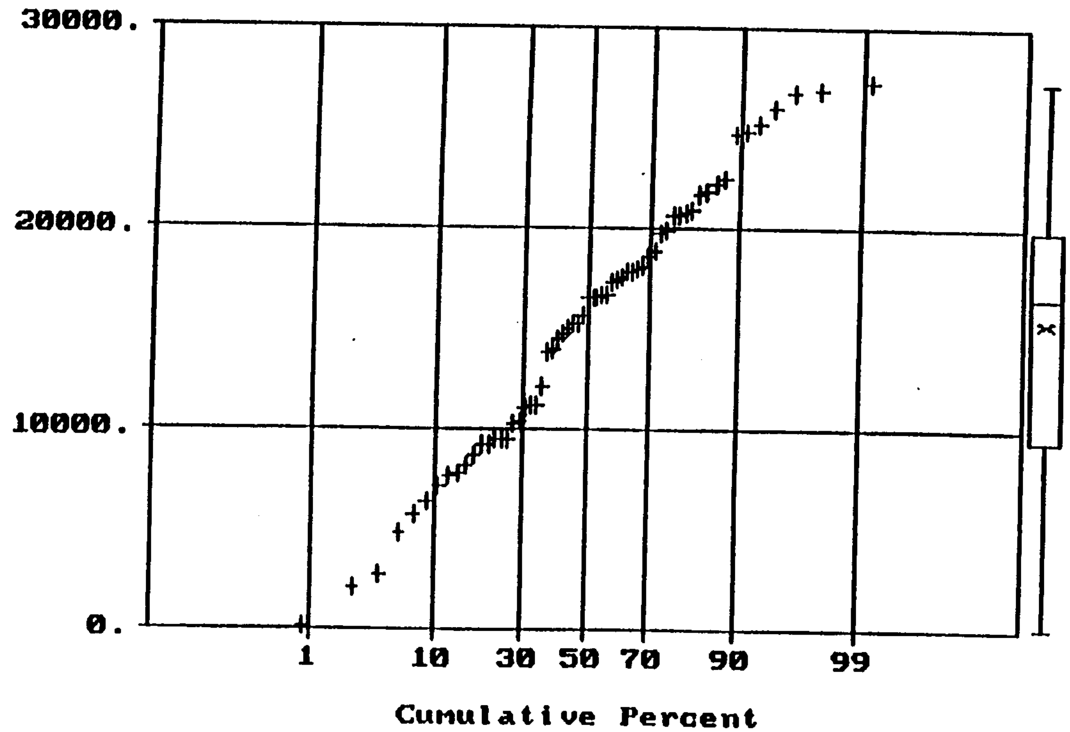


Source: LUTTON, et. al., 1987
DIBBLEE, 1980a,b,c, 1981

GEOLOGY OF WPNSTA CONCORD

FIGURE 2

FIGURE 3: PROBABILITY PLOT OF ALUMINUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

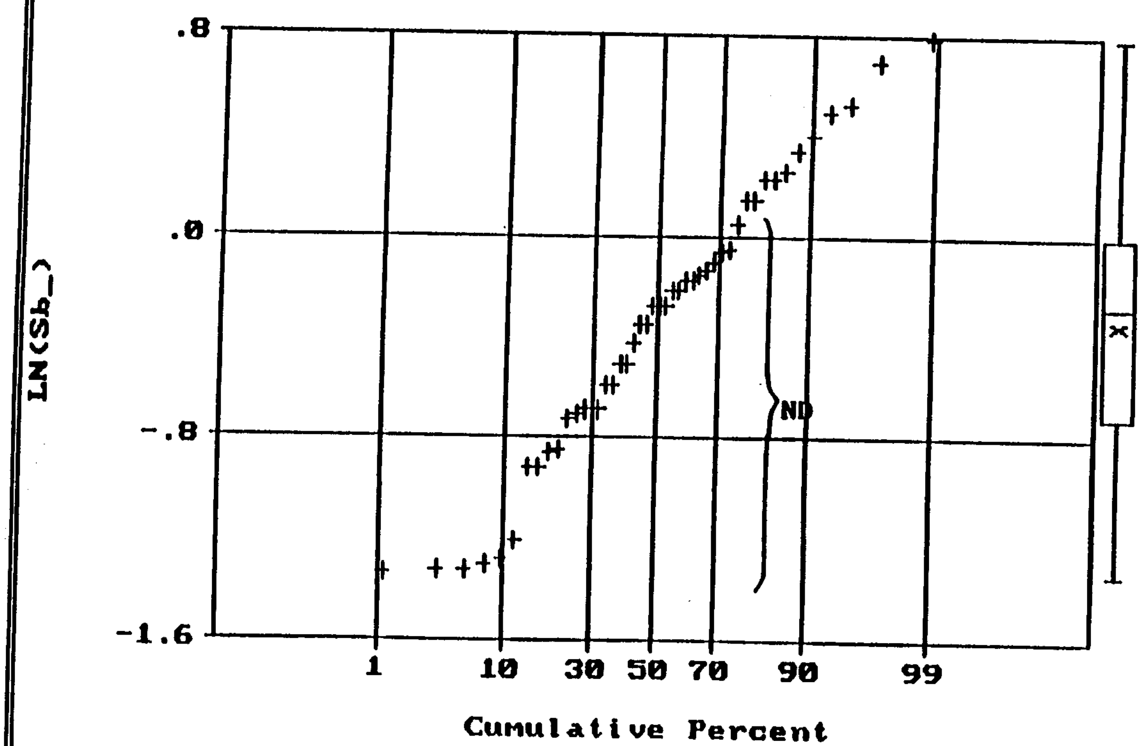


Statistics

N Used :	61
Mean :	15184.460
Variance :	43765520.000
Std. Dev :	6615.551
% C.V. :	43.568
Skewness :	-.149
Kurtosis :	2.353
Minimum :	82.200
25th % :	9432.500
Median :	16400.000
75th % :	19850.000
Maximum :	27300.000

Note: The data set distribution is normal.

FIGURE 4: PROBABILITY PLOT OF ANTIMONY CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

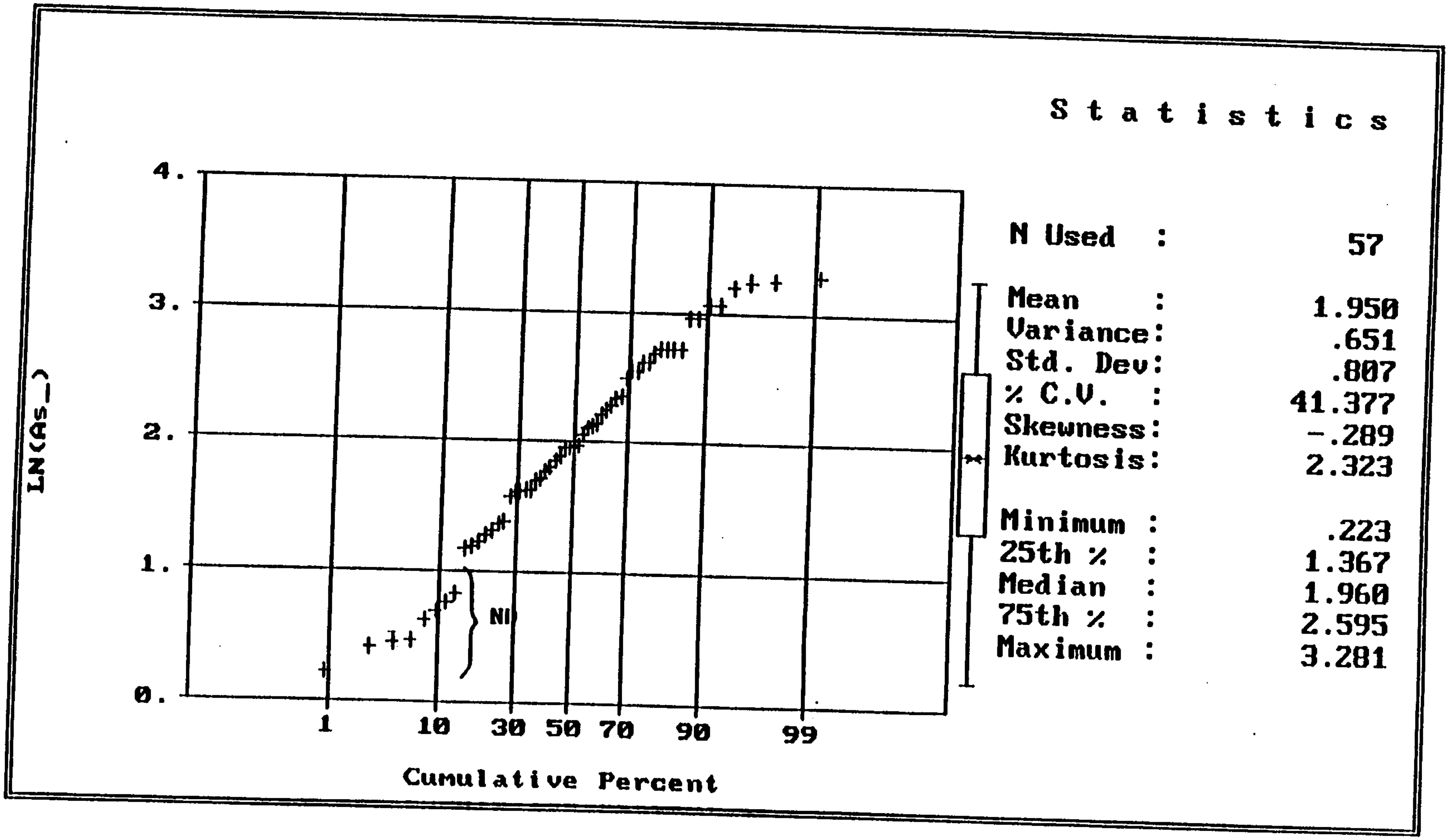


Statistics

N Used	:	46
Mean	:	-.352
Variance	:	.322
Std. Dev	:	.567
% C.V.	:	161.341
Skewness	:	-.051
Kurtosis	:	2.306
Minimum	:	-1.347
25th %	:	-.724
Median	:	-.288
75th %	:	-.001
Maximum	:	.788

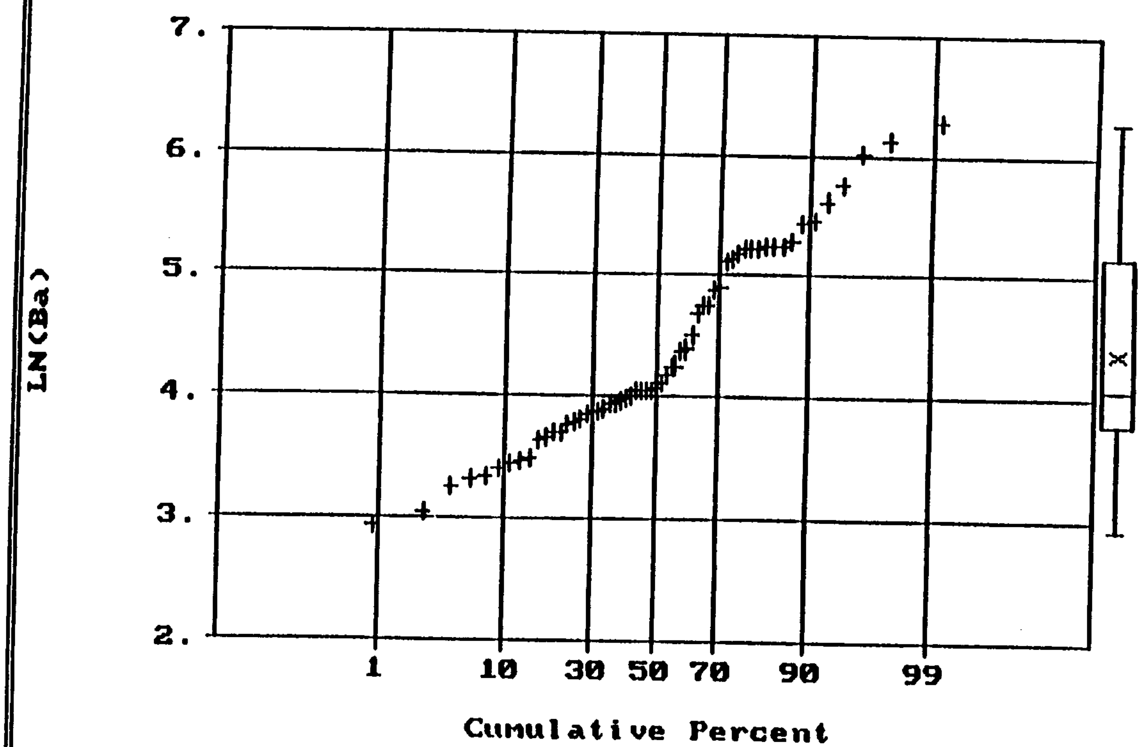
Note: The data set distribution is nonparametric.

FIGURE 5: PROBABILITY PLOT OF ARSENIC CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



Note: The data set distribution is lognormal.

FIGURE 6: PROBABILITY PLOT OF BARIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES WPNSTA CONCORD

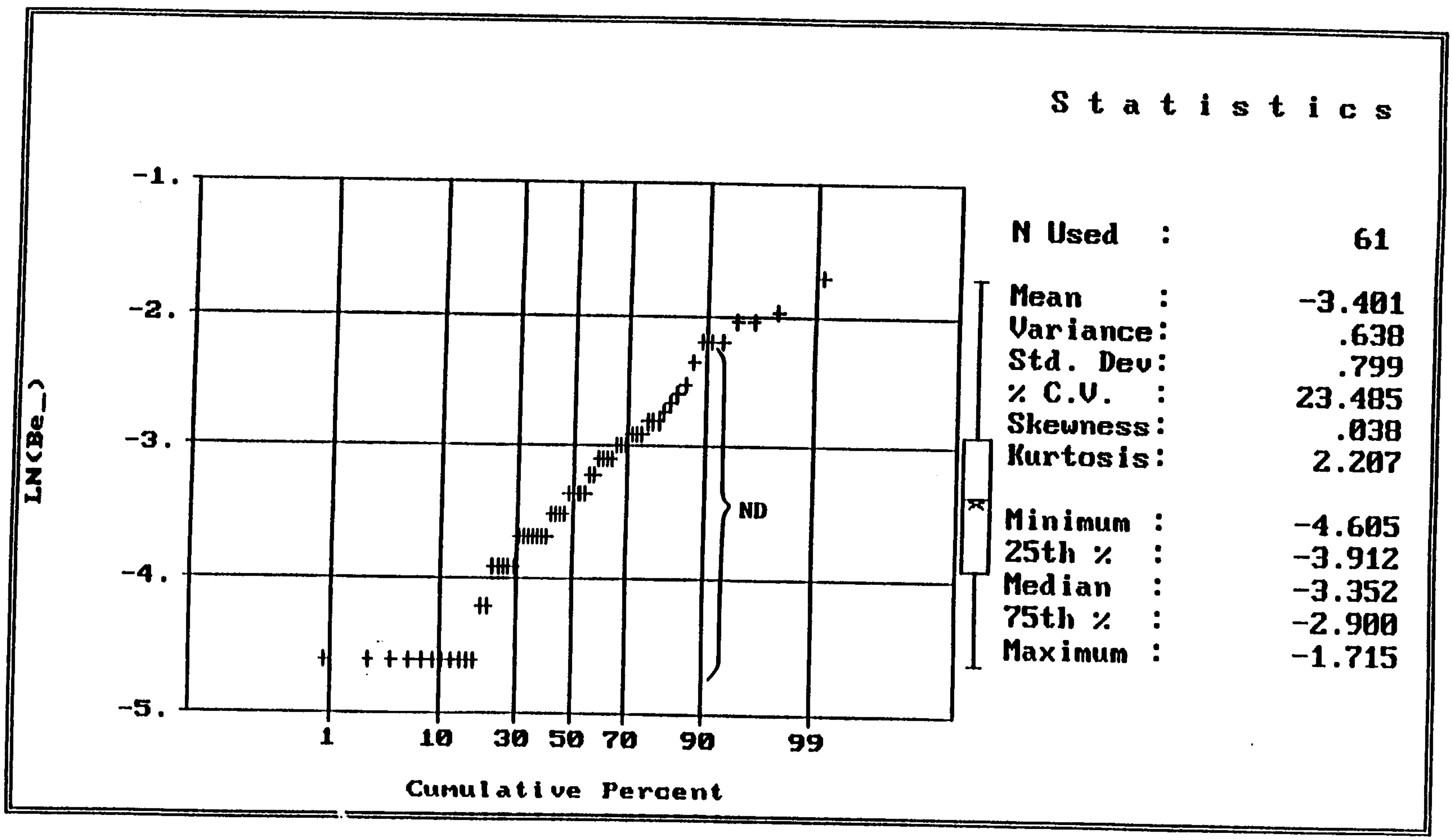


S t a t i s t i c s

N Used :	59
Mean :	4.376
Variance:	.677
Std. Dev:	.823
% C.V. :	18.807
Skewness:	.455
Kurtosis:	2.298
Minimum :	2.918
25th % :	3.781
Median :	4.074
75th % :	5.146
Maximum :	6.271

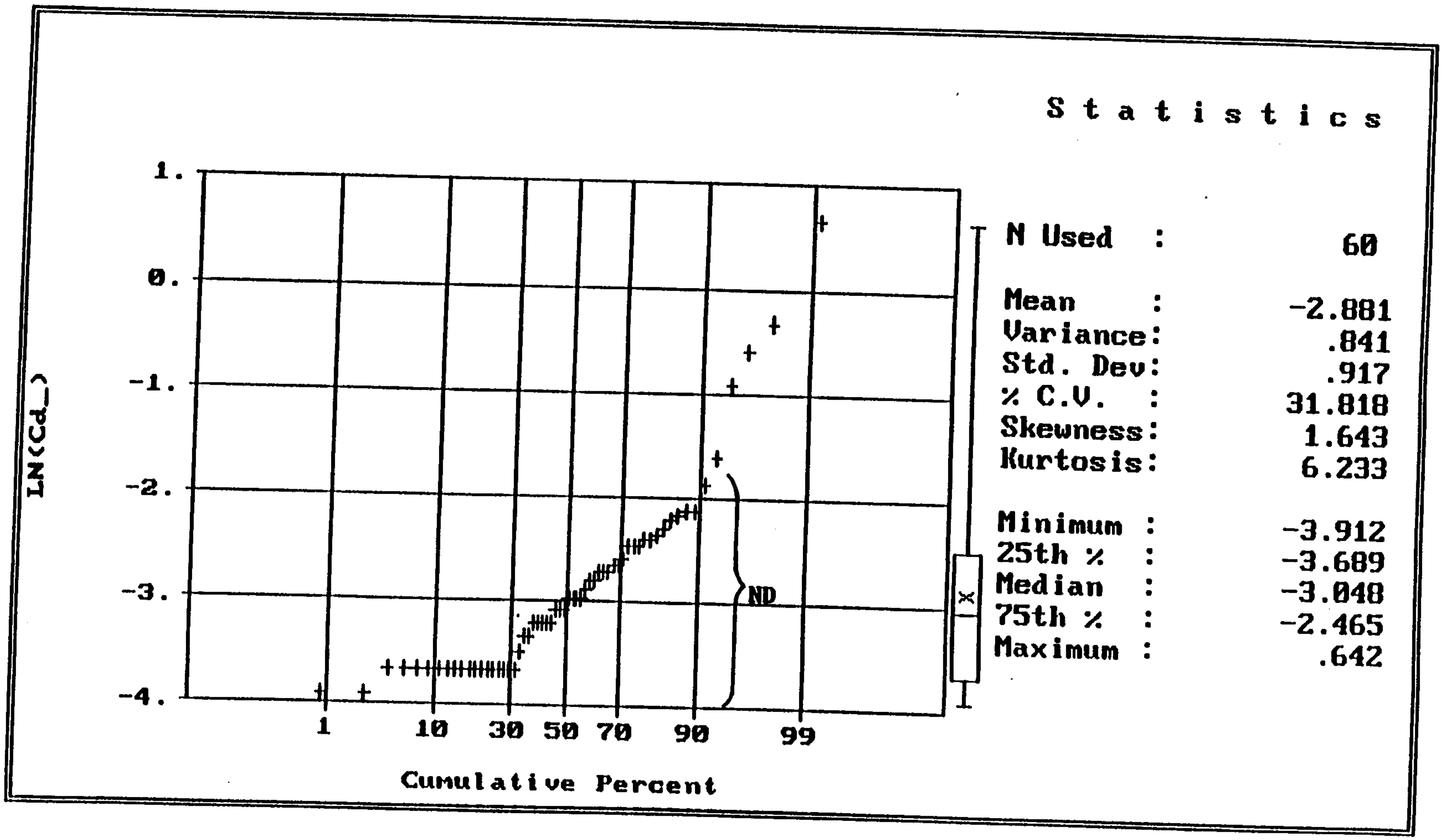
Note: The data set distribution is lognormal.

FIGURE 7: PROBABILITY PLOT OF BERYLLIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



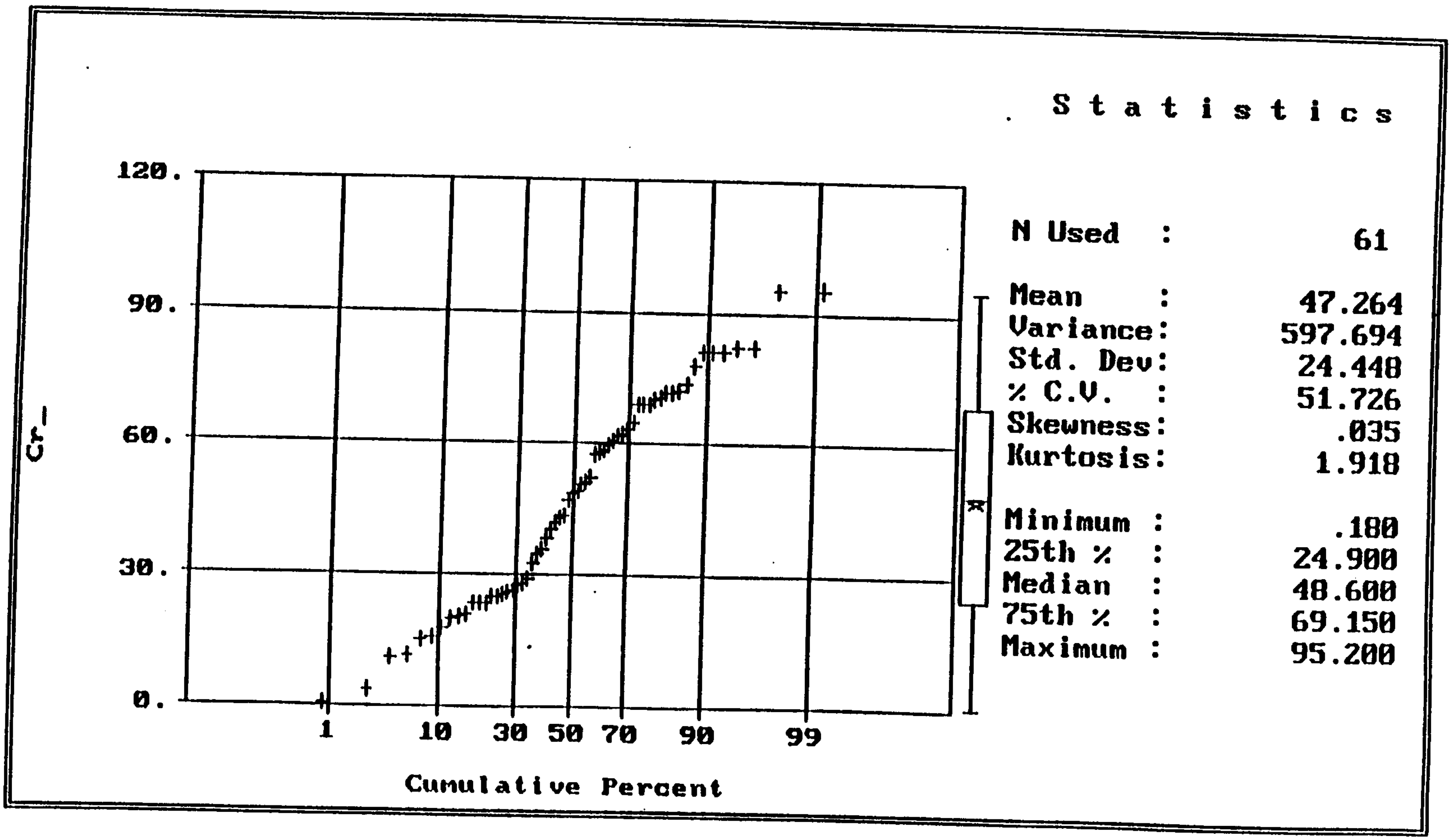
Note: The data set distribution is nonparametric.

FIGURE 8: PROBABILITY PLOT OF CADMIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



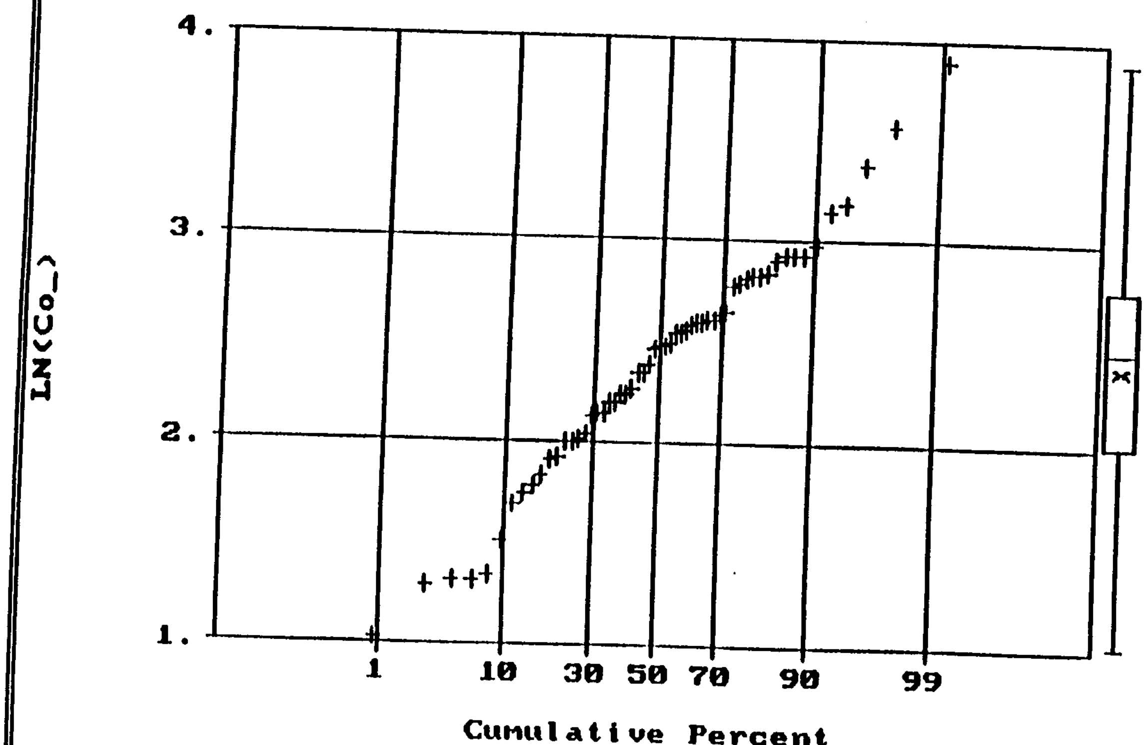
Note: The data set distribution is nonparametric.

FIGURE 9: PROBABILITY PLOT OF CHROMIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



Note: The data set distribution is normal.

FIGURE 10: PROBABILITY PLOT OF COBALT CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

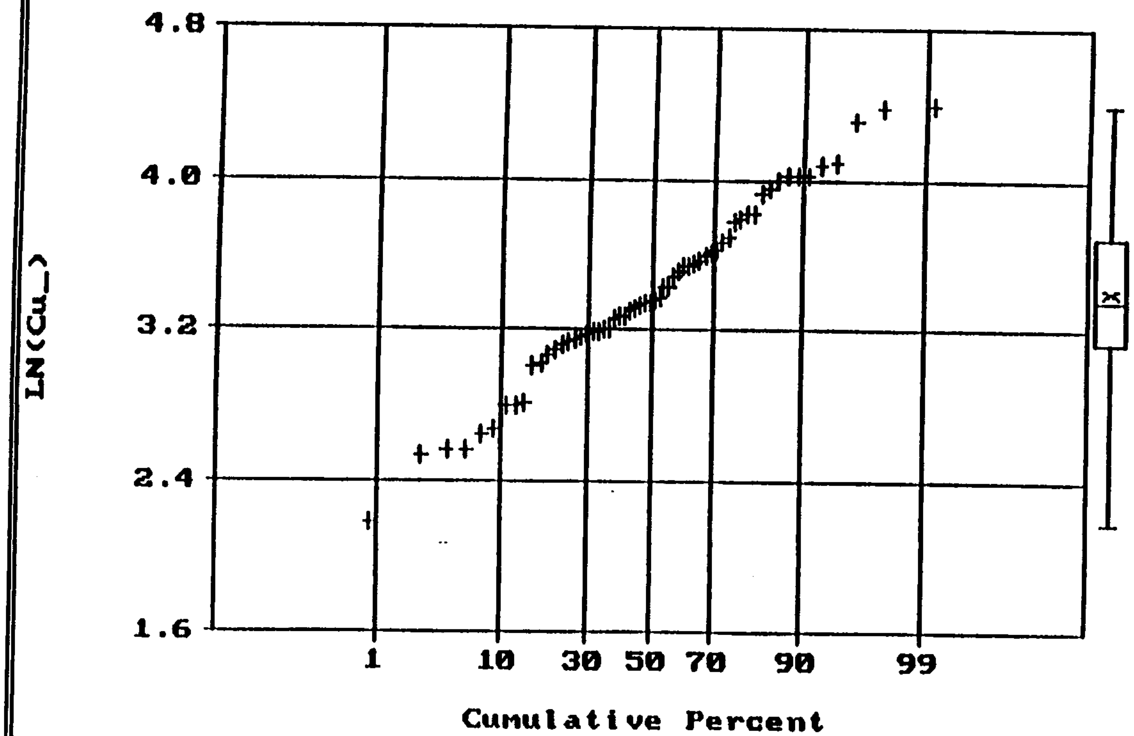


Statistics

N Used :	57
Mean :	2.376
Variance:	.338
Std. Dev:	.581
% C.V. :	24.473
Skewness:	-.079
Kurtosis:	3.121
Minimum :	1.030
25th % :	2.005
Median :	2.460
75th % :	2.769
Maximum :	3.894

Note: The data set distribution is lognormal.

FIGURE 11: PROBABILITY PLOT OF COPPER CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

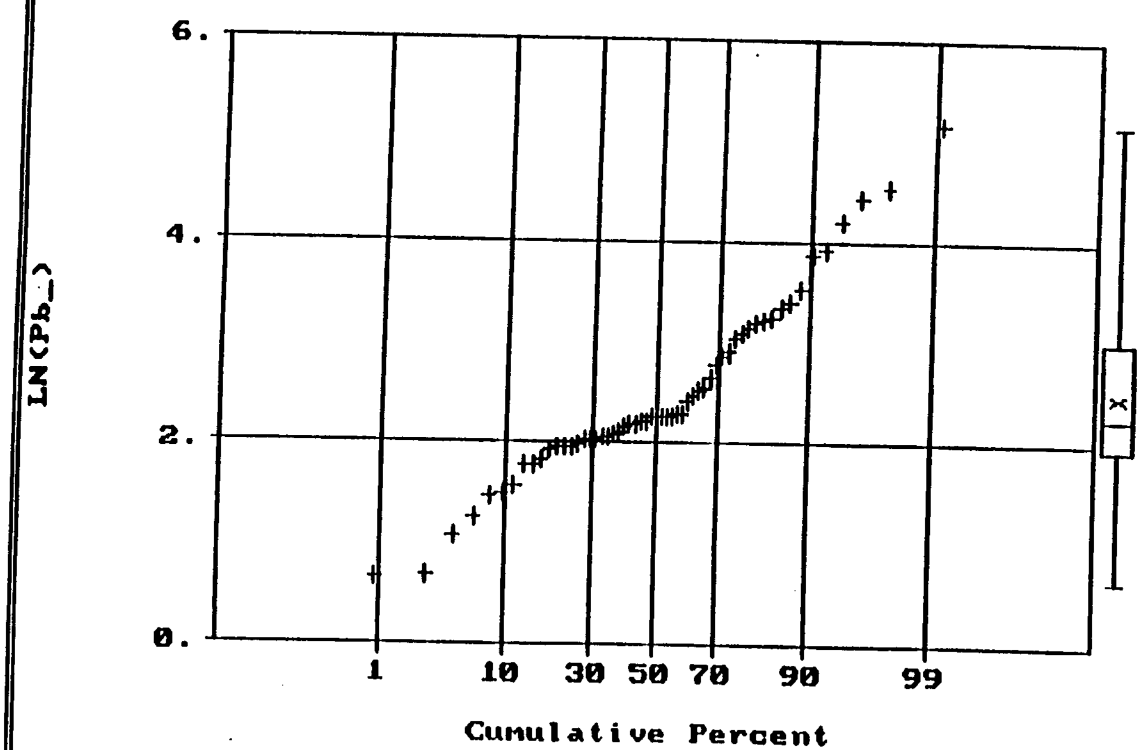


Statistics

N Used :	60
Mean :	3.401
Variance:	.231
Std. Dev:	.481
% C.V. :	14.130
Skewness:	-.079
Kurtosis:	2.804
Minimum :	2.175
25th % :	3.135
Median :	3.352
75th % :	3.689
Maximum :	4.389

Note: The data set distribution is lognormal.

FIGURE 12: PROBABILITY PLOT OF LEAD CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

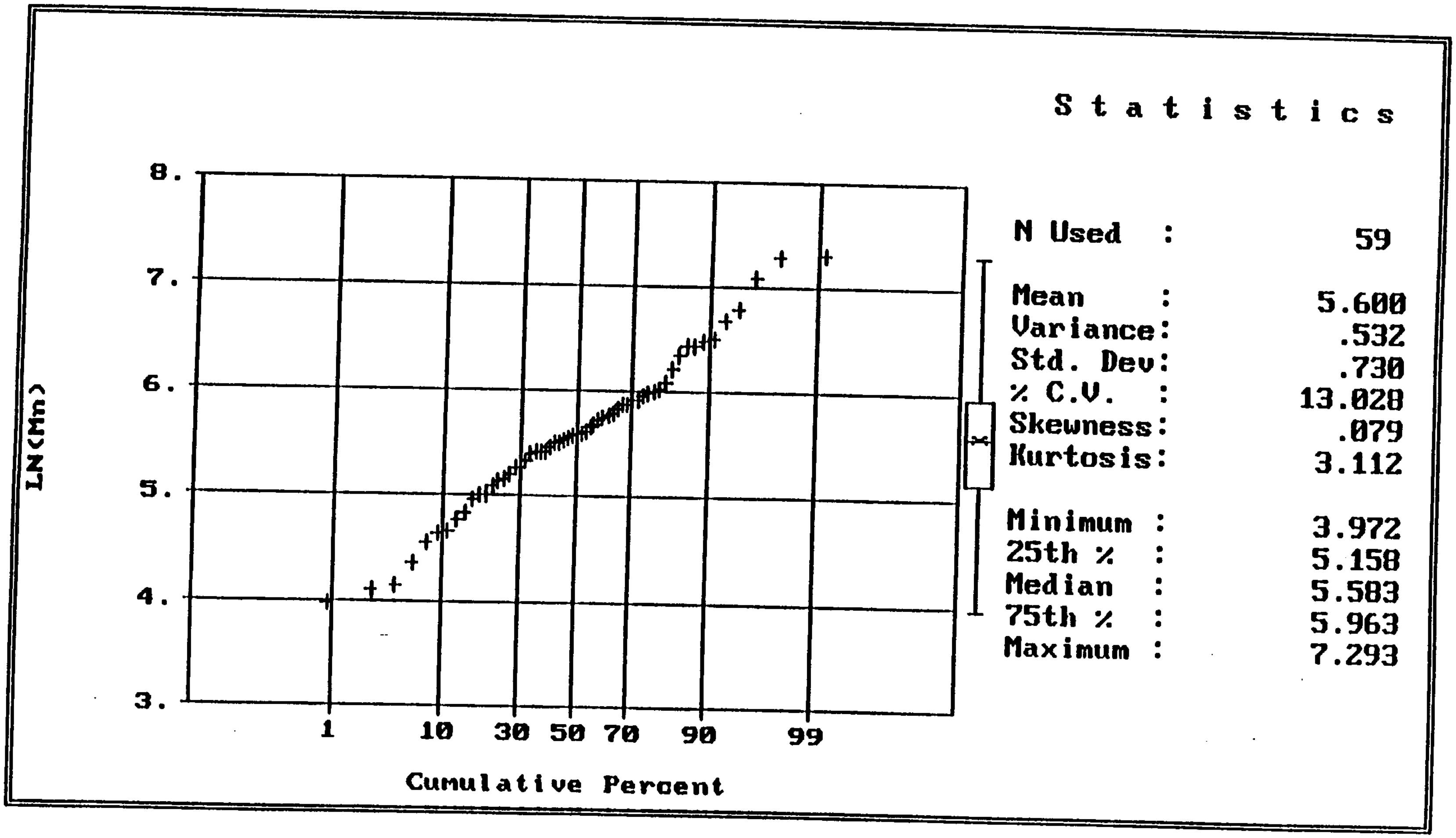


Statistics

N Used :	57
Mean :	2.465
Variance :	.825
Std. Dev :	.908
% C.V. :	36.844
Skewness :	.736
Kurtosis :	3.740
Minimum :	.642
25th % :	1.953
Median :	2.251
75th % :	3.006
Maximum :	5.170

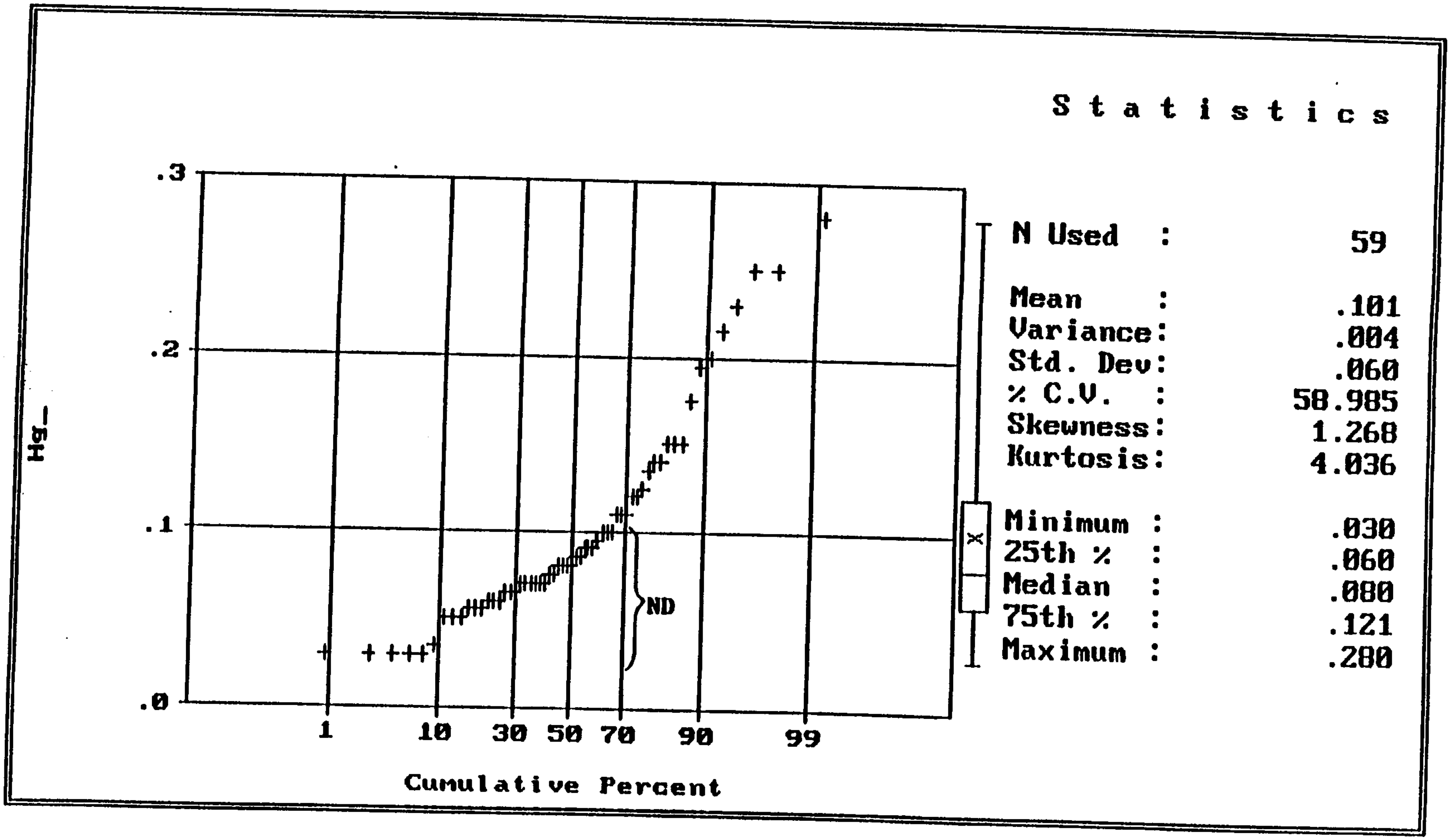
Note: The data set distribution is lognormal.

FIGURE 13: PROBABILITY PLOT OF MANGANESE CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



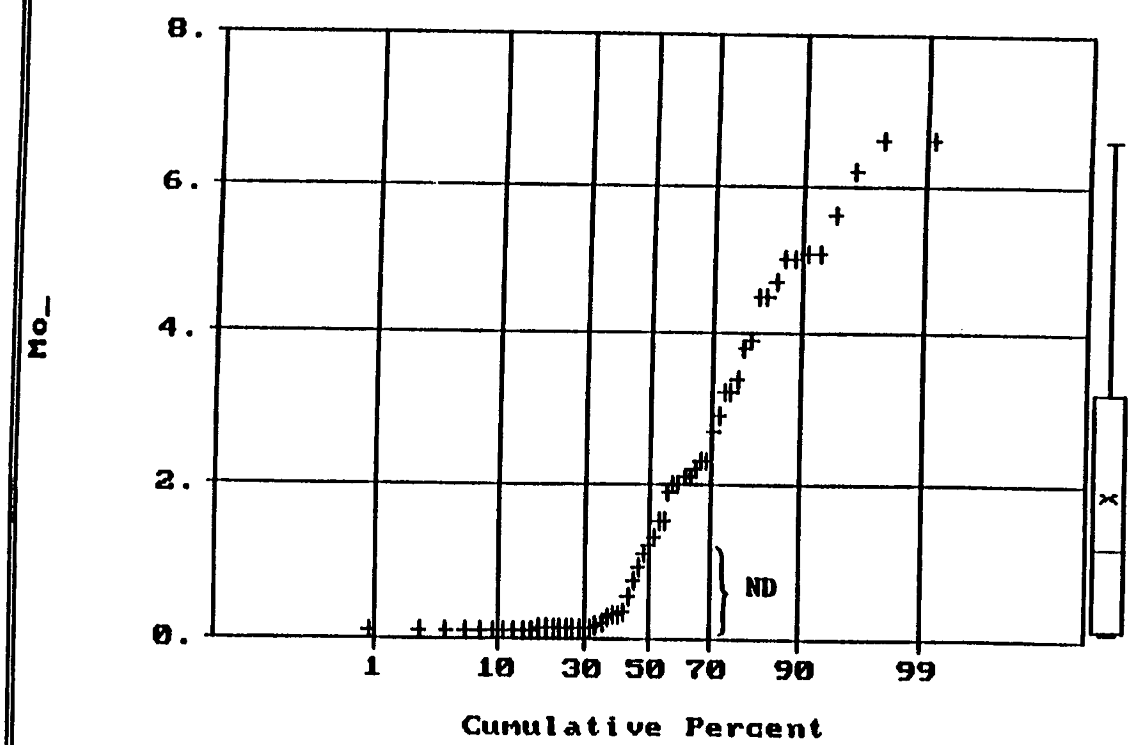
Note: The data set distribution is lognormal.

FIGURE 14: PROBABILITY PLOT OF MERCURY CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



Note: The data set distribution is nonparametric.

FIGURE 15: PROBABILITY PLOT OF MOLYBDENUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES WPNSTA CONCORD

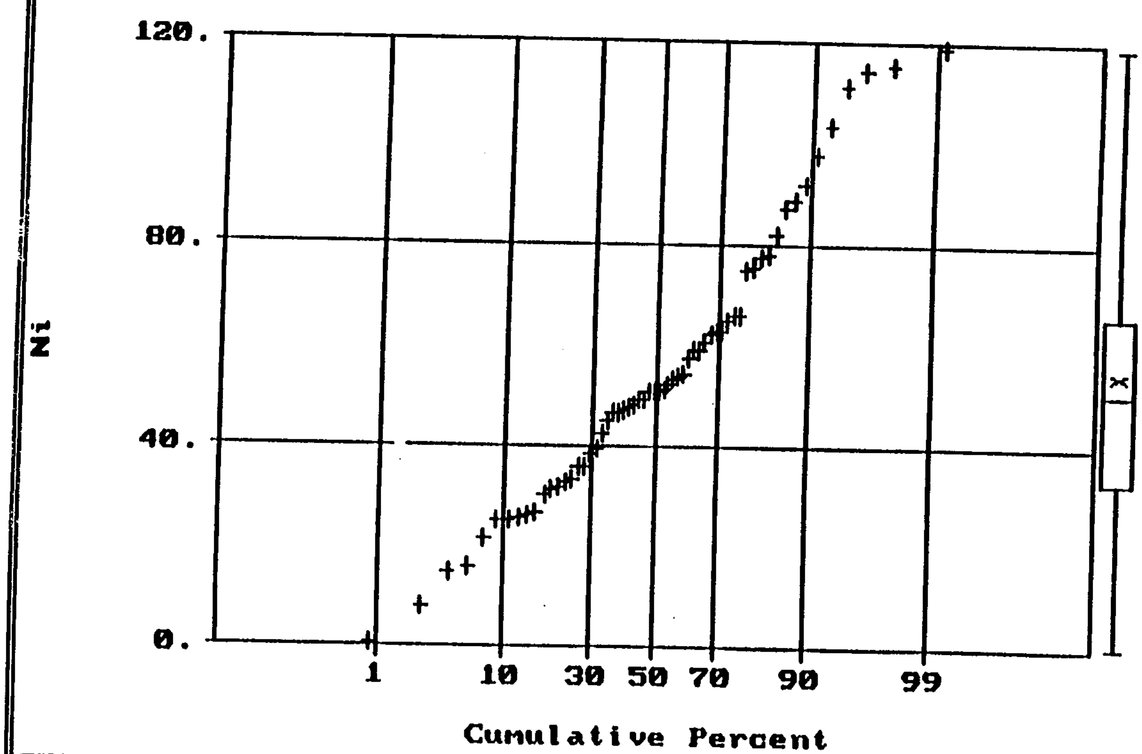


Statistics

N Used	:	59
Mean	:	1.889
Variance	:	4.061
Std. Dev	:	2.015
% C.V.	:	106.687
Skewness	:	.874
Kurtosis	:	2.506
Minimum	:	.090
25th %	:	.115
Median	:	1.200
75th %	:	3.200
Maximum	:	6.600

Note: The data set distribution is nonparametric.

FIGURE 16: PROBABILITY PLOT OF NICKEL CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD

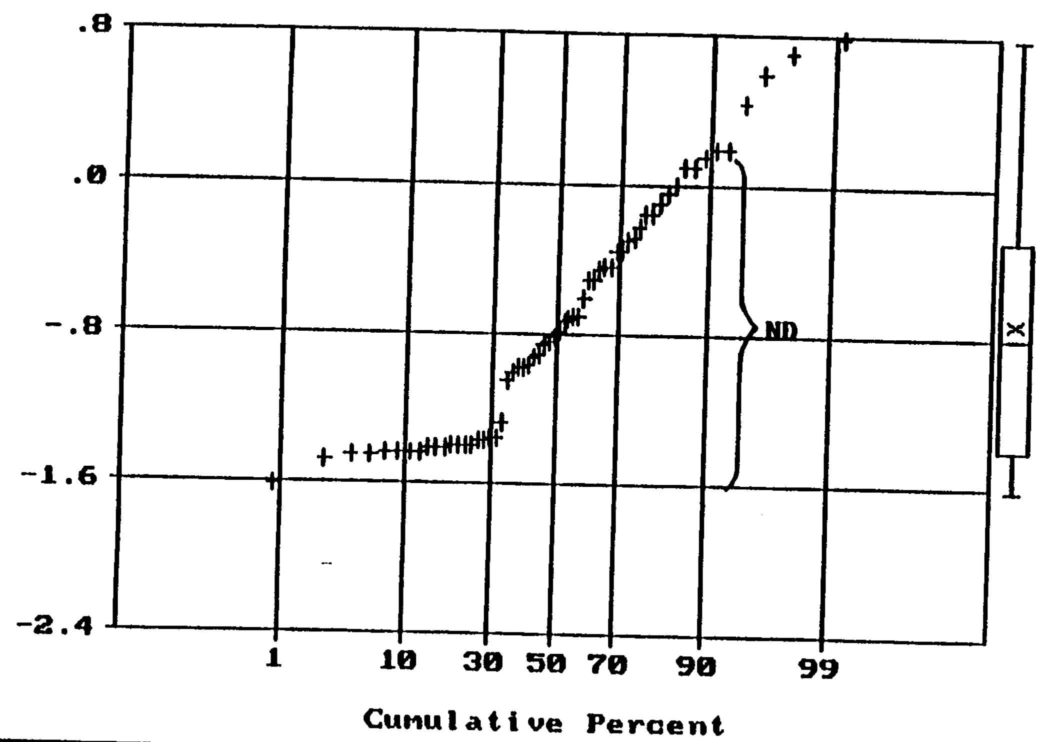


Statistics

N Used :	60
Mean :	54.515
Variance :	740.197
Std. Dev :	27.207
% C.V. :	49.906
Skewness :	.543
Kurtosis :	2.932
Minimum :	.330
25th % :	33.000
Median :	50.900
75th % :	66.100
Maximum :	119.000

Note: The data set distribution is normal.

FIGURE 17: PROBABILITY PLOT OF THALLIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES WPNSTA CONCORD

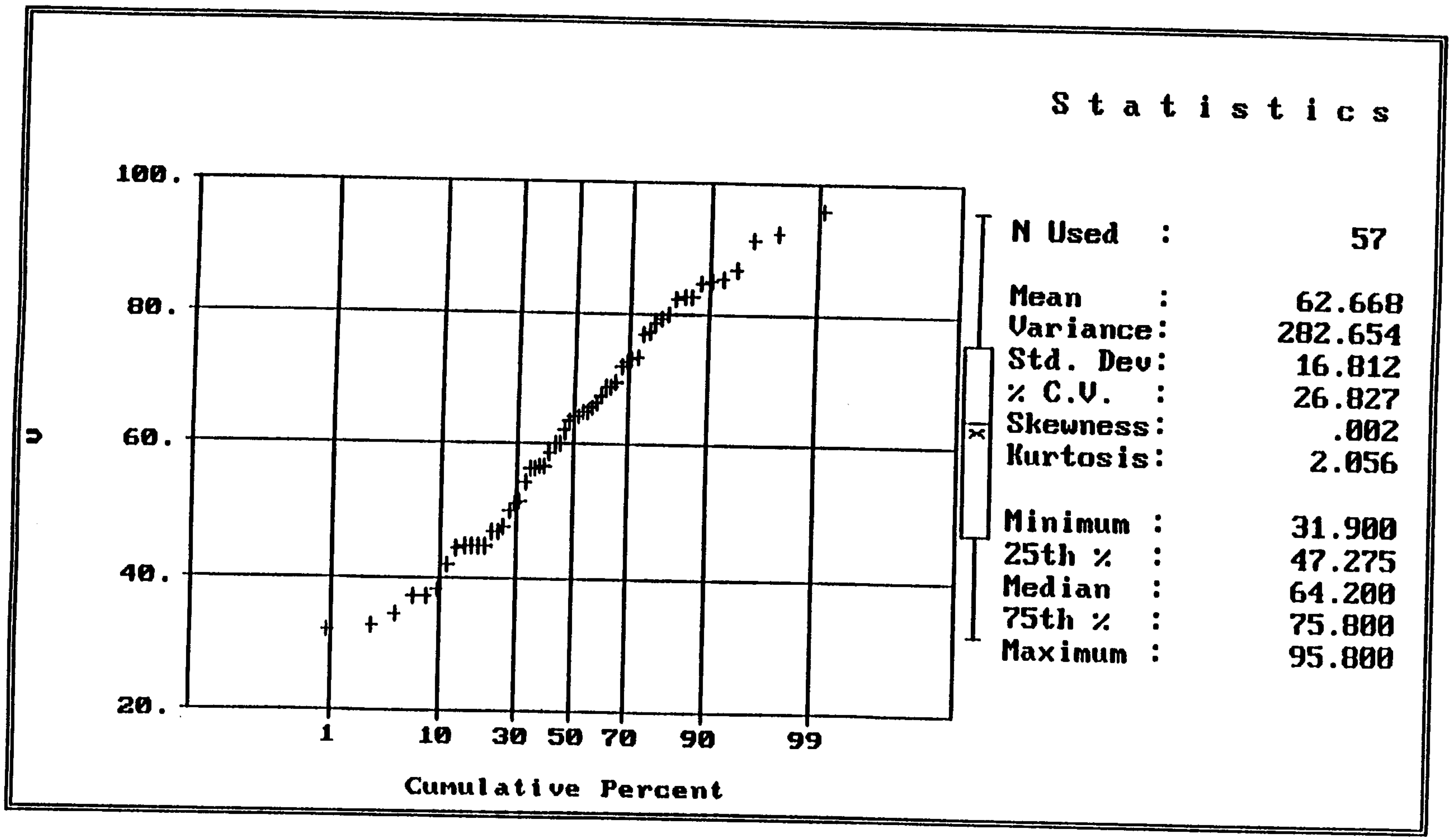


Statistics

N Used :	60
Mean :	-.713
Variance:	.411
Std. Dev:	.641
% C.V. :	89.863
Skewness:	.497
Kurtosis:	2.264
Minimum :	-1.609
25th % :	-1.386
Median :	-.799
75th % :	-.288
Maximum :	.788

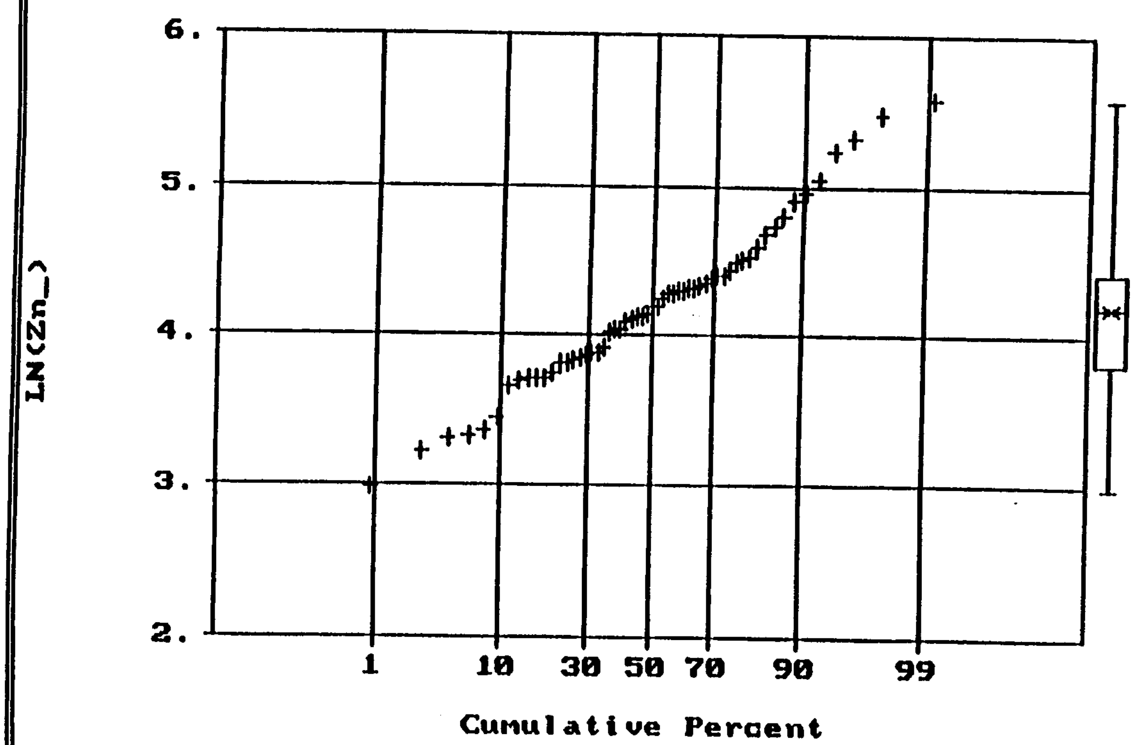
Note: The data set distribution is nonparametric.

FIGURE 18: PROBABILITY PLOT OF VANADIUM CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



Note: The data set distribution is normal.

FIGURE 19: PROBABILITY PLOT OF ZINC CONCENTRATIONS IN SOILS OF THE TIDAL AREA SITES
WPNSTA CONCORD



Statistics

N Used :	57
Mean :	4.193
Variance:	.304
Std. Dev:	.551
% C.V. :	13.139
Skewness:	.370
Kurtosis:	3.161
Minimum :	2.991
25th % :	3.822
Median :	4.188
75th % :	4.424
Maximum :	5.576

Note: The data set distribution is lognormal.

TABLES

TABLE 1. AMBIENT METALS CONCENTRATIONS IN SUBSURFACE SOILS OF THE TIDAL AREA SITES. NAVAL WEAPONS STATION CONCORD

Metal	Number of Detections/ Samples Analyzed	Values Excluded		Ambient Data Set Size[a]	Ambient Data Set Distribution	Soil Metal Concentration Statistics for Ambient Data Sets (mg/kg)						U.S. EPA PRG[g] (mg/kg)	ERM[l] (mg/kg)	RWQCB Sediment Screening Criterion[n] (mg/kg)
		Too Low	Too High			Minimum Detected[b]	Maximum Detected[c]	Mean	Standard Deviation	Coefficient of Variance	80% LCL on 95th p[e] (Ambient Limit)			
Aluminum	61/61	0	0	61	Normal	82.2	27300	15, 184.5	6615.6	0.44	**26000**	77000	N/A	N/A
Antimony	13/50	2	2	46	Nonparam.	0.6	2.2	0.7[d]	N/A	N/A	**1.7**	31	N/A	N/A
Arsenic	51/61	2	2	57	Lognormal	2.3	40.1	9.7	9.3	0.41	**24**	0.38	70	33
Barium	61/61	1	1	59	Lognormal	18.5	529.0	111.6	109.8	0.19	**300**	5300	N/A	N/A
Beryllium	6/61	0	0	61	Nonparam.	0.11	0.18	0.04[d]	N/A	N/A	**0.12**	0.14	N/A	N/A
Cadmium	6/61	0	1	61	Nonparam.	0.2	1.9	0.05[d]	N/A	N/A	**0.29**	9.0[h]/38	9.6	5
Chromium	57/61	0	0	61	Normal	11.2	95.2	47.3	24.4	0.51	**81**	210[j]	370	220
Cobalt	59/61	2	2	57	Lognormal	1.7	35.6	12.7	8.1	0.24	**24**	4600	N/A	N/A
Copper	56/61	1	0	60	Lognormal	8.8	80.6	33.7	17.2	0.14	**59**	2800	270	90
Lead	58/61	2	2	57	Lognormal	1.9	176.0	17.8	20.1	0.37	**61**	130[h]/400	218	50
Manganese	61/61	1	1	59	Lognormal	4.3	1,470.0	352.8	295.7	0.13	**840**	3,200	N/A	N/A
Mercury	20/60	0	1	59	Nonparam.	0.07	0.28	0.08[d]	N/A	N/A	**0.22**	23[j]	0.71	0.35
Molybdenum	31/61	0	2	59	Nonparam.	0.35	6.6	1.2[d]	N/A	N/A	**5.4**	380	N/A	N/A
Nickel	61/61	0	1	60	Normal	0.3	119.0	54.5	27.2	0.49	**107**	150[h]/1,500	51.6	140
Selenium	2/61	0	0	61	Nonparam.	4.8	5.3	0.7[d]	N/A	N/A	**DL[f]**	380	1.4[m]	0.7
Silver	0/61	0	0	61	Nonparam.	N/A	N/A	0.12[d]	N/A	N/A	**DL[f]**	380	3.7	1
Thallium	6/61	0	1	60	Nonparam.	0.64	2.2	0.45[d]	N/A	N/A	**1.4**	5.4[k]	N/A	N/A
Vanadium	61/61	2	2	57	Normal	31.9	95.8	62.7	16.8	0.27	**86**	540	N/A	N/A
Zinc	56/61	1	3	57	Lognormal	27.5	264.0	77.1	45.9	0.13	180	23000	410	160

Notes:

a The ambient data set consists of both detected and nondetected results. Nondetected results are represented by values of one half the detection limit. The data set excludes anomalously low and high values.

b Minimum detected concentration in ambient data set, after exclusion of anomalously low values.

c Maximum detected concentration in ambient data set, after exclusion of anomalously high values.

d Mean values for nonparametric distributions were estimated as the 50th percentile of the distribution.

e Results were rounded to two significant figures.

f The ambient limit was set at the detection limit.

g U.S. Environmental Protection Agency (EPA) preliminary remediation goals (PRG) for residential use (September 1995).

h Cal-Modified PRG (EPA 1995).

i Represents the total chromium PRG, which assumes a 1/6 ratio of chromium VI/chromium III.

j Represents the mercuric chloride PRG.

k Represents the thallic oxide PRG.

l Effects-range median (ERM) (Long and others 1995).

m Sediment Screening Criteria for Wetlands Creation Noncover, from "Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse" (Regional Water Quality Control Board [RWQCB] 1992).

n Sediment Screening Criteria for Wetlands Creation Cover, from "Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse" (Regional Water Quality Control Board [RWQCB] 1992).

DL Detection limit.

N/A Not available.

APPENDIX E

SOIL BORING AND WELL CONSTRUCTION LOGS

APPENDIX A

TABLE OF CONTENTS

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: 45.34 ft. MSL
DATE DRILLED: 21-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS009	0.0	PUSH		ML	FILL (af) SILT (ML), very dark gray (2.5Y 3/1), low plasticity, damp, medium stiff, trace very fine-grained sand and root material Color change to light olive brown (2.5Y 5/3), wet @ 3 ft. bgs Moist @ 4.5 ft. bgs
		SS010	0.0	PUSH			Damp @ 5.5 ft. bgs COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff Water measured @ 8.4 ft. bgs
10		SS011	0.0	PUSH			
		SS012	0.0	PUSH			Wet @ 14.5 ft. bgs
							T.D. of boring @ 16.0 feet
20							
30							

??(??)(??-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: 46.15 ft. MSL
DATE DRILLED: 21-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	FILL (af) SILT (ML), very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/4), mottled, low plasticity, moist, medium stiff, trace pockets of very fine-grained sand and root material Trace strong brown (7.5YR 6/4) iron-oxide spotting @ 3.5 ft. bgs
		SS006	0.0	PUSH			COLLUVIUM (Qco)
						SM	SILTY SAND (SM), dark yellowish brown (10YR 4/4), very fine-grained sand, poorly graded, moist, medium dense Water measured @ 5.9 ft. bgs
10		SS007	0.0	PUSH			
						ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff
		SS008	0.0	PUSH			Wet @ 15.5 ft. bgs
							T.D. of boring @ 16.0 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: 46.25 ft. MSL
DATE DRILLED: 20-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	FILL (af) CLAYEY SILT (ML), very dark brown (7.5YR 2.5/2), medium plasticity, moist, medium stiff, with trace root material. Water measured @ 3 ft. bgs. Color change to dark brown (10YR 3/3) and dark yellowish brown (10YR 4/6), mottled, with trace very fine-grained sand @ 3 ft. bgs
	■	SS001		PUSH			COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6) and light olive brown (2.5Y 5/3), mottled, low plasticity, very fine-grained sand, poorly graded, moist, medium stiff. Color change to yellowish brown (10YR 5/6) @ 8.5 ft. bgs, with pockets of medium-grained sand
10	■	SS002		PUSH			Minus pockets of medium-grained sand @ 10.5 ft. bgs
	■	SS003		PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, wet, medium dense, with trace clay
							T.D. of boring @ 16.0 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS013	2.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), very dark dray (10YR 3/1), low plasticity, very fine-grained sand, damp, stiff. Color grades to yellowish brown (10YR 5/4), trace calcite nodules. Color change to strong brown (1.5YR 5/6), minus nodules
10		SS014	3.0	PUSH			
		SS015	4.4	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 5/6), very fine-grained sand, poorly graded, moist, dense
							T.D. of boring @ 15.0 feet
20							
30							

* Field screening Analytical Results

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R.Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, damp, stiff, with trace very fine-grained sand
		SS016	11.3	//			
							COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6) and dark gray (5Y 4/1), mottled, low plasticity, very fine-grained sand, damp, stiff Moderate petroleum odor Trace medium-grained sand Moist, minus petroleum odor
10		SS017	28.1	//			
		SS018	5.7	//			
							T.D. of boring @ 15.0 feet
20							
30							

??(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
01-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 01
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							GRAVEL SURFACE
		SS019	59.6	//		ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, dry, stiff, with little subangular and subrounded gravel
						GW	FILL (af) GRAVEL (GW), light brownish gray (10YR 6/2), angular to subangular, well graded, dry, loose, with trace silt and very fine-grained sand
10		SS020	89.0	//		ML	FILL (af) GRAVELLY SILT (ML), yellowish brown (10YR 5/6), low plasticity, subangular well-graded gravel, dry, stiff, with trace very fine-grained sand
							T.D. of boring @ 13.0 feet
20							
30							

??????(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 41.05 ft. MSL
DATE DRILLED: 11-APR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: J. GOULD	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS017		//		CL	FILL (af) SANDY CLAY (CL), brown (5YR 3/4), trace very fine-grained sand, medium to high plasticity, slightly moist Cables and battery @ .3 to 1.5 ft bgs, with some staining.
		SS018		//			FILL (af) CLAY (CL), yellowish brown (10YR 5/4) with light gray (5Y 8/1) and olive (5Y 4/1) mottling, dry to slightly moist. Saturated @ 2.5 ft.
							T.D. of boring @ 3.5 feet
10							
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 42.61 ft. MSL
DATE DRILLED: 21-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS004		//		CL	ALLUVIUM (Qal) CLAY (CL) with trace gravel, (5YR 2.5/1), medium stiff, high plasticity, moist. ALLUVIUM (Qal) CLAY (CL) with trace sand and silt, (10YR 4/4), stiff, medium plasticity, damp.	
		SS005		//			Becoming saturated @ 4.5 ft.	
							T.D. of boring @ 5.0 feet	
10								
20								
30								

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 43.77 ft. MSL
DATE DRILLED: 21-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS001		//		CL	ALLUVIUM (Qal) CLAY (CL), (5YR 2.5/1), medium stiff, high plasticity, moist. ALLUVIUM (Qal) CLAY (CL) with trace sand, (10YR 4/4), stiff, medium plasticity, damp.	
		SS006		//				
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 44.08 ft. MSL
DATE DRILLED: 21-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS002		//		CL	ALLUVIUM (Qal) CLAY (CL), black (5YR 2.5/1), high plasticity, moist, medium stiff with trace gravel Color change to dark yellowish brown (10YR4/4), medium plasticity, damp, stiff, with trace sand @ 2 ft. bgs	
		SS003		//				
							T.D. of boring @ 4.5 feet	
10								
20								
30								

??????(??-???)??????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 47.75 ft. MSL
DATE DRILLED: 22-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
	⊠	SS007		//		CL	ALLUVIUM (Qal) CLAY (CL), with a few pebbles, (10YR 3/3), spotting, medium stiff, high plasticity, moist. ALLUVIUM (Qal) CLAY (CL) with trace pebbles and rootlets, (10YR 3/1), stiff, high plasticity, moist.	
	⊠	SS008		//				
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 48.44 ft. MSL
DATE DRILLED: 22-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS009		//		CL	ALLUVIUM (Qal) CLAY (CL) with a few pebbles and rootlets, (10YR 3/3), spotting, medium stiff, high plasticity, damp.	
		SS010		//			ALLUVIUM (Qal) CLAY (CL) with some rootlets, (10YR 3/1), medium stiff, high plasticity, moist.	
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 52.86 ft. MSL
DATE DRILLED: 23-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS014	0.0	PUSH		ML	ASPHALT and BASEROCK (0.25 ft. thick) COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff
		SS015	0.0 0.0	//			Very dark grayish brown (10YR 3/2) spotting @ 4.5 ft.
							T.D. of boring @ 6.0 feet
10							
20							
30							

??(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: 52.73 ft. MSL
DATE DRILLED: 23-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS012	0.0 0.0	PUSH		ML	ASPHALT (3 in. thick) COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6), low plasticity, fine to very fine-grained sand, poorly graded, moist, medium stiff with trace pebbly gravel Wet @ 5 ft.
		SS013	0.0	PUSH			
							T.D. of boring @ 6.0 feet
10							
20							
30							

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

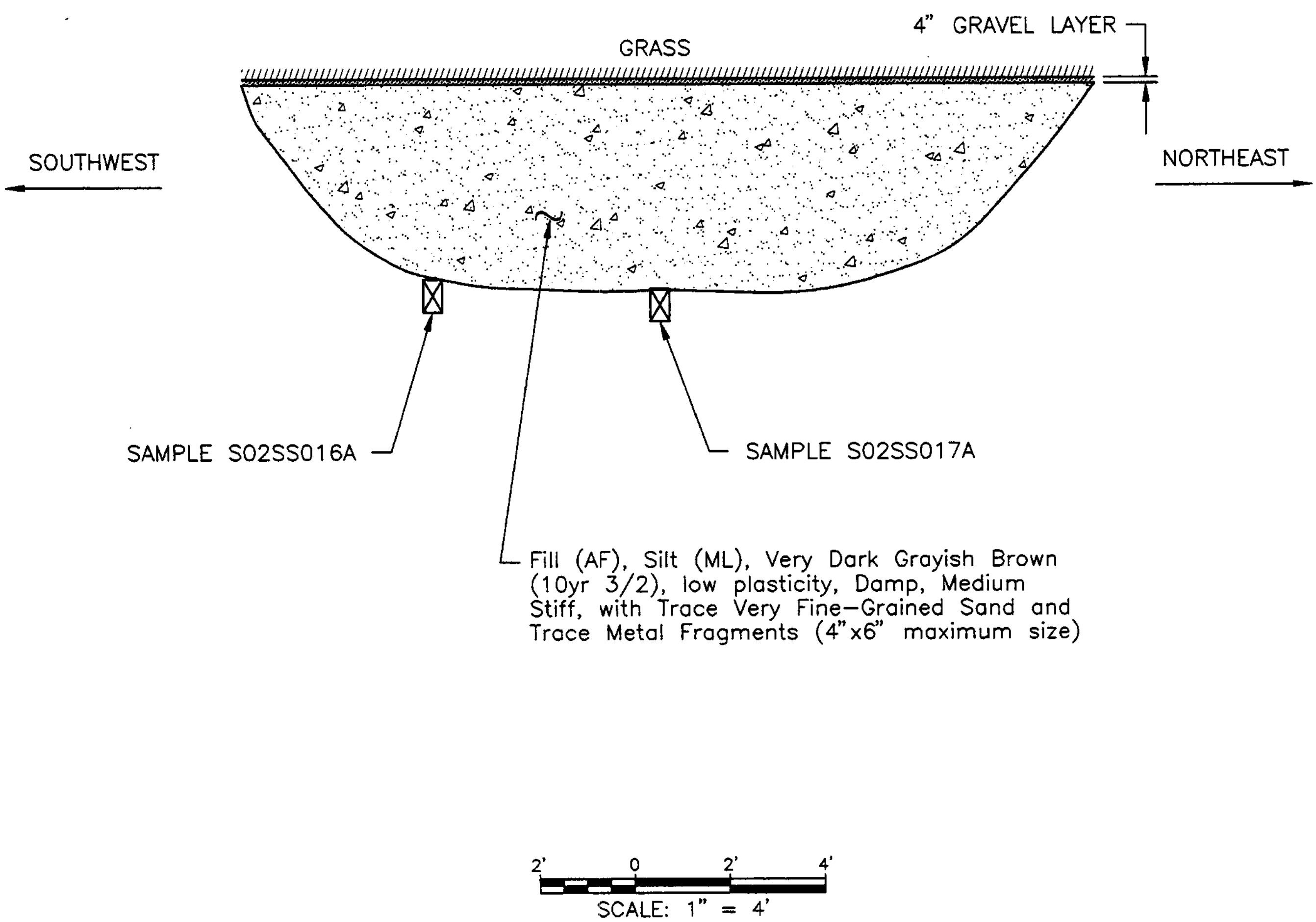
* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF TRENCH EXCAVATION
02-09

PROJECT: WPNSTA CONCORD RFI Confirmation Study	LOCATION: SWMU-2
PROJECT NO.: 044-0283	EXCAVATION METHOD: BACKHOE
DATE EXCAVATED: 27-APR-95	
LOGGED BY: R. VERNIMEN	

TEST TRENCH 02-09



KCH (SF) (044-0283) TRCH0209- 07/01/96 - PLOT 1=4 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-10

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS019	0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, dry, stiff, with trace root material
		SS020	0.0	PUSH			Trace fine- and medium-grained sand
		SS021	0.0				COLLUVIUM (Qco) SILT(ML), very dark brown (10YR 2/2), low plasticity, damp, stiff, with little very fine-grained sand
10							Rod driven from 8 to 26 ft. bgs to encounter water
20							
							T.D. of boring @ 26.0 feet
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-11

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS022	0.0	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, low plasticity, dry, stiff, with trace calcite nodules
		SS023	0.0	//			Change to damp @ 4.0 ft. bgs
		SS024	0.0				COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/2), low plasticity, damp, stiff, with trace very fine-grained sand
							T.D. of boring @ 8.0 feet
10							
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-12

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS025	0.0	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, very fine-grained sand, dry, stiff, with trace root material
		SS026	0.0	//			COLLUVIUM (Qco) SILT (ML), very dark brown (10YR 2/2), low plasticity, damp, very stiff
		SS027	0.0	//			COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, very fine-grained sand, damp, stiff
						SM	COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/6) with gray (10YR 5/1) spotting, very fine-grained sand, poorly graded, damp, dense
10							T.D. of boring @ 8.0 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-13

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS028	0.0	//		ML	COLLUVIUM (Qco) SILT (ML), brown (10YR 4/3), low plasticity, dry, medium stiff, trace organic material
		SS029	0.0	//			COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4) with strong brown (7.5YR 5/6) mottling, low plasticity, very fine-grained sand, damp, stiff, with trace organic matter Color grades to very dark grayish brown (10YR 3/2)
		SS030	0.0				COLLUVIUM (Qco) SILT (ML), very dark gray (10YR 3/1), low plasticity, damp, very stiff, with trace very fine-grained sand
10							T.D. of boring @ 8.0 feet
20							
30							

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
02-14

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 02
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS031	0.0	//		ML	COLLUVIUM (Qco) SILT (ML), olive gray (5Y 4/2) with light brown (2.5Y 5/3) spotting, low plasticity, dry, stiff with trace organic matter
		SS032	0.0	//			COLLUVIUM (Qco) SANDY SILT (ML), very dark gray (7.5YR 3/1), low plasticity, very fine-grained sand, dry, stiff
		SS033	0.0	//			COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6) with light gray (10YR 7/2) mottling, very fine-grained sand, poorly graded, damp, dense
							T.D. of boring @ 17.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 60.12 ft. MSL
DATE DRILLED: 10-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	ASPHALT (3 in. thick) FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff
		SS027		5/7/9			
10		SS028		4/10/13			Color change to dark yellowish brown (10YR 4/6) @ 10 ft. bgs, stiff COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6) with minor black (2.5Y 2.5/1) speckling, low plasticity, very fine-grained sand, poorly graded, moist, stiff Water level @ 14.75 ft. bgs Hydropunch sample from 25 to 29 ft. bgs
		SS029		6/13/20			
20		SS030		6/12/16			
30							T.D. of boring @ 29.0 feet

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 60.5 ft. MSL
DATE DRILLED: 02-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
							ASPHALT	
		SS007		3/6/8		ML	CLAYEY SILT (ML), (2.5Y 4/2), low plasticity, damp, stiff Color change to gray (2.5Y 5/1) and olive brown (2.5Y 5/3), mottled SILT (ML), brown (7.5YR 5/4), low to medium plasticity, dry, stiff, very uniform	
10		SS008		5/13/18				
		SS009		6/9/17			Minor very fine-grained sand, low plasticity, dry, hard, with linear white (5YR 8/1) mottles @ 15.5 ft. bgs Water level measured @ 24.5 ft. bgs Color change to (10YR 6/4) with linear white mottles @ 25 ft. bgs, low plasticity, dry, hard Hydropunch sample @ 30.5 ft. bgs	
20		SS010		6/10/24				
		SS011						
30							T.D. of boring @ 30.5 feet	

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 59.74 ft. MSL
DATE DRILLED: 08-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
0							ASPHALT (~9 in.)
						SM	FILL (af) SILTY SAND (SM), dark yellowish brown (10YR 4/6), very fine-grained sand, poorly graded, moist, medium dense Steel bar (rebar) @ 3 ft. bgs, no concrete
5		SS020	0.0 0.0	2 2 3		ML	COLLUVIUM (Qco) SANDY SILT (ML), olive brown (2.5Y 4/3), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff with moderate petroleum odor No petroleum odor Color change to dark yellowish brown (10YR 4/6) @ 10 ft. bgs, damp, stiff Water level measured @ 18.2 ft. bgs COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), medium plasticity, very fine-grained sand, poorly graded, wet, medium stiff, with little clay Color change to yellowish brown (10YR 5/6) @ ft. bgs
10		SS021	0.0 0.0	6 13 16			
15		SS022	0.0 0.0	5 11 17			
20		SS024	0.0 0.0	8 15 24			
27							Hydropunch sample @ 27 to 29.5 ft. bgs
30							T.D. of boring @ 29.5 feet

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 58.75 ft. MSL
DATE DRILLED: 06-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						GP	GRAVEL (GP)
						CL	SILTY CLAY (CL), dark gray (10YR 3/1), high plasticity, medium stiff, moist, uniform, slight hydrocarbon odor Color change to dark brown (10YR 3/3) @ 5.5 ft. bgs, low plasticity, damp to moist, trace subrounded fine-grained sand and gravel with black staining
						ML	SANDY SILT (ML), yellowish brown (10YR 4/6), low plasticity, dry, uniform, very fine-grained sand, no odor CLAYEY SILT (ML), yellowish brown (10YR 4/4), dry, low plasticity, medium stiff, trace rounded gravel, no odor Water level measured @ 23.4 ft. bgs Becomes saturated @ 24.0 feet bgs and Hydropunch sample from 24.0 to 29.0 feet bgs
		SS013		3 / 5 / 10			
10		SS014		5 / 13 / 19			
		SS016		6 / 11 / 15			
20		SS017					
							T.D. of boring @ 29.0 feet
30							

* Field screening Analytical Results

SHEET: 1 of 1

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 58.84 ft. MSL
DATE DRILLED: 28-FEB-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS003	0.0	14 5 5		CL	ASPHALT (2 in. thick) FILL (af) SILTY CLAY (CL), yellowish brown (10YR 5/4), moist, medium plasticity, medium stiff, trace fine-grained gravel with olive brown mottling	
		SS004	0.0	3 3 3			FILL (af) GRAVELLY CLAY (CL), very dark gray (2.5Y 3/1), high plasticity, medium stiff, moist, with trace subangular gravel	
							T.D. of boring @ 6.5 feet	
10								
20								
30								

* Field screening Analytical Results

SHEET: 1 of 1

??????(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 58.66 ft. MSL
DATE DRILLED: 28-FEB-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS005		16 5 5		CL	ASPHALT (2 in. thick) FILL (af) SILTY CLAY (CL), yellowish brown (10YR 4/4) and dark gray (10YR 4/1), mottled, medium plasticity, medium stiff, moist to damp, trace subrounded, fine-grained gravel and coarse-grained sand
		SS006		2 3 3			FILL (af) GRAVELLY CLAY (CL), dark grayish brown (10YR 4/2) to brownish yellow (10YR 6/6), mottled, high plasticity, soft, trace subangular to subrounded, coarse-grained gravel
							T.D. of boring @ 6.5 feet
10							
20							
30							

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 60.71 ft. MSL
DATE DRILLED: 28-FEB-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS001	0.0	//		SM	ASPHALT COLLUVIUM (Qco) SILTY SAND (SM), light olive brown (2.5Y 5/4), very fine-grained sand, poorly graded, damp, medium dense Trace yellowish brown (10YR 5/6) spotting @ 4.0 ft. bgs
		SS002	0.0				
							T.D. of boring @ 5.0 feet
10							
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
05-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 05
PROJECT NO.: 044-0283	SURFACE ELEVATION: 59.91 ft. MSL
DATE DRILLED: 17-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS034	0.0	PUSH		SM	ASPHALT (ac) approximately 6-inches thick. COLLUVIUM (Qco) SILTY SAND (SM), light olive brown (2.5Y 5/4), sand is very fine-grained, poorly graded, medium dense, damp. Color change to trace yellowish brown (10YR 5/6) spotting.
5		SS035		PUSH			
							T.D. of boring @ 5.0 feet
10							
20							
30							

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 61.9 ft. MSL
DATE DRILLED: 17-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS028	0.0	//		SM	ASPHALT COLLUVIUM (Qco) SILTY SAND (SM), light olive brown (2.5Y 5/4), very fine-grained sand, poorly graded, damp, medium dense
		SS029	0.0	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff
							T.D. of boring @ 6.0 feet
10							
20							
30							

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 62.46 ft. MSL
DATE DRILLED: 03-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT
		SS019	0.0	6 6 5		ML	SANDY SILT (ML), yellow brown (10YR 5/4), low plasticity, dry, soft, very fine-grained sand, poorly graded, loose, very uniform, unconsolidated
						CL	SILTY CLAY (CL), very dark gray (5YR 3/1), medium plasticity, moist, stiff, very uniform
		SS020	1.5	5 7 10		ML	SANDY SILT (ML), pink (5YR 7/4) and yellowish brown (10YR 5/4), mottled, low plasticity, damp, stiff, very fine-grained sand, poorly graded, mottles show linear patterns
							T.D. of boring @ 6.5 feet
10							
20							
30							

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 62.51 ft. MSL
DATE DRILLED: 03-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS027		PUSH		SM	ASPHALT (6 in.) FILL (af) SILTY SAND (SM), yellowish brown (10YR 6/6), very fine-grained, poorly graded, dry, medium dense, loose, very uniform
						GW	FILL (af) GRAVEL (GW), reddish brown clay matrix, subangular to subrounded, well graded Refusal @ 2.5 ft., hit plastic
							T.D. of boring @ 2.5 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 62.38 ft. MSL
DATE DRILLED: 03-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT
		SS026	0.0	7 4 5		SM ML	SILTY SAND/SANDY SILT (SM/ML), yellowish brown (10YR 5/6), low plasticity, hard, very fine-grained, poorly graded, dry, dense
						GW	Water level measured @ 4 ft. bgs GRAVEL
							T.D. of boring @ 4.5 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 62.19 ft. MSL
DATE DRILLED: 03-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT
		SS025	0.0	5/5/6		ML/SM	SANDY SILT/SILTY SAND (ML/SM), yellowish brown (10YR 5/8), low plasticity, dry, hard, very fine-grained sand, poorly graded, dense, dry
							Refusal @ 3.5 ft., hit pipe or metal surface
							T.D. of boring @ 3.5 feet
10							
20							
30							

???(??)(???-????)????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 62.21 ft. MSL
DATE DRILLED: 03-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT
						ML	SANDY SILT (ML), strong brown (7.5YR 5/6), with linear white mottles, low plasticity, dry, hard, very fine-grained sand, poorly graded, very uniform Changes to damp, stiff, loose @ 10 ft. bgs
		SS021	4.9	4/10/15			
10		SS022	5.4	4/9/12			
							Water level measured @ 13.64 ft. bgs
						SM	SILTY SAND (SM), strong brown (7.5YR 4/6), very fine-grained sand, poorly graded, wet, loose to medium dense, unconsolidated
		SS023	3.2	3/5/8			
							T.D. of boring @ 16.5 feet
20							
30							

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 61.15 ft. MSL
DATE DRILLED: 02-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: Kay Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (12 in.) over BASEROCK (6 in.)
						ML/SM	SANDY SILT (ML/SM), (2.5Y 5/4), low plasticity, dry, loose, very fine-grained sand, poorly graded, slight petroleum odor
		SS013	0.0	2/4/6		CL/ML	SILTY CLAY/CLAYEY SILT (CL/ML), (2.5Y 2.5/1), high plasticity, medium stiff, dry to damp, very uniform, petroleum odor
10		SS014	0.0	4/13/17		ML	SANDY SILT (ML), (5Y 4/1), medium plasticity, dry, stiff, very fine-grained sand, poorly graded, very uniform, petroleum odor CLAYEY SILT (ML), (5Y 4/2) and (5Y 5/1), mottled, medium plasticity, damp, stiff to hard, strong petroleum odor, minor very fine-grained sand, very uniform Color change to olive (5Y 4/3) and gray (5Y 4/1) @ 20 ft. bgs, low plasticity, dry, medium stiff, loose, with very strong petroleum odor
		SS015		4/15/17			
20		SS016		7/13/20			Static water level measured @ 22.7 ft. bgs SILTY CLAY (CL), olive (5Y 4/3) and gray (5Y 4/1), mottled, medium plasticity, dry to damp, medium stiff, loose, very uniform, very strong petroleum odor
		SS017		6/10/12		CL	Hydropunch sample @ 30.5 ft. bgs
30							
							T.D. of boring @ 30.5 feet

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 61.38 ft. MSL
DATE DRILLED: 01-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: Kay Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						CL	ASPHALT SILTY CLAY (CL), very dark gray (10YR 3/1), medium plasticity, damp to moist, hard, slight petroleum odor, trace fine-grained angular gravel
		SS006	0.0	PUSH			
10		SS007	0.0	PUSH		ML	CLAYEY SILT (ML), dark yellowish brown (10YR 4/6), low plasticity, dry, stiff to hard, very uniform, slight petroleum odor Color change to olive brown (2.5Y 4/4), mottled, dry to damp, hard, slight petroleum odor, few fine-grained sand Water level measured @ 18.3 ft. bgs
		SS008		PUSH			
20		SS009		7 13 18			SANDY SILT (ML), olive brown (2.5Y 4/3) and dark gray (2.5Y 4/1), mottled, low plasticity, dry to damp, hard, very fine-grained sand, medium petroleum odor SILTY SAND (SM), dark yellowish brown (10YR 4/4), low plasticity, poorly graded, very fine-grained sand, very uniform, loose, moist, no odor Wet @ 26 ft. bgs Hydropunch sample taken at 29 ft. bgs. Water level 29.2 measured @ time of drilling.
						SM	
		SS010		4 6 9			
30							T.D. of boring @ 30.5 feet

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-09

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: 61.78 ft. MSL
DATE DRILLED: 28-FEB-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: Kay Pannell	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	SOIL CLASS	GEOLOGIC DESCRIPTION
						ASPHALT
					SM	SAND (SM)
					ML	CLAYEY SILT (ML), dark grayish brown (2.5Y 4/2), low plasticity, stiff, damp
		SS001	0.0	6 / 12 / 41	SC	CLAYEY SAND (SC), dark yellowish brown (10YR 4/6), well graded, angular gravel, hard, dry to damp, compacted, mostly fine-grained sand
10		SS002	0.0	8 / 11 / 18	SP	SAND (SP), strong brown (7.5YR 5/6), poorly graded, fine-grained sand, trace clay and fine-grained gravel, loose, dry to damp, low plasticity
		SS003	0.0	7 / 14 / 17	SC	CLAYEY SAND (SC), yellowish brown (10YR 5/4) with gray (5Y 5/1) mottling, poorly graded, fine-grained sand, low plasticity, dense, dry to damp, trace fine-grained subrounded gravel
20		SS004	0.0	8 / 19 / 24	ML	CLAYEY SILT (ML), (10YR 5/4), low plasticity, dry to damp Color change to strong brown (7.5YR 5/6) @ 21 ft. bgs, hard very uniform, slight layering/stratification Color change to yellowish brown (10YR 5/4), medium to low plasticity, medium stiff, moist Water level measured @ 27.5 ft. bgs Hydropunch sample @ 30 ft. bgs
		SS005	0.0	5 / [illegible]		
30						
						T.D. of boring @ 31.5 feet

* Field screening Analytical Results

SHEET: 1 of 1

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-10

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (~2 in.) over BASEROCK (~3 in.)
		SS030	0.0	//		SM	COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/4), fine- to very fine-grained sand, poorly graded, damp, dense
		SS031	0.0	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, damp, stiff Trace clay @ 13 ft. bgs
		SS032	0.0	//			
10							
		SS033	0.0	//			T.D. of boring @ 15.0 feet
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-11

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (~2 in.) over BASEROCK (~3 in.)
		SS034	0.0	//		SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, dense
						ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, damp, stiff, with trace clay Changes to moist Rod driven to 30 ft. bgs to encounter water
10							
		SS035	1.3	//			
20							
30							T.D. of boring @ 30.0 feet

* Field screening Analytical Results

SHEET: 1 of 1

??(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-12

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (~3 in.) over BASEROCK (~3 in.)
						SM	COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/6), very fine-grained sand, poorly graded, damp, dense
						ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, damp, medium stiff, with little very fine-grained sand
							COLLUVIUM (Qco) SILTY SAND (ML), brown (7.5YR 4/4), low plasticity, damp, very fine-grained sand, stiff
							Color change to dark gray (5Y 4/1) and brown (7.5YR 4/4), mottled @ 18.0 ft. bgs, with moderate petroleum odor
10	■	SS037	1.6	//			Probe rod driven to 30.0 ft. bgs in an attempt to collect water
20	■	SS036	85.0	//			
							T.D. of boring @ 30.0 feet
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
07-13

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 07
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 12-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R.Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SM	ASPHALT (~3 in.) over BASEROCK (~4 in.) COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/6), fine- to very fine-grained sand, poorly graded, damp, dense
						ML	COLLUVIUM (Qco) SILT (ML), very dark brown (10YR 2/2), low plasticity, damp, stiff, with trace very fine-grained sand
							COLLUVIUM (Qco) SANDY SILT (ML), brown (7.5YR 4/4), low plasticity, damp, very fine-grained sand, stiff Changes to very stiff, with trace calcitic sand stringers Color changes to dark olive gray (5Y 3/2) and brown (7.5YR 4/4), mottled, moist, with moderate petroleum odor, minus calcite stringers
10		SS038	2.9	//			
		SS039	3.2	//			
20							
		SS040	4.5	//			
							T.D. of boring @ 30.0 feet
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
12-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 12
PROJECT NO.: 044-0283	SURFACE ELEVATION: 149.94 ft. MSL
DATE DRILLED: 16-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	FILL (af) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, moist, medium stiff, with trace clay and root material Trace gravel @ 2 ft. COLLUVIUM (Qco) GRAVELLY SILT (ML), strong brown (7.5YR 4/6) and gray (2.5Y 5/1), mottled, low plasticity, angular to subangular gravel, well graded, damp, medium stiff, with trace fine-grained sand Moist @ 11 ft. bgs Damp @ 14 ft. bgs
		SS003	0.0 0.0	PUSH			
10		SS004	0.0 0.0	PUSH			
		SS005	0.0	PUSH			T.D. of boring @ 15.5 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
12-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 12
PROJECT NO.: 044-0283	SURFACE ELEVATION: 150.41 ft. MSL
DATE DRILLED: 02-MAR-95	DRILLING METHOD: GEOPROBE/GEOSTAR
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
						ML	FILL (af) SANDY SILT (ML), very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4), mottled, low plasticity, very fine-grained sand, poorly graded, moist, medium stiff with trace roots Color change to very dark brown @ 3 ft.	
		SS001	0.0 0.0	PUSH			FILL (af) CLAYEY SILT (ML), dark yellowish brown (10YR 4/4), medium plasticity, moist, stiff with little very fine-grained sand	
10		SS002	0.0 0.0	PUSH			FILL (af) SANDY SILT (ML), dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/6), mottled, low plasticity, fine to very fine-grained sand, poorly graded, moist, medium stiff with little subangular gravel & few siltstone fragments No gravel and little clay @ 9.5 ft., wet Little siltstone fragments @ 11 ft.	
							T.D. of boring @ 12.0 feet	
20								
30								

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
12-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 12
PROJECT NO.: 044-0283	SURFACE ELEVATION: 149.87 ft. MSL
DATE DRILLED: 16-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) GRAVELLY SILT (ML), very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/6), mottled, low plasticity, angular to subrounded gravels, well graded, moist, medium stiff, with trace fine-grained sand. Color change to dark gray (2.5Y 4/1) gravel
		SS006	0.0 0.0	PUSH			
10		SS007	0.0 0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6) and olive brown (2.5Y 4/3), mottled, low plasticity, fine to very fine-grained sand, poorly graded, moist, medium stiff, with little gravel
		SS008		PUSH			COLLUVIUM (Qco) GRAVELLY SILT (ML), dark yellowish brown (10YR 4/6) with dark gray (2.5Y 4/1) gravels, low plasticity, angular to subangular gravel, well graded, moist, medium stiff with trace fine-grained sand
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
13-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 13
PROJECT NO.: 044-0283	SURFACE ELEVATION: 141.01 ft. MSL
DATE DRILLED: 04-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, moist, medium stiff, with trace root material and very fine-grained sand Trace siltstone fragments @ 2.5 ft. bgs COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff Damp @ 5 ft. bgs Stiff @ 6 ft. bgs
		SS001	0.0	PUSH			
10		SS002	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), light olive brown (2.5Y 5/4), very fine-grained sand, poorly graded, damp, dense Little medium-grained sand @ 11.5 ft. bgs
		SS003	0.0	PUSH		SP	COLLUVIUM (Qco) GRAVELLY SAND (SP), yellowish brown (10YR 5/6), with gray (10YR 5/1) gravel, fine-grained sand, poorly graded, angular to subrounded gravel, well graded, damp, dense
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
13-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 13
PROJECT NO.: 044-0283	SURFACE ELEVATION: 143.14 ft. MSL
DATE DRILLED: 04-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, fine- to medium-grained sand, well graded, moist, medium stiff, with trace subrounded gravel Wet @ 3.5 ft. bgs
		SS006	0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff, with trace clay
10		SS007	0.0	PUSH		SW	COLLUVIUM (Qco) GRAVELLY SAND (SW), pale brown (10YR 6/3), medium- to very fine-grained sand, well graded, angular to subrounded gravel, well graded, damp, dense
		SS008	0.0 0.0	PUSH			Color change to yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottled @ 15.5 ft. bgs
							T.D. of boring @ 16.5 feet
20							
30							

??????(??)(???-????)????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
13-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 13
PROJECT NO.: 044-0283	SURFACE ELEVATION: 144.35 ft. MSL
DATE DRILLED: 04-APR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
	■	SS004	0.0			GW	COLLUVIUM (Qco) SILTY GRAVEL (GW), gray (10YR 5/1), gravels with dark grayish brown (10YR 4/2) silt, angular to subrounded, poorly graded, damp, loose to medium stiff
	■	SS005	0.0			ML	COLLUVIUM (Qco) SILT (ML), dark grayish brown (10YR 4/2), medium plasticity, moist, medium stiff, with trace clay
							T.D. of boring @ 3.5 feet
10							
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
14-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 14
PROJECT NO.: 044-0283	SURFACE ELEVATION: 119.76 ft. MSL
DATE DRILLED: 28-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS001	0.0 0.0	PUSH		ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), medium plasticity, wet, medium stiff, with trace root material and very fine-grained sand Moist @ 2.5 ft. bgs COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, stiff
10		SS002	0.0 0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 5/6), very fine-grained sand, poorly graded, damp, medium dense
						GW	COLLUVIUM (Qco) SANDY GRAVEL (GW), brown (7.5YR 4/4) and gray (7.4YR 5/1), mottled, angular to subangular gravel, well graded, fine-grained sand, damp, dense
		SS003	0.0	PUSH		SP	COLLUVIUM (Qco) SAND (SP), strong brown (7.5YR 5/6), fine-grained sand, poorly graded, damp, dense
20							T.D. of boring @ 16.5 feet
30							

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
14-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 14
PROJECT NO.: 044-0283	SURFACE ELEVATION: 120.61 ft. MSL
DATE DRILLED: 28-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS004	0.0 0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML) with trace clay and root material, mottled dark brown (7.5YR 3/2) and strong brown (7.5YR 5/6), sand is very fine-grained in pockets, poorly-graded, low plasticity, medium stiff, moist 4-inch layer of angular to subangular gravel @ 4.5 ft. bgs Color change to strong brown (7.5YR 5/6) @ 5 ft. bgs, no gravel Decrease moisture content to damp	
10		SS005	0.0	PUSH		SP	COLLUVIUM (Qco) Poorly-graded SAND (SP), strong brown (7.5YR 4/6), sand is fine-grained, dense, moist	
		SS006	0.0	PUSH			COLLUVIUM (Qco) Poorly-graded GRAVELLY SAND (SP) with trace silt, strong brown (7.5YR 4/6) with gray (7.5YR 5/1) gravel, sand is very fine-grained, dense, damp	
							T.D. of boring @ 16.5 feet	
20								
30								

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
15-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 15
PROJECT NO.: 044-0283	SURFACE ELEVATION: 96.36 ft. MSL
DATE DRILLED: 07-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS003	0.0	PUSH		SP ML	COW MANURE and VEGETATION 3-inches thick GRAVELLY SAND (SP) 3-inches thick COLLUVIUM (Qco) CLAYEY SILT (ML), black (5Y 2.5/1), low plasticity, medium stiff, moist
		SS004	0.0	PUSH			COLLUVIUM (Qco) SILT (ML), olive gray (5Y 4/2) with light olive brown (2.5Y 5/4) spotting, low plasticity, medium stiff, moist
							T.D. of boring @ 7.0 feet
10							
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
15-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 15
PROJECT NO.: 044-0283	SURFACE ELEVATION: 96.44 ft. MSL
DATE DRILLED: 07-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SP	COW MANURE and VEGETATION 3-inches thick FILL (af) Poorly-graded GRAVELLY SAND (SP), yellowish brown (10YR 5/6) with dark gray (10YR 4/1) gravel, sand is fine-grained, gravel is sub-angular to sub-rounded and well-graded, medium dense, wet
	■	SS001	0.0	PUSH			
						ML	COLLUVIUM (Qco) CLAYEY SILT (ML) with trace calcite fragments, black (5Y 2.5/1), low plasticity, medium stiff, moist
	■	SS002	0.0				
							Color change to very dark gray (5Y 3/1) and dark olive gray (5Y 3/2) mottled with no calcite fragments
							T.D. of boring @ 6.5 feet
10							
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
15-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 15
PROJECT NO.: 044-0283	SURFACE ELEVATION: 96.4 ft. MSL
DATE DRILLED: 11-APR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: J. GOULD	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
							6-Inches CONCRETE (CO)	
		SS006		PUSH		CH	High plasticity CLAY (CH), black (N2), very sticky, saturated	
		SS007		PUSH			Same as above	
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??(??)(???-????) ??????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: 63.92 ft. MSL
DATE DRILLED: 14-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT
		SS005	0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), dark grayish brown (2.5Y 4/2) and gray (2.5Y 5/1), mottled, angular to subangular, well graded, wet with trace medium-grained sand
		SS006	0.0	PUSH		ML	FILL (af) SANDY SILT (ML), dark yellowish brown (10YR 4/6) and dark grayish brown (10YR 3/2), mottled, low plasticity, very fine-grained sand, poorly graded, moist, medium stiff
							COLLUVIUM (Qco) CLAYEY SILT (ML), dark gray (2.5Y 4/1) and very dark gray (2.5Y 3/1), mottled, medium plasticity, moist, medium stiff, with trace very fine-grained sand
10							T.D. of boring @ 6.0 feet
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: 63.8 ft. MSL
DATE DRILLED: 14-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS003	0.0	PUSH		GW	ASPHALT FILL (af), SILTY GRAVEL (GW), dark yellowish brown (10YR 4/6) and brown (10YR 4/3), mottled, angular to subangular, well graded, moist, loose, with trace fine-grained sand
		SS004	0.0	PUSH		ML	COLLUVIUM (Qco) CLAYEY SILT (ML), very dark gray (2.5Y 3/1) with strong brown (7.5YR 4/6) iron-oxide spotting, low plasticity, moist, medium stiff Color change to black (2.5Y 2.5/1) with trace decayed organic material
							T.D. of boring @ 6.0 feet
10							
20							
30							

??(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: 64.06 ft. MSL
DATE DRILLED: 14-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS001	0.0	PUSH		GW	ASPHALT FILL (af) SILTY GRAVEL (GW), dark brown (10YR 3/3) and gray (10YR 5/1), mottled, angular to subangular, well graded, wet, loose	
						ML	FILL (af) SANDY SILT (ML), dark yellowish brown (10YR 4/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff	
		SS002	0.0	PUSH			COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), medium plasticity, moist, medium stiff Trace peat-like organic material @ 4 to 5 ft. bgs, trace clay	
10							T.D. of boring @ 6.0 feet	
20								
30								

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-04

PROJECT: RFA CONFIRMATION STUDY | LOCATION: SWMU 16
PROJECT NO.: 044-0283 | SURFACE ELEVATION: 65.26 ft. MSL
DATE DRILLED: 15-MAR-95 | DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen | DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS010	0.0 0.0	PUSH			ASPHALT (~3 in.) over BASEROCK (~6 in.)
						ML	FILL (af) SILT (ML), very dark grayish brown (10YR 3/2), with brown (7.5YR 4/3) iron-oxide mottling, low plasticity, damp stiff Minus brown iron-oxide mottling, moist, very stiff
		SS011	0.0 0.0	PUSH			Color change to dark brown (10YR 3/3) @ 5 ft. bgs, trace very fine-grained sand
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: 65.43 ft. MSL
DATE DRILLED: 15-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS013	0.0	PUSH		ML	FILL (af) GRAVELLY SILT (ML), dark olive brown (2.5Y 3/3) and dark gray (2.5Y 4/1), mottled, low plasticity, damp, angular to subangular well graded gravel, medium stiff, with trace root material and fine-grained sand	
		SS014	0.0	PUSH			FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/8), low plasticity, very fine-grained sand, poorly graded, moist, stiff	
							T.D. of boring @ 6.0 feet	
10								
20								
30								

* Field screening Analytical Results

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: 65.34 ft. MSL
DATE DRILLED: 15-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS007	0.0 0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), olive brown (2.5YR 4/3) and very dark grayish brown (2.5Y 3/2), mottled, subangular to subrounded, well graded, moist, loose
						ML	FILL (af) CLAYEY SILT (ML), dark olive brown (2.5YR 3/3), medium plasticity, moist, medium stiff
		SS008	0.0 0.0	PUSH			FILL (af) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, moist, medium stiff, very fine-grained sand, poorly graded. Color change to dark yellowish brown (10YR 3/6) @ 6.5 ft. bgs, stiff
10		SS009	0.0 0.0	PUSH			FILL (af) CLAYEY SILT (ML), dark yellowish brown (10YR 3/6), medium plasticity, moist, medium stiff, with trace chrome and copper colored metal filings
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, moist, medium dense
		SS012	0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6) with minor black (10YR 2/1) speckling, low plasticity, very fine-grained sand, poorly graded, moist, very stiff
							T.D. of boring @ 17.5 feet
20							
30							

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16–07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044–0283	SURFACE ELEVATION: –9 ft. MSL
DATE DRILLED: 13–OCT–95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS015	0.6	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 4/6), low plasticity, very fine–grained sand, damp, dense
		SS016	0.4	//			
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???–????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS017	0.3	//		SM	TOPSOIL (~2 in.) COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, dry, dense
		SS018	0.9	//		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, damp, stiff
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-09

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS019	0.7	PUSH		ML	ASPHALT (~2 in.) over BASEROCK (~3 in.) COLLUVIUM (Qco) SANDY SILT (ML), reddish brown (5YR 4/4), low plasticity, very fine-grained sand, dry, stiff Trace calcite stringers @ 4.0 feet bgs
		SS020	1.1	PUSH			T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-10

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS021	0.0	//		ML	FILL (af) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, moist, medium stiff, with trace clay and very fine-grained sand
		SS022	0.0	//			
		SS023	0.9				COLLUVIUM (Qco) SANDY SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, very fine-grained sand, poorly graded, moist, stiff
							T.D. of boring @ 6.0 feet
10							
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-11

PROJECT: RFA CONFIRMATION STUDY

LOCATION: SWMU 16

PROJECT NO.: 044-0283

SURFACE ELEVATION: -9 ft. MSL

DATE DRILLED: 13-OCT-95

DRILLING METHOD: GEOPROBE

LOGGED BY: R. Vernimen

DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS024	1.2	//		SM	ASPHALT (~2 in.) over BASEROCK (3 in.)
		SS025	1.3	//		ML	FILL (af) SILTY SAND (SM), yellowish brown (10YR 5/6) and gray (10YR 5/1), mottled, fine to very fine-grained sand, dry, dense, with trace gravel
		SS026	0.8				COLLUVIUM (Qco) SILT (ML), very dark gray (2.5Y 3/1), low plasticity, damp, stiff, with little very fine-grained sand
							COLLUVIUM (Qco) SANDY SILT (ML), dark brown (7.5YR 3/4), low plasticity, very fine-grained sand, damp, stiff
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16–12

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044–0283	SURFACE ELEVATION: –9 ft. MSL
DATE DRILLED: 13–OCT–95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS027	0.5	//		ML	ASPHALT (~2 in.) over BASEROCK (~3 in.) FILL (af) SILT (ML), very dark gray (2.5Y 3/1), low plasticity, damp, stiff, with trace very fine–grained sand
		SS028	0.9	//			Changes to little very fine–grained sand
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???–????)????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
16-13

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 16
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS029	0.0	//		SM	BASEGRAVEL and TOPSOIL (~2 in.) COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/4), fine- to very fine-grained sand, dry, medium dense	
							T.D. of boring @ 2.0 feet	
10								
20								
30								

??????(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
17-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 17
PROJECT NO.: 044-0283	SURFACE ELEVATION: 137.41 ft. MSL
DATE DRILLED: 27-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	FILL (af) SILT (ML), with trace very fine-grained sand and trace root material, very dark grayish brown (10YR 3/2), low plasticity, medium stiff, moist FILL (af) SANDY SILT (ML) with trace root material and angular to sub-angular gravel, dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottled, sand is very fine-grained, poorly-graded, low plasticity, medium stiff, damp
		SS001	0.0 0.0	PUSH			Increase gravel to little, average size 1/2-inch Increase moisture content to moist with trace siltstone fragments
10		SS002	0.0 0.0	PUSH			Color change to dark greenish gray (5BG 4/1) with dark yellowish brown (10YR 4/4) spotting with trace fine-grained sand
		SS003	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
17-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 17
PROJECT NO.: 044-0283	SURFACE ELEVATION: 137.74 ft. MSL
DATE DRILLED: 27-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	FILL (af) SANDY SILT (ML) with little angular to sub-angular gravel, dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottled, sand is very fine-grained, poorly-graded, low plasticity, medium stiff, moist Color change to yellowish brown (10YR 5/6), decrease gravel content to trace and moisture content to damp Color change to bluish gray (5B 5/1) Color change to light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6) mottled, with no gravel and trace siltstone fragments
		SS004	0.0 0.0	PUSH			
10		SS005	0.0	PUSH			
		SS006	0.0	PUSH			Color change to bluish gray (5B 5/1)
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: 61.05 ft. MSL
DATE DRILLED: 08-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
							CONCRETE (CO) approximately 9-inches thick	
						ML	FILL (af) CLAYEY SILT (ML) with trace sand and pebbly gravel, olive gray (5Y 4/2), low plasticity, medium stiff, damp	
							Color change to dark gray (5Y 4/1) in pockets and fine-grained sand	
							Color change to dark olive gray (5Y 3/2) with trace very fine-grained sand and no pebbly gravel	
		SS013	0.0	3/6/5			Color change to dark yellowish brown (10YR 4/6) mottled	
							COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6), sand is very fine-grained, poorly-graded, low plasticity, stiff, damp	
10		SS014	0.0	5/8/16			Increase in moisture content to moist	
							Increase to very stiff	
							COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/6), sand is very fine-grained, poorly-graded, low plasticity, very stiff, moist	
		SS015		5/10/15				
20								
			0.0					
						SM	COLLUVIUM (Qco) SILTY SAND (SM), dark yellowish brown (10YR 4/6), sand is very fine-grained, poorly-graded, medium dense, wet	
			5.0					
30							T.D. of boring @ 30.0 feet	

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: 60.99 ft. MSL
DATE DRILLED: 07-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS
						ML
		SS007	0.0	3		
						ML
		SS008	0.0	6/12/17		
10		SS009	0.0	5/9/13		
		SS010	0.0	7/15/24		
20						
30						

GEOLOGIC DESCRIPTION

ASPHALT (AS) approximately 3-inches thick

BASEROCK approximately 4-inches thick

FILL (af)
GRAVELLY SILT (ML) with little coarse-grained sandm, very dark grayish brown (2.5Y 3/2), gravel is sub-angular to sub-rounded and medium stiff to loose, low plasticity, damp

FILL (af)
SANDY SILT (ML), yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2) mottled, sand is very fine-grained, poorly-graded, low plasticity, medium stiff, damp

CONCRETE (CO) rubble layer approximately 10-inches thick

COLLUVIUM (Qco)
SANDY SILT (ML), dark yellowish brown (10YR 4/4), sand is very fine-grained, poorly-graded, low plasticity, stiff, damp
Increase in moisture content to moist
Increase to very stiff

COLLUVIUM (Qco)
SANDY SILT (ML), dark yellowish brown (10YR 4/4), sand is very fine-grained, poorly-graded, low plasticity, very stiff, moist

HYDROPUNCH FROM 21.0 TO 24.0 FEET BGS
Did not yield water, consequently the boring was drilled to 26.0 feet bgs and hydro punched to 19.0 feet as a second attempt to obtain water

T.D. of boring @ 29.0 feet

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: 47.1 ft. MSL
DATE DRILLED: 24-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS013		PUSH		SM	ALLUVIUM (Qal) SILTY SAND (SM), sand is rounded and very fine-grained, loose, damp
						CL	ALLUVIUM (Qal) High plasticity CLAY (CL), yellowish brown (10YR 4/4), stiff, moist
		SS014		PUSH			
							T.D. of boring @ 4.5 feet
10							
20							
30							

??????(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: 48.67 ft. MSL
DATE DRILLED: 24-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: K. BOWEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS011		PUSH		SM	ALLUVIUM (Qal) SILTY SAND (SM) with trace gravel, sand is rounded and very fine-grained, loose, damp
						CL	ALLUVIUM (Qal) High plasticity CLAY (CL) yellowish brown (10YR 4/4), stiff, moist
		SS012		PUSH			ALLUVIUM (Qal) High plasticity CLAY (CL), (10YR 3/3) mottling, stiff, damp
							T.D. of boring @ 4.5 feet
10							
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: 45.15 ft. MSL
DATE DRILLED: 24-FEB-95	DRILLING METHOD: HAND AUGER
LOGGED BY: Ken Bowen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS015		PUSH		SM	ALLUVIUM (Qal) SILTY SAND (SM), brown (7.5YR 4/4), sand is rounded and very fine-grained, loose, damp	
		SS016		PUSH		CL	ALLUVIUM (Qal) High plasticity CLAY (CL), yellowish brown (10YR 4/4), stiff, moist	
							T.D. of boring @ 4.0 feet	
10								
20								
30								

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS)
		SS017	2.0	PUSH		GW	FILL (af) Well-graded GRAVEL (GW) with little silt and red brick fragments, gray (7.5YR 5/1), gravel is angular to sub-rounded, loose to medium dense, dry
						ML	COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 4/6), sand is very fine-grained, low plasticity, stiff, damp
						SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 4/6), sand is fine to very fine-grained, dense, moist
10		SS018	1.9				
							T.D. of boring @ 10.0 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS019	1.0	PUSH		SM	ASPHALT (AS) approximately 2-inches COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), sand is fine- to very fine-grained, poorly-graded, dense, dry
						ML	COLLUVIUM (Qco) SANDY SILT (ML) with trace clay, strong brown (7.5YR 4/6), sand is very fine-grained, low plasticity, stiff, moist
10		SS020	1.5	PUSH			
							T.D. of boring @ 10.0 feet
20							
30							

??????(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							CONCRETE (CO) approximately 4-inches thick
						ML	BASEROCK approximately 6-inches thick
		SS021	1.3	PUSH			COLLUVIUM (Qco) SANDY SILT (ML) with trace clay, very dark grayish brown (2.5Y 3/2) and yellowish brown (10YR 5/6) mottled, sand is very fine-grained, low plasticity, stiff, damp
							Color change to yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2) mottled
							COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 4/6), sand is very fine-grained, low plasticity, stiff, damp
10		SS022	1.4	PUSH			
							T.D. of boring @ 10.0 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-09

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED:	DRILLING METHOD:
LOGGED BY: R. Vernimen	DRILLING COMPANY:

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS)
		SS023	1.4	PUSH		ML	FILL (af) SANDY SILT (ML) with trace gravel and piece of wire, strong brown (7.5YR 4/6), sand is very fine-grained, low plasticity, stiff, dry
							Refusal at 2.0 feet bgs
							T.D. of boring @ 2.0 feet
10							
20							
30							

??(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18–10

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS), approximately 2-inches thick over BASEROCK, approximately 8-inches thick
		SS025	1.5	PUSH		ML	FILL (af) SANDY SILT (ML) with little gravel, dark brown (7.5YR 3/2) and strong brown (7.5YR 4/6) mottled, sand is very fine-grained, low plasticity, stiff, damp
							Color change to very dark gray (10YR 3/1), with trace clay and no gravel
							T.D. of boring @ 5.5 feet
10							
20							
30							

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18-11

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (~12 in.)
		SS026	1.2	PUSH		ML	FILL (af) SANDY SILT (ML), very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/6), mottled, low plasticity, damp, stiff with trace gravel COLLUVIUM (Qco) SANDY SILT (ML), strong brown (7.5YR 4/6), low plasticity, very fine-grained sand, damp, stiff
10		SS027	1.9	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 4/6), fine- to very fine-grained sand, poorly graded, moist, dense
							T.D. of boring @ 10.0 feet
20							
30							

* Field screening Analytical Results

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
18–12

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 18
PROJECT NO.: 044–0283	SURFACE ELEVATION: –9 ft. MSL
DATE DRILLED: 16–OCT–95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (12 in.)
		SS028	1.0	//		ML	FILL (af) SANDY SILT (ML), dark brown (10YR 3/3) and dark yellowish brown (10YR 4/6), mottled, low plasticity, very fine–grained sand, damp, stiff, with little gravel Asphaltic gravel layer @ 2.75 ft. bgs Sampler refusal @ 5 ft. bgs.
							T.D. of boring @ 5.0 feet
10							
20							
30							

???(??)(???–????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
22-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 22
PROJECT NO.: 044-0283	SURFACE ELEVATION: 282.04 ft. MSL
DATE DRILLED: 10-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/3), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff, with trace root material. Color change to strong brown (7.5YR 4/6) @ 3 ft. bgs, minus root material
		SS006		PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5Y 4/6), very fine-grained sand, poorly graded, damp, dense
10		SS007	0.0	PUSH			
						SP	COLLUVIUM (Qco) SAND (SP), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, dense
		SS008	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
22-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 22
PROJECT NO.: 044-0283	SURFACE ELEVATION: 291.93 ft. MSL
DATE DRILLED: 10-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
0–13						ML	COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/3) and yellowish brown (10YR 5/4), mottled, low plasticity, very fine-grained sand, poorly graded, damp, medium stiff. Color change to brown (7.5YR 4/3) @ 3.5 ft., moist. Color change to strong brown (7.5YR 4/6) @ 11 ft., damp, stiff
5		SS003	0.0	PUSH			
10		SS004	0.0	PUSH			
13–16.5						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, dense
15		SS005	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
22-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 22
PROJECT NO.: 044-0283	SURFACE ELEVATION: 299.36 ft. MSL
DATE DRILLED: 10-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/4), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/4), very fine-grained sand, poorly graded, damp, medium dense, with trace silt
		SS011	0.0	PUSH			Dense @ 5.5 ft. bgs
10		SS012	0.0	PUSH			Medium dense @ 10.5 ft. bgs, with little silt
		SS013	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
22-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 22
PROJECT NO.: 044-0283	SURFACE ELEVATION: 278.95 ft. MSL
DATE DRILLED: 10-APR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: Jon Gould	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS009		PUSH		SC	SANDY CLAY (CL) with rootlets to 5.0 feet bgs, brown (5YR 3/2), 10% sand, 90% clay, sand is very fine-grained, clay is sticky, medium plasticity, slightly moist to moist	
		SS010		PUSH			SANDY CLAY (SC) with orange veins, brown (10YR 3/2), 10% sand, 90% clay, sand is very fine-grained, clay is sticky, medium plasticity, slightly moist to moist	
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
22-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 22
PROJECT NO.: 044-0283	SURFACE ELEVATION: 269.47 ft. MSL
DATE DRILLED: 10-APR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: Jon Gould	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS001		PUSH		CL	SANDY CLAY (CL), 10% sand and 90% clay, dark brown (5YR 3/2), sand is very fine-grained, clay is sticky, medium plasticity, no odor or staining, slightly moist to moist	
		SS002		PUSH			Same as above, no water in hole	
							T.D. of boring @ 5.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1-1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
23-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 23
PROJECT NO.: 044-0283	SURFACE ELEVATION: 449.83 ft. MSL
DATE DRILLED: 07-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SM	FILL (af) SILTY SAND (SM), light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6), mottled, very fine-grained sand, poorly graded, damp, medium dense, with trace root material
		SS005	0.0 0.0	PUSH		SP	COLLUVIUM (Qco) SAND (SP), light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6), mottled, very fine-grained sand, poorly graded, moist, medium dense Little fine-grained sand @ 5.5 ft. bgs
10		SS006	0.0 0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), light brownish gray (2.5Y 6/2) with brownish yellow (10YR 6/6) banding, low plasticity, damp, very dense
		SS007	0.0	PUSH		SP	COLLUVIUM (Qco) SAND (SP), light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6), mottled, very fine-grained sand, poorly graded, damp, very dense
20							T.D. of boring @ 16.5 feet
30							

??(??)(???-????)(????-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
23-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 23
PROJECT NO.: 044-0283	SURFACE ELEVATION: 448.09 ft. MSL
DATE DRILLED: 06-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SM	FILL (af) SILTY SAND (SM), light olive brown (2.5Y 5/4), very fine-grained sand, poorly graded, damp, dense, with trace subrounded gravel
							Minus trace gravel
		SS001	0.0 0.0	PUSH			
						SP	FILL (af) SAND (SP), light yellowish brown (2.5Y 6/4), very fine-grained sand, poorly graded, damp, dense
						ML	COLLUVIUM (Qco) SANDY SILT (ML), light brownish gray (2.5Y 6/2) with brownish yellow (10YR 6/6) banding, low plasticity, dry, very dense (siltstonelike layer)
10		SS002	0.0 0.0	PUSH			
						SP	COLLUVIUM (Qco) SAND (SP), light yellowish brown (2.5Y 6/3), fine- to very fine-grained sand, poorly graded, damp, very dense
		SS003	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
24-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 24
PROJECT NO.: 044-0283	SURFACE ELEVATION: 212.48 ft. MSL
DATE DRILLED: 31-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), brown (7.5YR 4/4), low plasticity, moist, medium stiff, with trace very fine-grained sand and root material Trace clay @ 3 ft. bgs, yellowish brown (10YR 5/4) Minus clay @ 4 ft. bgs
		SS004	0.0 0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff COLLUVIUM (Qco) GRAVELLY SILT (ML), strong brown (7.5YR 4/6) with gray (7.5YR 5/1) gravel, low plasticity, angular to subrounded gravel, well graded, damp, medium stiff, with trace very fine-grained sand
10		SS005	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/4), very fine-grained sand, poorly graded, moist, medium dense
		SS006	0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff
							T.D. of boring @ 16.5 feet
20							
30							

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
24-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 24
PROJECT NO.: 044-0283	SURFACE ELEVATION: 215.29 ft. MSL
DATE DRILLED: 31-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/4), low plasticity, moist, medium stiff, trace clay, root material and very fine grained-sand
							COLLUVIUM (Qco) CLAYEY SILT (ML), brown (7.5YR 4/4), medium plasticity, moist, stiff, with trace very fine-grained sand
		SS001	0.0 0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6) with gray (10YR 5/1) gravel, low plasticity, very fine-grained sand, poorly graded, damp, medium stiff, with some subangular gravel
10		SS002	0.0 0.0	PUSH			COLLUVIUM (Qco) GRAVELLY SILT (ML), yellowish brown (10YR 5/6) with gray (10YR 5/1) gravel, low plasticity, angular to subrounded gravel and gravel fragments, well graded, damp, medium stiff
		SS003	0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, stiff
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
24-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 24
PROJECT NO.: 044-0283	SURFACE ELEVATION: 212.22 ft. MSL
DATE DRILLED: 04-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
						ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, damp, medium stiff, with trace root material and very fine-grained sand	
		SS008	0.0	PUSH			COLLUVIUM (Qco) SANDY SILT(ML), strong brown (7.5YR 5/6), low plasticity, very fine grained-sand, poorly graded, damp, stiff	
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, dense	
10		SS009	0.0	PUSH		SW	COLLUVIUM (Qco) GRAVELLY SAND (SW), light brownish gray (10YR 6/2), medium- to very fine-grained sand, well graded, angular to subrounded gravel, well graded, damp, dense, with trace silt	
							T.D. of boring @ 11.5 feet	
20								
30								

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
25-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 25
PROJECT NO.: 044-0283	SURFACE ELEVATION: 394.3 ft. MSL
DATE DRILLED: 03-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/2), low plasticity, dry, stiff, some fine-grained sand, clay, and root materials Silty with trace sand @ 2.5 ft. bgs, dark grayish brown (10YR 3/2), dry
		SS001	0.0	PUSH		CL	COLLUVIUM (Qco) SILTY CLAY (CL), brown (7.5YR 3/3), low plasticity, medium dense, trace very fine-grained sand
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellow brown (10YR 5/6)
						ML	COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/6), low plasticity, medium dense, trace clay Refusal @ 8.2 ft.
10							T.D. of boring @ 8.2 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
25-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 25
PROJECT NO.: 044-0283	SURFACE ELEVATION: 399.03 ft. MSL
DATE DRILLED: 03-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: K. Bowen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
			0.0			ML	COLLUVIUM (Qco) CLAYEY SILT (ML), brown (10YR 3/2), low plasticity, dry, medium stiff, trace very fine-grained sand and root material COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 3/2), low plasticity, moist, medium stiff, very fine- to medium-grained sand and trace roots
		SS002	0.0	PUSH		SP	COLLUVIUM (Qco) SAND (SP), brown (10YR 5/6), very fine- to medium-grained sand, poorly graded, low density, dry, very friable Change to very fine-grained sand, friable @ 10.0 ft. bgs
10		SS003	0.0	PUSH			
		SS004	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), brown (10YR 4/6), very fine-grained sand, moist
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(???-????)(????-???)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
25-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 25
PROJECT NO.: 044-0283	SURFACE ELEVATION: 394.3 ft. MSL
DATE DRILLED: 03-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: K. Bowen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/2), low plasticity, dry, some fine-grained sand, clay, and root materials Changes to trace sand @ 2.5 ft. bgs, dark grayish brown (10YR 3/2), dry
						CL	COLLUVIUM (Qco) SILTY CLAY (CL), brown (7.5YR 3/3), low plasticity, medium density, trace very fine-grained sand
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6)
						ML	COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/6), low plasticity, medium dense, trace clay
10		SS005	0.0 0.0	PUSH			COLLUVIUM (Qco) SILTY SAND (SM), light brown (10YR 4/6), very fine-grained sand, low density, dry, friable
							Refusal @ 14 ft. bgs
							T.D. of boring @ 14.0 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 1.51 ft. MSL
DATE DRILLED: 11-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS005	0.0	PUSH		ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp to moist, with trace angular to subrounded gravel Concrete fragments in shoe Refusal @ 3 ft.	
							T.D. of boring @ 3.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 3.16 ft. MSL
DATE DRILLED: 13-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS007	0.0	PUSH		GW	FILL (af)
						SM	SILTY GRAVEL (GW), gray (2.5Y 5/1), subangular to subrounded, well graded, damp, loose
							COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained, poorly graded, dense, damp
		SS008	0.0	PUSH			Water level @ 1.0 ft. bgs Saturated @ 4.5 ft. Refusal @ 5 ft.
							T.D. of boring @ 5.0 feet
10							
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 2.44 ft. MSL
DATE DRILLED: 13-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS009	0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), gray (5Y 5/1), subangular to subrounded, well graded, damp, loose to medium dense, with trace fine-grained sand Moist @ 2.5 ft. Water level @ 3.3 ft. bgs	
		SS010	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/8) and dark grayish brown (2.5Y 4/2), mottled, very fine-grained, poorly graded, damp, medium dense	
							T.D. of boring @ 7.0 feet	
10								
20								
30								

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????)????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 2.46 ft. MSL
DATE DRILLED: 13-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS011	0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), gray (5Y 5/1), angular to subrounded, well graded, damp, medium dense, with little fine-grained sand
						ML	FILL (af) SANDY SILT (ML), light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6), mottled, low plasticity, very fine-grained sand, poorly graded, damp, medium stiff
						GW	FILL (af) SILTY GRAVEL (GW), very dark gray (2.5Y 3/1), angular to subrounded, well graded, moist, dense, with little fine-grained sand
		SS012	0.0	PUSH		ML	FILL (af) GRAVELLY SILT (GW), yellowish brown (10YR 5/6), with dark gray (10YR 4/1) gravel, low plasticity, damp, stiff, with little sand Refusal @ 6 ft.
10							T.D. of boring @ 6.0 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37–05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044–0283	SURFACE ELEVATION: 4.5 ft. MSL
DATE DRILLED: 17–APR–95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
							ASPHALT (~1 in.)	
		SS021	0.0	PUSH		GW	FILL (af) SANDY GRAVEL (GW), gray (2.5Y 5/1) gravels with yellowish brown (10YR 5/6) fine–grained sand, well graded, angular to subangular, damp, loose	
		SS022	0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), dark grayish brown (2.5Y 4/2) and olive gray (5Y 4/2), mottled, low plasticity, very fine–grained sand, poorly graded, damp, medium stiff	
							T.D. of boring @ 7.0 feet	
10								
20								
30								

???(??)(???–????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 5.92 ft. MSL
DATE DRILLED: 17-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS023	0.0	PUSH		SM	ASPHALT (~1 in.) over BASEROCK (~4 in.) COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained, poorly graded, damp, medium dense. Color changes to olive brown (2.5Y 4/4)
		SS024	0.0	PUSH		SP	COLLUVIUM (Qco) SAND (SP), olive brown (2.5Y 4/4), fine-grained, poorly graded, wet, medium dense, with trace silt
10							T.D. of boring @ 7.0 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 2.2 ft. MSL
DATE DRILLED: 13-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS013	0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), gray (5Y 5/1), angular to subrounded, well graded, damp, medium dense
						ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, moist, medium stiff, with trace gravel
		SS014	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), light brown (2.5Y 5/4) and olive brown (2.5Y 4/3), mottled, very fine-grained, poorly graded, wet, medium dense, with trace clay
							T.D. of boring @ 7.0 feet
10							
20							
30							

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 1.44 ft. MSL
DATE DRILLED: 11-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS001	0.0	PUSH		ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/8), low plasticity, fine-grained sand, poorly graded, damp, medium dense with trace gravel Change to moist
		SS002	0.0	PUSH			FILL (af) CLAYEY SILT (ML), yellow brown (10YR 5/8) with dark gray (N4) mottling, medium plasticity, moist, medium soft ASPHALT Refusal @ 6 ft.
							T.D. of boring @ 6.0 feet
10							
20							
30							

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-09

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 1.37 ft. MSL
DATE DRILLED: 11-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS003	0.0	PUSH		ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, stiff with trace angular gravel
		SS004	0.0	PUSH		GW	FILL (af) SILTY GRAVEL (GW), gray (7.5YR 5/1), angular to subangular, well graded, damp, dense Asphalt @ 5.4 ft., refusal @ 5.5 ft.
							T.D. of boring @ 5.5 feet
10							
20							
30							

???(??)(??-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-10

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 0.77 ft. MSL
DATE DRILLED: 17-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
		SS025	0.0	PUSH		ML	ASPHALT (~3 in.) over BASEROCK (~2 in.) FILL (af) SANDY SILT (ML), olive brown (2.5Y 4/3) and dark yellowish brown (10YR 4/4), mottled, low plasticity, very fine-grained sand, poorly graded, moist, medium stiff, with little subrounded gravel	
		SS026	0.0				Color change to very dark gray (5Y 3/1) @ 3.5 ft. Refusal @ 4 ft.	
							T.D. of boring @ 4.0 feet	
10								
20								
30								

* Field screening Analytical Results

??(??)(??-????) ???????.DWG ??/??/?? PLOT 1=1 R001

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-11

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 3.93 ft. MSL
DATE DRILLED: 18-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS028	0.0	PUSH		GW	ASPHALT (~1 in.)
						SP	FILL (af) SILTY GRAVEL (GW), very dark gray (5Y 3/1), subangular to subrounded, well graded, damp, loose
						SM	FILL (af) SAND (SP), yellowish brown (10YR 5/6), very fine-grained, poorly graded, damp, medium dense
		SS029	0.0	PUSH			COLLUVIUM (Qco) SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), very fine-grained, poorly graded, moist, dense Trace asphaltic gravel @ 2 ft.
						SP	COLLUVIUM (Qco) SAND (SP), very dark grayish brown (2.5Y 3/2), medium-grained, poorly graded, saturated, medium dense
						ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6) and dark gray (10YR 4/1), mottled, low plasticity, very fine-grained sand, poorly graded, moist, stiff, with trace siltstone fragments
10						CL	YOUNGER BAY MUD (Qyb) SILTY CLAY (CL), very dark gray (5Y 3/1), medium plasticity, wet, soft, with little decayed organic material
							T.D. of boring @ 11.0 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-12

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 1.88 ft. MSL
DATE DRILLED: 14-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. VERNIMEN	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS016	0.0	PUSH		ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/8) and olive brown (2.5Y 4/3), mottled, low plasticity, very fine-grained sand, poorly graded, damp, medium stiff, with trace gravel and wood pieces Color change to yellowish brown (10YR 5/8) @ 4 ft., moist, minus wood pieces
		SS017	0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/8), medium plasticity, very fine-grained sand, poorly graded, moist, medium stiff, with trace clay Color grading to olive gray (5Y 4/2) and dark yellowish brown (10YR 4/4) @ 7.5 ft., mottled
10							Wet @ 10 ft. Saturated @ 10.5 ft.
							COLLUVIUM (Qco) CLAYEY SILT (ML), olive gray (5Y 4/2) and yellowish brown (10YR 5/6), mottled, medium plasticity, moist, medium stiff, with trace fine-grained sand
							T.D. of boring @ 13.0 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
37-13

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 37
PROJECT NO.: 044-0283	SURFACE ELEVATION: 3.93 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
						GW	SILTY GRAVEL (GW), very dark gray (5Y 3/1), subangular to subrounded, well graded, damp, loose	
						SP	SAND (SP), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, medium dense	
						SM	SILTY SAND (SM), very dark grayish brown (2.5Y 3/2), very fine-grained sand, poorly graded, moist, dense	
						SP	SAND (SP), very dark grayish brown (2.5Y 5/2), medium-grained sand, poorly graded, moist, medium dense	
						ML	SANDY SILT (ML), yellowish brown (10YR 5/6) and dark gray (10YR 4/1), mottled, low plasticity, very fine-grained sand, poorly graded, moist, stiff, with trace siltstone fragments	
10						CL	SILTY CLAY (CL), very dark gray (5Y 3/1), medium plasticity, wet, soft, with little decayed organic material	
							T.D. of boring @ 12.0 feet	
20								
30								

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
40-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 40
PROJECT NO.: 044-0283	SURFACE ELEVATION: 9.21 ft. MSL
DATE DRILLED: 24-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS001	0.0 0.0	PUSH		GW	FILL (af) Well-graded SILTY GRAVEL (GW) with trace medium- and fine-grained sand, dark gray (5Y 4/1), gravel is sub-angular to sub-rounded, loose, wet Increase in moisture content to saturated
		SS002	0.0	PUSH			
							Increase in gravel size, angular
10							T.D. of boring @ 10.0 feet
20							
30							

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
40-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 40
PROJECT NO.: 044-0283	SURFACE ELEVATION: 8.99 ft. MSL
DATE DRILLED: 24-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
	■	SS003	0.0			GW	FILL (af) SILTY GRAVEL (GW), dark gray (5Y 4/1), subangular to subrounded, well graded, moist, loose, with trace fine-grained sand Refusal @ 1 ft. bgs. hand auger T.D. of boring @ 1.0 feet	
10								
20								
30								

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????)????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
40-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 40
PROJECT NO.: 044-0283	SURFACE ELEVATION: 9.42 ft. MSL
DATE DRILLED: 24-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
	■	SS004	0.0			GW	FILL (af) SILTY GRAVEL (GW), dark gray (5Y 4/1), subangular to subrounded, well graded, damp, loose, with trace fine-grained sand Refusal @ 2 ft. bgs. hand auger
	■	SS005	0.0				
							T.D. of boring @ 2.0 feet
10							
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
44-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 44
PROJECT NO.: 044-0283	SURFACE ELEVATION: 28.86 ft. MSL
DATE DRILLED: 12-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS001	0.0	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), very dark grayish brown (10YR 3/2) and brown (10YR 4/3), mottled, low plasticity, very fine-grained sand, poorly graded, damp, with trace subangular gravel and root material, medium stiff. Color change to strong brown (7.5YR 4/6) @ 3.0 ft. bgs, with very dark grayish brown (10YR 3/2) mottling, minus gravel. Sand occurring in pockets within the silt @ 5.0 ft. bgs, stiff. Sand uniformly mixed with silt @ 9.0 ft. bgs. Color change to yellowish brown (10YR 5/6) @ 10.0 ft. bgs, very stiff
10		SS002	0.0	PUSH			
		SS003	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6) with minor white (10YR 8/1) banding, very fine-grained sand, poorly graded, damp, very dense
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
44-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 44
PROJECT NO.: 044-0283	SURFACE ELEVATION: 28.67 ft. MSL
DATE DRILLED: 12-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), very dark gray (10YR 3/1), low plasticity, moist, medium stiff, with trace subrounded gravel, very coarse-grained sand, and root material from 0 to 1 ft. bgs Trace very fine-grained sand COLLUVIUM (Qco) SANDY SILT (ML), dark grayish brown (2.5Y 4/2) and yellowish brown (10YR 5/4), mottled, low plasticity, very fine-grained sand, poorly graded, damp, stiff
		SS004	0.0	PUSH			Color change to brownish yellow (10YR 6/6) @ 10.0 ft. bgs, slightly damp, very stiff Color change to yellowish brown (10YR 5/6) @ 14.0 ft. bgs, damp Color change to dark yellowish brown (10YR 4/6) @ 15.0 ft. bgs
10		SS005	0.0	PUSH			
		SS006	0.0	PUSH			
							T.D. of boring @ 18.0 feet
20							
30							

??????(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 ROO1

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: 8.79 ft. MSL
DATE DRILLED: 07-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS), approximately 9-inches thick
							BASEROCK approximately 2-inches thick
		SS006	0.0	3 / 19 / 18		ML	FILL (af) SILT (ML) with trace very fine-grained sand and pebbly gravel, yellowish brown (10YR 5/6), low plasticity, medium stiff, damp
		SS007	0.0	17 / 11 / 3			FILL(af) SILT (ML) with little clay and trace pebbly sub-angular gravel, dark gray (5Y 4/1) and black (5Y 2.5/1), low plasticity, stiff, damp
						GW	4-inch layer of sub-angular GRAVEL (GW), loose, saturated
						ML	FILL (af) CLAYEY SILT (ML), dark gray (5Y 4/1), medium plasticity, medium stiff, wet
10							T.D. of boring @ 6.5 feet
20							
30							

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: 8.95 ft. MSL
DATE DRILLED: 07-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS), approximately 12-inches thick
						ML	FILL (af) SANDY SILT (ML), yellowish brown (10YR 5/6), sand is very fine-grained, poorly-graded, low plasticity, medium stiff, damp
		SS008	0.0	7 10 11		SM	Color change to yellowish brown (10YR 5/6) with olive gray (5Y 4/2) mottled
		SS009	999.0	14 15 13		GW	FILL (af) SILTY SAND (SM) with moderate diesel odor, olive gray (5Y 4/2), sand is fine-grained, poorly-graded, medium dense, damp
							FILL (af) GRAVEL (GW) with strong diesel odor, dark gray (2.5Y 4/1), gravel is angular to sub-rounded, average diameter 1/2-inch, loose, saturated
10							T.D. of boring @ 6.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: 8.4 ft. MSL
DATE DRILLED: 07-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS), approximately 10-inches thick over BASEROCK, approximately 2-inches thick
						ML	FILL (af) SANDY SILT (ML) with trace clay and little pebbly gravel, dark yellowish brown (10YR 4/6) and light olive brown (2.5Y 5/4) mottled, sand is very fine-grained, poorly-graded, low plasticity, medium stiff, moist
		SS003	0.0	4 2 4			FILL (af) GRAVELLY SILT (ML) with trace very fine-grained sand, very dark gray (10YR 3/1), gravel is pebbly and sub-angular, well-graded, low plasticity, medium stiff, wet Increase to trace angular gravels with (inferred diameter) average
10		SS004	0.0	1 1 4		CL	YOUNGER BAY MUD (Qyb) SANDY CLAY (CL) with trace fine-grained rootlets, dark gray (5Y 4/1), sand is fine-grained, poorly-graded, medium plasticity, medium stiff, saturated
							T.D. of boring @ 11.5 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: 8 ft. MSL
DATE DRILLED: 06-MAR-95	DRILLING METHOD: HOLLOW STEM AUGER
LOGGED BY: K. Bowen	DRILLING COMPANY: HEW DRILLING

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
						AS	ASPHALT (AS), approximately 12-inches thick	
						GW	GRAVEL (GW), approximately 6-inches thick	
						SM	SILTY SAND (SM) with trace clay, dark yellowish brown (10YR 4/4), sand is very fine-grained, poorly-graded, no odor, wet	
							SILT (ML), olive brown (2.5Y 4/4), silt is uniform, low plasticity, no odor, moist	
	X	SS001		2 5 11				
10	X	SS002		5 8 11				
							T.D. of boring @ 15.0 feet	
20								
30								

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-05

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (~3 in.) over BASEROCK (~4 in.)
		SS010	0.6	PUSH		ML	FILL (af) SANDY SILT (ML), strong brown (7.5YR 5/6) and very dark gray (7.5YR 3/1), mottled, low plasticity, very fine-grained sand, stiff, with little subrounded gravel throughout
		SS011	0.9	PUSH			Color changes to dark gray (2.5Y 3/1)
							T.D. of boring @ 4.0 feet
10							
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-06

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS012	1.2	PUSH		ML	ASPHALT (AS), approximately 3-inches thick, over BASEROCK, approximately 3-inches thick
		SS013	1.8	PUSH			FILL (af) SANDY SILT (ML) with little sub-rounded gravel throughout interval, dark yellowish brown (10YR 4/4), sand is very fine-grained, low plasticity, stiff, damp
							T.D. of boring @ 4.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-07

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 13-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		SS014	1.5	PUSH		ML	APHALT (AS), approximately 3-inches thick BASEROCK, approximately 3-inches thick FILL (af) SANDY SILT (ML) with trace gravel, dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottled, sand is very fine-grained, low plasticity, stiff, damp
		SS015	1.2	PUSH			Color change to dark yellowish brown (10YR 4/4) and dark olive brown (2.5Y 3/3) mottling Color change to black (2.5Y 2.5/1) with trace clay, moist
							T.D. of boring @ 6.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
50-08

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 50
PROJECT NO.: 044-0283	SURFACE ELEVATION: -9 ft. MSL
DATE DRILLED: 16-OCT-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: VIRONEX

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							ASPHALT (AS), approximately 3-inches thick
							BASEROCK, approximately 3-inches thick
		SS016	0.4	PUSH		ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), sand is very fine-grained, low plasticity, stiff, dry
		SS017	1.5	PUSH			Color change to olive gray (5Y 4/2), damp
							T.D. of boring @ 5.0 feet
10							
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
51-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 51
PROJECT NO.: 044-0283	SURFACE ELEVATION: 87.88 ft. MSL
DATE DRILLED: 06-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML) with trace root material, black (2.5Y 2.5/1), low plasticity, medium stiff, moist COLLUVIUM (Qco) SANDY SILT (ML) with trace clacite pieces, dark grayish brown (2.5Y 4/2) with yellowish brown (10YR 5/4) spotting, sand is very fine-grained, poorly-graded, low plasticity, medium stiff, moist
		SS001	0.0 0.0	PUSH			COLLUVIUM (Qco) CLAYEY SILT (ML) with trace calcite fragments, very dark gray (5Y 3/1) with white (5Y 8/1) spotting, low plasticity, medium stiff, moist COLLUVIUM (Qco) SILTY SAND (SM) with trace clay, light olive brown (2.5Y 5/3) with yellowish
10		SS002	0.0 0.0	PUSH		SM	brown (10YR 5/4) spotting, sand is very fine-grained, poorly-graded, medium dense, wet Change grain size to fine- to very fine-grained, dense with trace clay
		SS003	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??????(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
51-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 51
PROJECT NO.: 044-0283	SURFACE ELEVATION: 88.89 ft. MSL
DATE DRILLED: 06-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML) with traces of very fine-grained sand, clay and root material, black (2.5Y 2.5/1), low plasticity, medium stiff, moist
							COLLUVIUM (Qco) SANDY SILT (ML) with trace clay, light olive brown (2.5Y 5/3), sand is very fine-grained, poorly-graded, low plasticity, medium stiff, moist
		SS004	0.0 0.0	PUSH			COLLUVIUM (Qco) CLAYEY SILT (ML) with trace calcite pieces, dark gray (5Y 4/1) with light gray (5Y 7/1) spotting, low plasticity, medium stiff, moist
							Color change to very dark gray (2.5Y 3/1)
10							Color change to dark gray (5Y 4/1), medium plasticity, increase in moisture content to saturated
		SS005	0.0	PUSH		SM	COLLUVIUM (Qco) SILTY SAND (SM) with trace clay, light olive brown (2.5Y 5/3) and yellowish brown (10YR 5/4) mottled, sand is very fine-grained, poorly-graded, dense, moist
							Increase to little clay
		SS006	0.0	PUSH		CL	COLLUVIUM (Qco) SANDY CLAY (CL) with trace silt, light olive brown (2.5Y 5/3) and yellowish brown (10YR 5/4), sand is very fine-grained, poorly-graded, medium plasticity, soft, moist
							T.D. of boring @ 16.5 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
52-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 52
PROJECT NO.: 044-0283	SURFACE ELEVATION: 161.66 ft. MSL
DATE DRILLED: 29-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/6), mottled, low plasticity, very fine-grained sand, poorly graded, damp, medium stiff with trace root material Color change to yellowish brown (10YR 5/6) @ 3.5 ft. bgs, trace angular to subrounded gravel
		SS001	0.0 0.0	PUSH			COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/3), low plasticity, damp, very stiff, with trace very fine-grained sand COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, very stiff, with trace subangular to subrounded gravel
10		SS002	0.0 0.0	PUSH			Color change to strong brown (7.5YR 4/6) @ 15 ft. bgs, medium stiff, minus gravel
		SS003	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
52-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 52
PROJECT NO.: 044-0283	SURFACE ELEVATION: 162.44 ft. MSL
DATE DRILLED: 29-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/4), very fine-grained sand, poorly graded, moist, medium dense, with trace root material Woody root and trace angular to subrounded gravel @ 3 ft.
		SS004	0.0 0.0	PUSH		ML	COLLUVIUM (Qco) SILT (ML), very dark gray (2.5Y 3/1), low plasticity, damp, stiff, with trace subrounded gravel and root material
10		SS005	0.0 0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, stiff
		SS006		PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
52-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 52
PROJECT NO.: 044-0283	SURFACE ELEVATION: 152.1 ft. MSL
DATE DRILLED: 30-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
	■	SS008	0.0			ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), medium plasticity, moist, medium stiff, with little clay, trace very fine-grained sand, and pebbly, little rounded to subrounded gravel	
			0.0					
	■	SS009					T.D. of boring @ 2.5 feet	
10								
20								
30								

* Field screening Analytical Results

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
52-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 52
PROJECT NO.: 044-0283	SURFACE ELEVATION: 154.2 ft. MSL
DATE DRILLED: 30-MAR-95	DRILLING METHOD: HAND AUGER
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	
	■	SS010	0.0			ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2) with reddish brown (5YR 4/4) spotting, low plasticity, damp, medium stiff, with little clay	
	■	SS011					No reddish brown spotting from 2 ft. bgs, medium plasticity	
			0.0					
							T.D. of boring @ 4.0 feet	
10								
20								
30								

??(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
53-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 53
PROJECT NO.: 044-0283	SURFACE ELEVATION: 158.74 ft. MSL
DATE DRILLED: 30-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							TOPSOIL (4 in.) with grass roots
						SP	COLLUVIUM (Qco) SAND (SP), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, medium dense, with trace silt
						ML	COLLUVIUM (Qco) SILT (ML), very dark gray (10YR 3/1), low plasticity, damp, medium stiff. Color change to very dark brown (10YR 2/2) @ 4.0 ft. bgs. Trace very fine-grained sand @ 5.0 ft. bgs. Color change to dark grayish brown (2.5Y 4/2) @ 10.0 ft. bgs, stiff, little very fine-grained sand
		SS001	0.0 0.0	PUSH			
10		SS002	0.0	PUSH			
		SS003	0.0 0.0	PUSH			COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/3), low plasticity, very fine-grained sand, poorly graded, damp, stiff
							T.D. of boring @ 16.5 feet
20							
30							

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
53-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 53
PROJECT NO.: 044-0283	SURFACE ELEVATION: 159.2 ft. MSL
DATE DRILLED: 30-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						SM	COLLUVIUM (Qco) SILTY SAND (SM), yellowish brown (10YR 5/6), very fine-grained sand, poorly graded, damp, medium dense with trace root material
						ML	COLLUVIUM (Qco) SILT (ML), very dark grayish brown (10YR 3/2), low plasticity, damp, medium stiff
		SS004	0.0 0.0	PUSH			Stiff @ 4.5 ft. bgs
							COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/6), low plasticity, very fine-grained sand, poorly graded, damp, stiff
10		SS005	0.0 0.0	PUSH			
							Color change to dark yellowish brown (10YR 4/4) @ 14.5 ft. bgs, medium stiff
		SS006	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??????(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
54-01

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 54
PROJECT NO.: 044-0283	SURFACE ELEVATION: 165.85 ft. MSL
DATE DRILLED: 05-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), brown (10YR 4/3), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff, with trace root material
							Color changes to strong brown (7.5YR 5/6) @ 3.0 ft. bgs
		SS011	0.0 0.0	PUSH			COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 5/6), very fine-grained sand, poorly graded, damp, medium dense
						SM	Some fine-grained sand @ 10.0 ft. bgs, dense
							Very dense @ 15.0 ft. bgs
10		SS012	0.0 0.0	PUSH			
		SS013	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ????????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
54-02

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 54
PROJECT NO.: 044-0283	SURFACE ELEVATION: 166.98 ft. MSL
DATE DRILLED: 05-APR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SANDY SILT (ML), yellowish brown (10YR 5/4), low plasticity, very fine-grained sand, poorly graded, damp, medium stiff Color changes to dark yellowish brown (10YR 4/4) @ 2 ft. bgs
		SS008	0.0 0.0	PUSH			
						SM	COLLUVIUM (Qco) SILTY SAND (SM), strong brown (7.5YR 5/6), very fine-grained sand, poorly graded, damp, dense
10		SS009	0.0	PUSH			
		SS010		PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

* Field screening Analytical Results

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

SHEET: 1 of 1

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
54-03

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 54
PROJECT NO.: 044-0283	SURFACE ELEVATION: 174.52 ft. MSL
DATE DRILLED: 23-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), dark brown (7.5YR 3/3), low plasticity, wet, medium stiff, with trace very fine-grained sand and root material Moist @ 2.5 ft. COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, very fine-grained sand, poorly graded, moist, stiff
		SS001	0.0	PUSH			
10		SS002	0.0	PUSH			
		SS003	0.0	PUSH			
							T.D. of boring @ 16.0 feet
20							
30							

* Field screening Analytical Results

SHEET: 1 of 1

???(??)(???-????) ???????.DWG ??/??/?? PLOT 1=1 R001

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOG OF BORING
54-04

PROJECT: RFA CONFIRMATION STUDY	LOCATION: SWMU 54
PROJECT NO.: 044-0283	SURFACE ELEVATION: 174.3 ft. MSL
DATE DRILLED: 22-MAR-95	DRILLING METHOD: GEOPROBE
LOGGED BY: R. Vernimen	DRILLING COMPANY: PRC EMI

ELEVATION (FEET) DEPTH	SAMPLE	SAMPLE NO.	PID (ppm)	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						ML	COLLUVIUM (Qco) SILT (ML), dark yellowish brown (10YR 3/4), low plasticity, wet, medium stiff, with little very fine-grained sand COLLUVIUM (Qco) SANDY SILT (ML), dark yellowish brown (10YR 4/4), low plasticity, moist, very fine-grained sand, poorly graded, stiff Color change to yellowish brown (10YR 5/6) @ 5.5 ft. bgs Color change to strong brown (7.5YR 4/6) @ 10.0 ft. bgs Color change to yellowish red (5YR 4/6) @ 14.5 ft. bgs, damp, very stiff, with trace siltstone fragments
		SS004	0.0	PUSH			
10		SS005	0.0	PUSH			
		SS006	0.0	PUSH			
							T.D. of boring @ 16.5 feet
20							
30							

??????(??)(???-????)???????.DWG ??/??/?? PLOT 1=1 R001

* Field screening Analytical Results

SHEET: 1 of 1

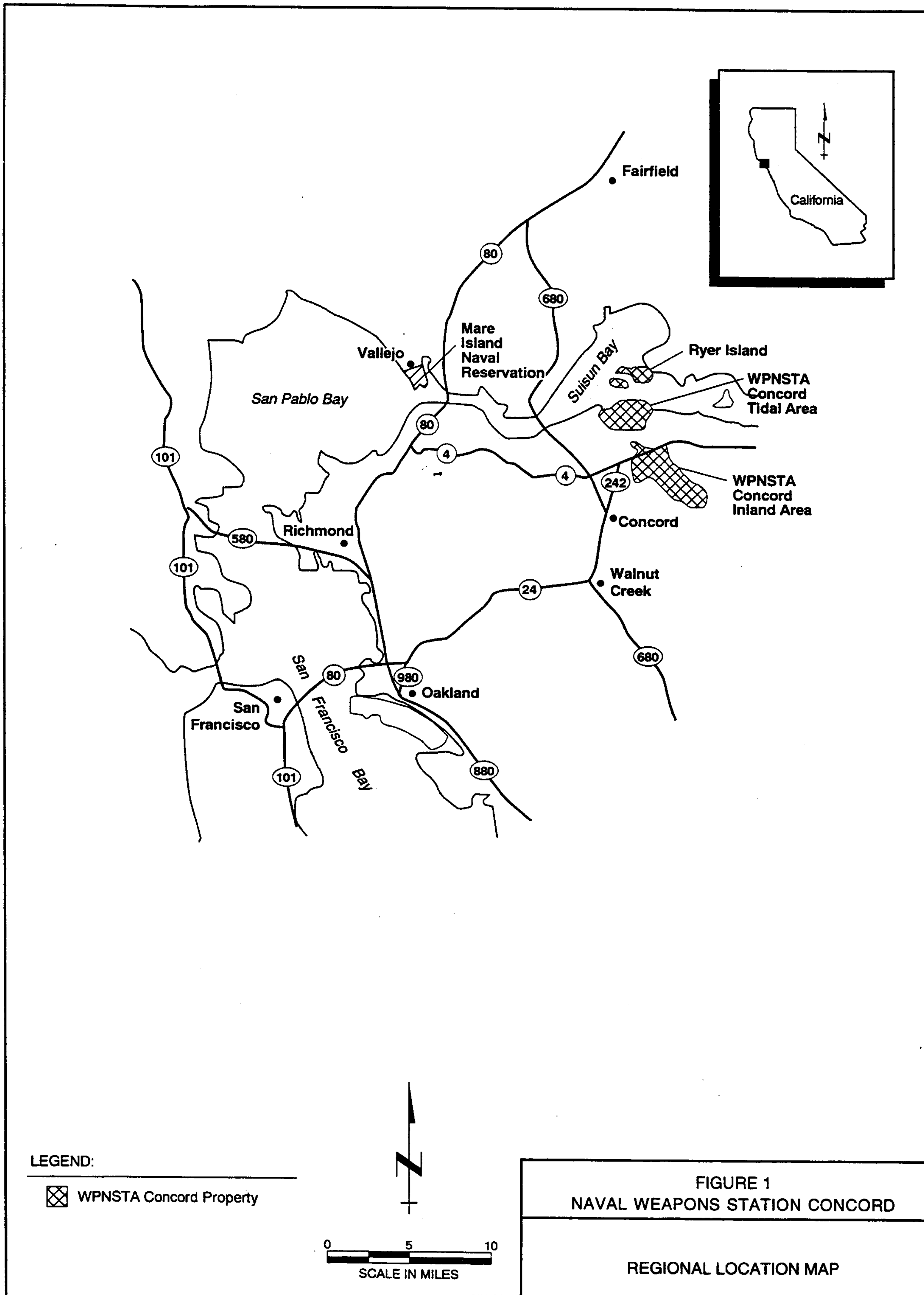


FIGURE 1
NAVAL WEAPONS STATION CONCORD

REGIONAL LOCATION MAP

Figures F2 and F3

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

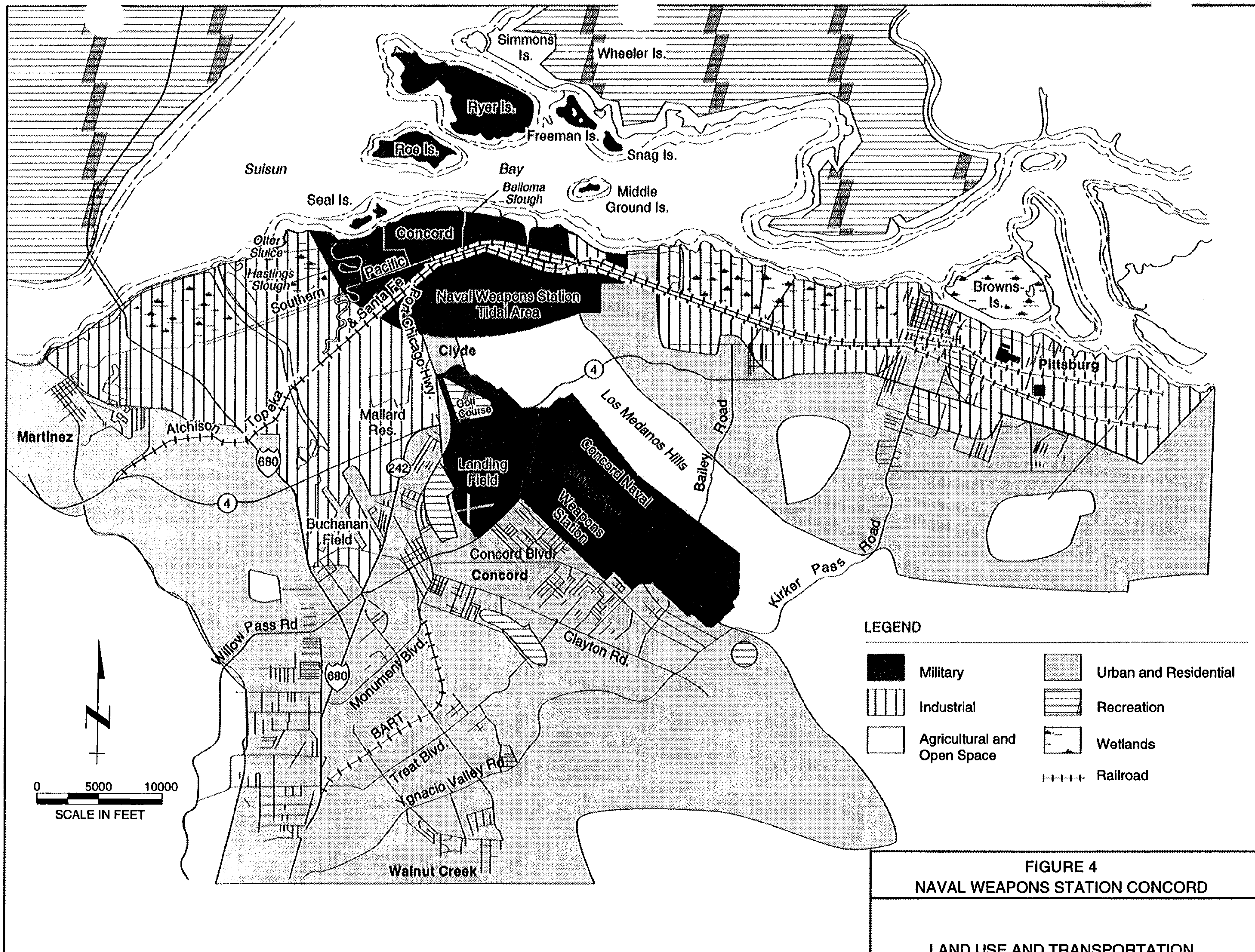


FIGURE 4
NAVAL WEAPONS STATION CONCORD

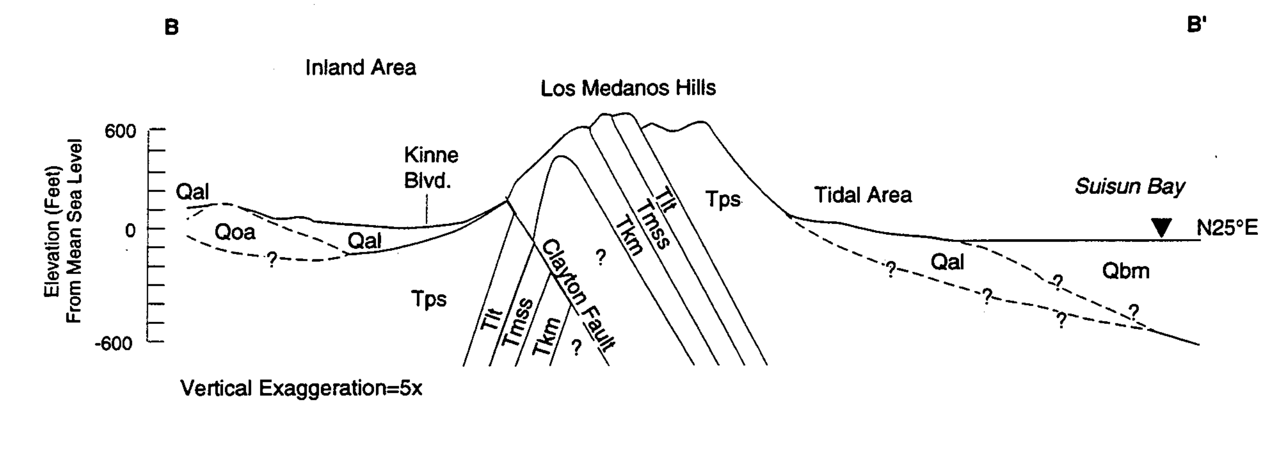
LAND USE AND TRANSPORTATION

SOURCE DRAWING: FIGURE 2-4, IT VOLUME I, DRAFT WORK PLAN, JUNE 1989

06/96.CO

Figures F5 and F6

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.



LEGEND

Quaternary Sediments:

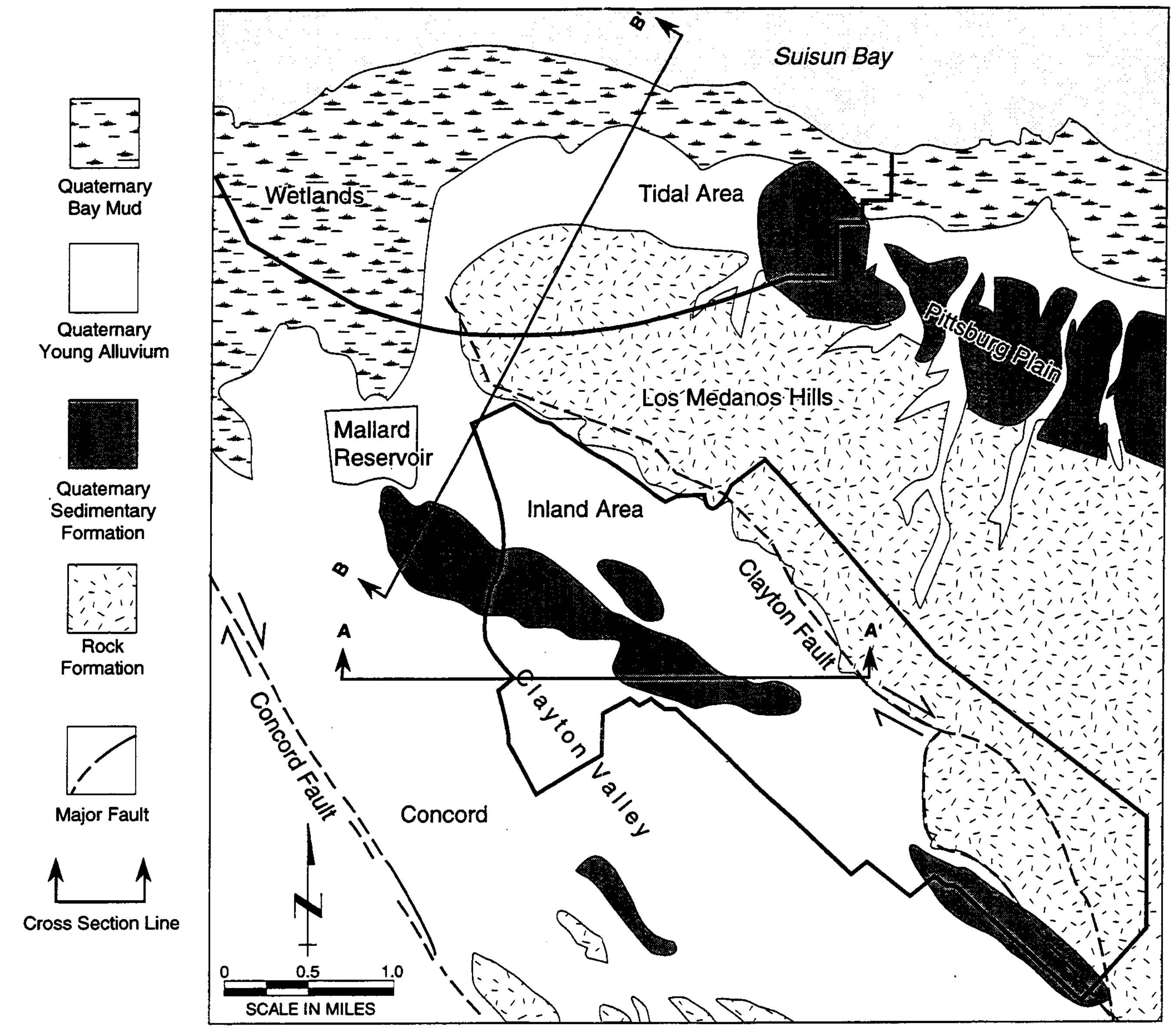
Qbm	Bay Mud
Qal	Young Alluvium
Qoa	Old Alluvium

Tertiary Rock Formations:

Tps	Pliocene Nonmarine Sedimentary Rocks
Tlt	Pliocene Pumiceous Tuff Breccias (Lawlor Tuff)
Tmss	Miocene Marine Sandstones
Tkm	Eocene Sandstone-Markley Member of Kreyenhagen Formation

Source: Adapted from DIBBLEE, 1981

Cross-Section A-A' is Figure 2-5.



Source: LUTTON, et. al., 1987
DIBBLEE, 1980a,b,c, 1981

FIGURE 7
NAVAL WEAPONS STATION CONCORD

REGIONAL GEOLOGY

06/96.CO

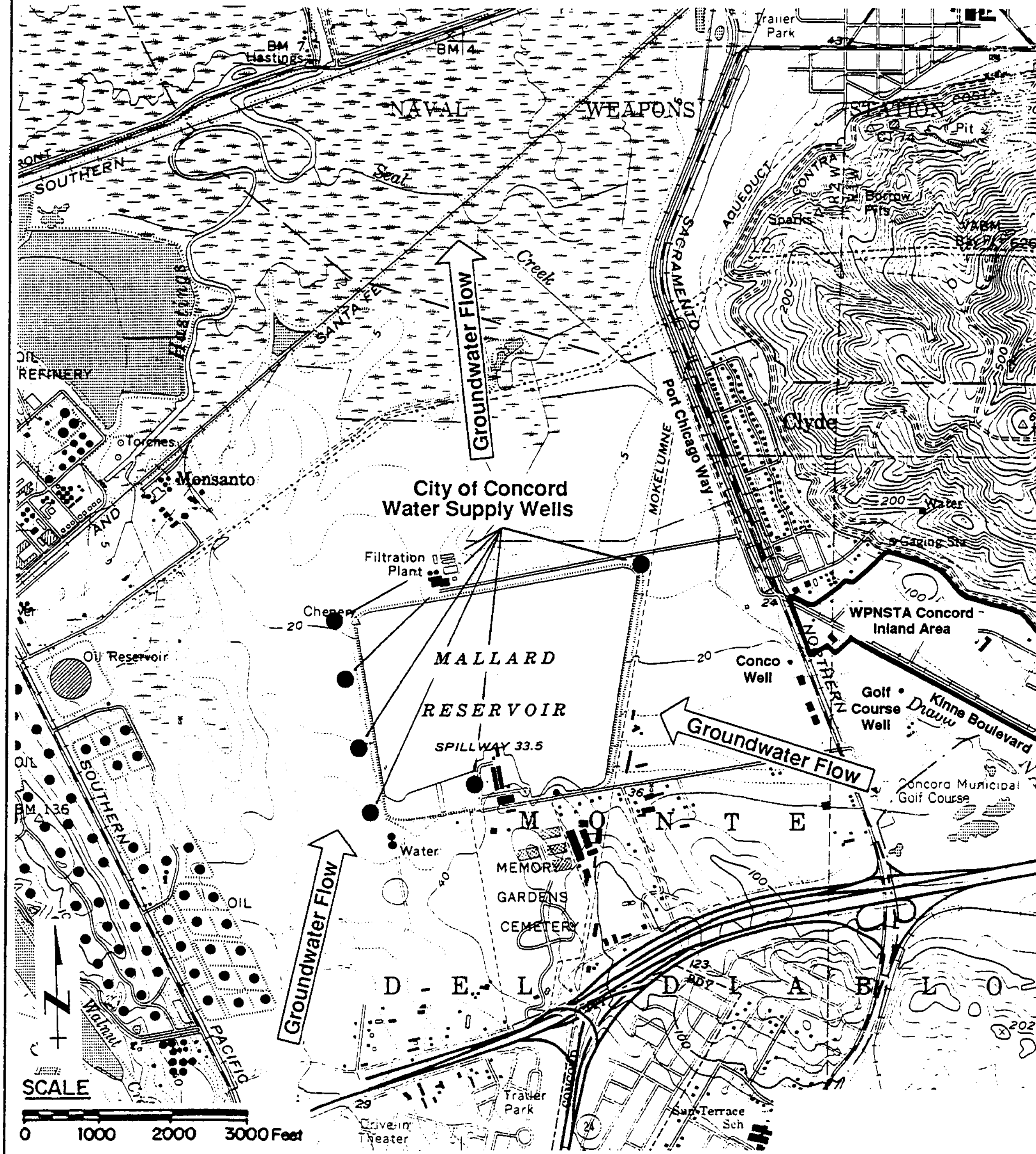


FIGURE 8
NAVAL WEAPONS STATION CONCORD

LOCATION OF WATER WELLS
IN THE VICINITY OF
WPNSTA CONCORD

Source Drawing: Figure 3-5, IT Volume II, Draft Sampling Plan, June 1989

WP.6/93.CO

TPHg = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPHd = TOTAL PETROLEUM HYDROCARBONS AS DIESEL
TPHmo = TOTAL PETROLEUM HYDROCARBONS AS MOTOR OIL
BTEX = TOTAL BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES
O&G = TOTAL OIL AND GREASE
VOC = TOTAL OF VOLATILE ORGANIC COMPOUNDS (SEE FOOTNOTE TO IDENTIFY CONSTITUENTS)
SVOC = TOTAL OF SEMIVOLATILE ORGANIC COMPOUNDS (SEE FOOTNOTE TO IDENTIFY CONSTITUENTS)
PCBs = TOTAL OF POLYCHLORINATED BIPHENYLS
Pest = TOTAL OF PESTICIDES
Expl = EXPLOSIVES
ANIONS = ANIONS (SEE LABORATORY SUMMARY SHEET TO IDENTIFY CONSTITUENTS)

LEGEND

- FENCE
- 20 TOPOGRAPHIC CONTOURS
- FIRE HYDRANT
- CATCH BASIN
- TREES
- CULVERT
- 01-02 SOIL BORING LOCATIONS
- MW-04 MONITORING WELL LOCATIONS
- 02-09 TRENCH EXCAVATION LOCATIONS

NOTE: SOIL AND GROUNDWATER SAMPLE DEPTHS (FEET) ARE INDICATED BELOW

SOIL ANALYSES, RESULTS REPORTED IN mg/kg

GROUNDWATER ANALYSES, RESULTS REPORTED IN ug/L

DEPTH	METALS	TPHg	TPHd	TPHmo	BTEX	O&G	VOC	SVOC	PCBs	Pest	Expl	ANIONS /TDS
6	--	ND	ND	7	ND	--	--	--	--	--	--	--
11	--	ND	ND	7	ND	--	--	--	--	--	--	--
16	--	ND	ND	7	ND	--	--	--	--	--	--	--
21	--	ND	ND	ND	ND	--	--	--	--	--	--	--
26	--	ND	ND	7	ND	--	--	--	--	--	--	--
GW=25	*Y*	*ND*	*470*	*140*	--	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

INDICATES IF CLP METALS ANALYSIS WAS PERFORMED Y = YES

SEE FOOTNOTE FOR A DESCRIPTION OF METAL CONSTITUENTS WHICH EXCEED PRELIMINARY REMEDIATION GOALS AND EXCEED BACKGROUND SOIL CONCENTRATIONS

-- = NOT ANALYZED

ND = NOT DETECTED

FIGURE 9
NAVAL WEAPONS STATION CONCORD

STANDARD LEGEND DETAILS FOR SITE PLANS

KCH:(SF)(044-0283)TITLSHET.DWG - 06/26/96 - PLOT 1:1

Figures F10 - F36

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.