CROWLEY ENVIRONMENTAL SERVICES

July 31, 1992

Mr. Barney M. Chan
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

S1101420

Re: Site Investigation of the Eastern Section of Yard I at 1441 Embarcadero, Oakland CA 94606, aka Pacific Dry Dock

Dear Mr. Chan:

Enclosed please find one copy of the Preliminary Site Investigation Report (PIER) for the Pacific Dry Dock and Repair Yard No. 1 located at 1441 Embarcadero in Oakland, for your review and comment. The PIER has been prepared for Crowley Marine Services (Crowley) by Versar, Inc. (Versar).

Per your letter dated March 9, 1992, Crowley will perform an additional investigation in the eastern section of the site. The further investigation is to define the lateral and vertical extent of the impacted soils identified during the first investigation. The field work is scheduled for the third week in August, 1992.

In the event that an interim removal action may be performed at the same time on the eastern and western sections of the property, the groundwater wells will not be installed during this phase of the investigation.

Please contact me at (206) 443-8042 if you have any questions regarding this matter.

Yours sincerely,

R. Stephen Wilson
Manager, Site Remediation

enclosure

cc: C. Nalen
M. Willms
D. Schoenholtz
L. Kleinecke w/o enclosure

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Versar INC. SACRAMENTO

PRELIMINARY INVESTIGATION AND EVALUATION REPORT (PIER)
PACIFIC DRY DOCK AND REPAIR YARD I
EASTERN SECTION
OAKLAND, CALIFORNIA

Prepared for:

Crowley Maritime Corporation
2401 Fourth Avenue
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Prepared by:

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Versar Project No. 1457-027 (7703.27)

July 24, 1992

Versar INC. SACRAMENTO

PROJECT SUMMARY

This Preliminary Investigation and Evaluation Report (PIER) was prepared by Versar, Inc. of Sacramento, California for Crowley Maritime Corporation. Ms. Tracy Montgomery, Toxicologist, prepared this PIER. Mr. Lawrence Kleinecke, Geohydrologist/Chemist reviewed this PIER. This work was performed under the supervision of Mr. Kleinecke and Mr. James R. Frantes, R.G., Regional Manager.

This PIER documents the subsurface investigation conducted at the eastern section of the Pacific Dry Dock and Repair Yard I located at 1441 Embarcadero in Oakland, California. The activities performed as part of the investigation include the coring of 17 boreholes at the site, collection and analysis of three ground-water and 22 soil samples, interpretation of the laboratory analytical results, and preparation of the PIER. From the investigation, Versar, Inc. has drawn the following conclusions:

- Petroleum Hydrocarbons were identified in the ground water at the site; however, due to the total dissolved solids concentration, the aquifer may not be considered a drinking water source by the California Water Quality Control Board.
- Varying concentrations of gasoline, diesel, oil and grease, and benzene, toluene, ethylbenzene, and xylenes were identified in the soils at the site.
- Semi-volatile organic compounds were identified in the soils at one portion of the site.

- Copper concentrations in excess of Total Threshold Limit Concentration values were identified in one sample collected in the western area of the site.

Prepared By:

for Tracy Montgomery
Toxicologist

Reviewed By:

Lawrence Kleinecke
Geohydrologist/Chemist

Approved for Release:

REGISTERED GEOLOGIST James R. Frantes STATE OF CALIFORNIA

James R. Frantes, R.G. No. 4534
Pacific Regional Manager

DISCLAIMER

The purpose of this Preliminary Investigation and Evaluation Report (PIER) is only to inform the client of the environmental conditions as they currently exist at the subject site. Versar, Inc. (Versar) does not assume responsibility for the discovery and elimination of hazards that could possibly cause accidents, injuries, or damage. Compliance with submitted recommendations and/or suggestions in no way assures elimination of hazards or the fulfillment of a client's obligation under any local, or federal laws or any modifications or changes thereto. In many cases, federal, state or local codes require the prompt reporting to relevant authorities if a release occurs. It is the responsibility of the client to comply with requirements to notify authorities of any conditions that are in violation of the current legal standards.

Factual information regarding operations, conditions, and test data was obtained, in part, from the client and has been assumed by Versar to be correct and complete. Since the facts stated in this PIER are subject to professional interpretation, they could result in differing conclusions. In addition, the findings and conclusions contained in this PIER are based on various quantitative and qualitative factors as they existed on or near the date of the investigation.

Versar has prepared this PIER at the request of its client. Versar is responsible for the accuracy of the PIER's contents, subject to what is stated elsewhere in this Disclaimer, but recommends the PIER be used only for the purposes intended by the client and Versar when the PIER was prepared. Versar makes no warranty and assumes no liability with respect to the use of information contained in this PIER. The PIER may be unsuitable for other uses, and Versar assumes no liability for such uses. No changes to its form or content may be made without Versar's express written approval.

This PIER reflects conditions, operations, and practices as observed during the investigation. Changes or modifications to procedures and/or facilities made after the site visit are not included.

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1.0 INTRODUCTION

Versar, Inc. (Versar) has been retained by Crowley Maritime Corporation to conduct a Preliminary Investigation and Evaluation of the eastern section of the Pacific Dry Dock and Repair Yard I (PDD I) facility (hereinafter referred to as the site). The site is located at 1441 Embarcadero, Oakland, California. This Preliminary Investigation and Evaluation Report (PIER) documents the results of the investigation of the site. The investigation was outlined in Versar's Site Investigation Work Plan (Versar, 1991). The western section of the PDDI facility has been investigated as a separate site (Versar, 1992). Further investigations of the eastern and western sections of PDDI will be conducted separately.

1.1 Site History

The site has been used as a boat repair and dry dock facility from 1935 through 1991. Before 1953, the site was the first commercial facility along the local shoreline. Since 1953, the surrounding land use has been primarily light industrial and commercial office space.

Various regulated and nonregulated wastes are generated as a result of the practices of repairing and refurbishing sea-going vessels. In addition, these activities utilize many products which are regulated materials. These regulated and nonregulated wastes and products include: waste sand-blasting materials; oil-based paints; solvents; acids; bases; waste oils; hydrocarbon-contaminated water; and motor fuels.

Between December 1989 and October 1990, Versar conducted a site assessment of PDD I (Versar, 1990). The site assessment identified elevated concentrations of petroleum hydrocarbons, metals, and diesel fuel in the soil at the site.

1.2 Investigation Objectives

This investigation represents the initial Preliminary Investigation and Evaluation of the site. The Preliminary Investigation is intended to determine if the previously identified contamination is restricted to soils only, or if ground water has been affected.

The objectives of the field investigation are:

- To determine if soil contamination is present in the subsurface soils at selected locations.
- To determine if ground-water contamination is present.
- To obtain accurate contaminant concentrations through laboratory analysis of soil and ground-water samples.

The PIER will provide information necessary for assessment of the problem area and subsequent remedial proposals.

2.0 SITE DESCRIPTION

This section presents a description of the site with respect to its physical location, layout, geology and soils, and hydrology. Beneficial uses of the ground water beneath the site are also discussed.

2.1 Site Location

The site is located at 1441 Embarcadero in Oakland, California, in the central portion of the north bank of Brooklyn Basin. Brooklyn Basin, an estuary of Oakland Inner Harbor, is bounded by Government Island to the south and the city of Oakland to the north. Oakland Inner Harbor extends in an easterly direction from San Francisco Bay to San Leandro Bay. East and west of the site are light industrial businesses, commercial offices, a marina, restaurants, and hotels. North of the site are the Embarcadero, the Nimitz Freeway, Southern Pacific and Western Pacific Railways and a Bay Area Rapid Transit railway. Figures 1 and 2 show the site location and site layout, respectively.

2.2 Site Layout

For investigation purposes, the eastern section of the site was divided into three areas based on utilization. Area One encompasses the docking area, which consists of a wooden dock, approximately ten feet (ft) above the ground surface and the estuary; and the production office. Area Two contains Marine Railways Numbers One and Two, the winch house, and the paint storage building. Area Three consists of the remainder of the site which is unused and paved with asphalt. Area Three also contains an unregistered underground storage tank (UST) that was discovered following this investigation. A chain-linked fence separates the site from the Embarcadero. Figure 3 illustrates the area delineation and borehole locations.

2.3 Site Geology and Soils

The site is located in the Coast Ranges geomorphic province. The site is situated between the Hayward Fault (on the east) and the San Andreas Fault (on the west) and is tectonically active. The underlying bedrock consists of Mesozoic volcanic and metavolcanic rocks which are found throughout the Coast Ranges. Overlying the bedrock are Quaternary marine and nonmarine alluvial sediments consisting of clays and silts.

Data collected from sampling activities indicates that soils beneath the site consist of sand, silt, clay, spent sand-blasting material, and shell fragments. Versar's borehole logs which describe the subsurface stratigraphy are included as Appendix A. Figures 4 through 9 include cross-section lines of reference, graphic representation of standard symbols for soil types, and subsurface cross sections.

Stratigraphic units identified on the east side of Area One typically include a layer of silt to a depth of between five and nine ft below ground surface (bgs) overlying a clay layer. The clay layer is part of an extensive formation known as "Bay Muds". The Bay Muds consist of tan-grey clay with shell fragments. The west side of Area One consists of gravels from the surface to approximately 2.5 ft bgs, followed by silty sand to approximately eight ft bgs and clay below eight ft bgs. The south and center of Area One consists of sand and silt extending to the Bay Muds which begin at approximately nine ft bgs.

The central portion of Area Two consists of gravelly sand to approximately 2.5 ft bgs. Layers of silt, sand, and clay extend from the gravelly sand layer to the Bay Muds which begin between nine and 10.5 ft bgs. Stratigraphic units in Area Two along the perimeter of the estuary consist of sandy material with localized spent sand-blasting material to approximately four ft bgs.

Sands, silts, and clays extend from the sand layer to approximately seven ft bgs to the Bay Muds.

Statigraphic units identified in Area Three include a layer of gravel and sand which extends to depths varying from 2.5 ft to approximately 5.0 ft bgs. The stratigraphy between the sands and gravels and the Bay Muds, which occur at five ft to 10 ft bgs, is variable.

2.4 Site Hydrology

In Area One, ground water was encountered in sand layers, at approximately 2.5 ft bgs. In Area Two, ground water was encountered in sand and silt layers ranging from approximately 2.5 ft to five ft bgs. In Area Three, ground water was encountered in sand, silt, and clay layers ranging from approximately five ft to 7.5 ft bgs.

2.5 Beneficial Uses of Water

The surface water of the Brooklin Basin directly supports industrial activities such as maritime transportation, docking facilities and commercial enterprises that benefit from the "bay-side" location, such as hotels and restaurants. Recreational activities may include boating, fishing, and other leisure activities.

The shallow ground water beneath the site contains high [greater than 3,000 milligrams per liter (mg/L), see Table 6] concentrations of total dissolved solids (TDS). According to the State Water Resources Control Board (SWRCB), ground waters that contain greater than 3,000 mg/L TDS are not considered to be suitable or potentially suitable for municipal- or domestic-water supply (SWRCB, 1988). Therefore, there is no apparent beneficial use for the shallow ground water beneath the site.

3.0 SITE INVESTIGATION METHODS AND PROCEDURES

The following sections summarize the methods and procedures followed during Versar's preliminary investigation. Standard methods and procedures are more fully described in Versar's Site Investigation Work Plan (Versar, 1991). Deviations, if any, from the standard methods and procedures set forth in the work plan are described in the following sections.

3.1 Soil Sampling and Analysis

As part of Versar's investigation, soil samples were collected from 17 locations at the eastern section of the site, as shown in Figure 3. Five boreholes were cored in Area One, four boreholes were cored in Area Two, and eight boreholes were cored in Area Three. The boreholes were cored to a depth coinciding with the bay muds which inhibit vertical contaminant migration. The boreholes were cored by Powercore Soil Sampling, Inc. (Powercore) using hydraulically operated machinery to drive and retrieve soil samplers. Versar representatives Mr. Lawrence Kleinecke, Chemist/Geohydrologist, and Ms. Tracy Montgomery, Toxicologist, collected the soil samples and supervised the field activities.

Soil samples were collected by attaching a decontaminated, two-inch outside diameter, split-spoon sampler lined with brass tubes to a steel drilling rod and driving the sampler two ft into the soil. The sampler was then retrieved and the four six-inch brass tubes removed for inspection. Either a center or bottom tube was selected for possible laboratory analysis. The ends of the selected tube were covered with aluminum foil and fitted with plastic end caps. The tube was then appropriately labeled, and stored on ice in an insulated cooler.

A portion of each soil sample was monitored for volatile organic compounds (VOCs) by headspace analysis. The field

analysis was conducted using a Model 128 Century Organic Vapor Analyzer (OVA) using the following procedures:

- A background reading was obtained from the ambient air in the area, and the subsequent readings corrected to reflect a zero background reading.
- A full brass liner of soil (if available) was emptied into either a one-gallon Ziploc™ bag or a glass jar and sealed, allowing some ambient air to be included. The bag or glass jar was then agitated and placed in the sun to allow volatilization of VOCs.
- The Ziploc™ bag or glass jar was opened a minimum amount and the OVA probe inserted.
- The air within the bag or jar was monitored with the OVA and the maximum reading recorded in parts per million (ppm).

It should be noted that the results of field headspace analysis are only a qualitative indication of the presence of VOCs and cannot be used in place of laboratory analyses. The results of field headspace analysis are included in the borehole logs in Appendix A, and illustrated in Figure 10.

Four boreholes (BH13, BH15, BH16, and BH17) were cored around the docking area in Area One. The boreholes were cored to a depth of 10 ft bgs with the exception of BH15, which was cored to a depth of 7.5 ft bgs. Borehole BH14 was cored east of the production office to a depth of 10 ft bgs. Soil samples collected at 2.5 ft bgs in BH13 and BH16 exhibited moderate hydrocarbon odor. Ground water was encountered at approximately 2.5 ft bgs in this area.

In Area Two, boreholes BH1 and BH11 were positioned between Marine Railway Number One and Marine Railway Number Two. Borehole BH12 was positioned between Marine Railway Number One and the winch house and BH9 was positioned between the winch house and the paint storage building. Each of the boreholes was cored to a depth of 10 ft bgs. Soils collected from 2.5 and 5.0

ft bgs in BH12 exhibited moderate and strong hydrocarbon odors, respectively. A soil sample collected from BH11 at 5.0 ft bgs exhibited a slight hydrocarbon odor. Ground water was encountered at approximately 5.0 ft bgs in BH11 and BH12. Ground water was encountered in BH10 at approximately 3.0 ft bgs and 7.0 ft bgs in BH9.

Boreholes BH1, BH2, and BH3 were positioned along the north side of Area Three. Boreholes BH4, BH5, and BH6 were positioned along the west side of Area Three and BH7 and BH8 were positioned along the east side. Each of the boreholes was cored to a depth of 10 ft bgs with the exception of BH2, which was cored to a depth of 7.5 ft bgs. Slight to moderate hydrocarbon odors were noted in soil samples collected at 2.5 and 5.0 ft bgs in BH3 and BH4.

Soil samples collected from BH2 exhibited strong hydrocarbon odors at 5.0 and 7.5 ft bgs. Ground water was encountered at 5.0 ft bgs in BH1, and at 6.0 ft in BH2. In boreholes BH3, BH4, BH5, BH6, BH7, and BH8 ground water was encountered at 7.5 ft bgs.

A total of 59 soil samples were collected and transported following EPA protocols to Trace Analysis Laboratory, Inc. (Trace) via a Trace courier, under Versar's chain-of-custody documentation. Twenty-two of the soil samples were analyzed by Trace. A description of the analyses performed and the analytical results are included in Section 4.0 Laboratory Analytical Results.

3.2 Ground-Water Sampling and Analysis

A total of three ground-water samples were collected during Versar's investigation of the site. The ground-water samples were collected from boreholes BH4, BH12, and BH16. Boreholes BH12 and BH16 produced adequate amounts of ground water to perform borehole development procedures. Borehole BH4 did not produce an adequate amount of ground water for development

purposes; a sample of ground water was therefore collected from BH4 without first developing the borehole. The ground-water sampling locations are illustrated in Figure 3.

The following procedure was used to collect ground-water samples from the borings:

- Following the completion of soil coring operations, a decontaminated dedicated 1.5-inch inside diameter well screen was placed in the borehole and allowed to fill with ground water
- The well was purged by removing one well volume of water using a decontaminated Teflon™ bailer. The purge water was placed in DOT-approved 55-gallon drums for disposal.
- Following purging, ground-water samples were collected using a decontaminated bailer and placed in laboratory supplied containers.

Following sample collection, the casing was removed and the borehole backfilled with neat cement. Following the collection of ground-water samples, each sample was labeled and stored on ice in an insulated cooler. The samples were delivered to Trace following EPA protocols, by a Trace courier using Versar's chain-of-custody documentation.

4.0 LABORATORY ANALYTICAL RESULTS

A total of 22 soil samples and three water samples were submitted to and analyzed by Trace. The following sections briefly describe the results of the laboratory analysis. Copies of the laboratory analytical results are included as Appendix B. Tables 1 through 3 summarize the laboratory analytical results for soils. Tables 4 through 6 summarize the laboratory analytical results for ground water. In addition, analytical results for soils are illustrated in Figures 11 through 16. Figure 17 illustrates the analytical results for water.

4.1 Soil Sample Results

The laboratory analytical methods used and the number of soil samples analyzed by each method are as follows:

- Total petroleum hydrocarbons as gasoline (TPH-G) by the California Department of Health Services (DHS)/LUFT Field Manual Method - 17 samples.
- Total petroleum hydrocarbons as diesel (TPH-D) by the DHS/LUFT Field Manual Method - 17 samples.
- Oil and grease by U.S. Environmental Protection Agency (EPA) Method 5520EF - 17 samples.
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020 - 17 samples.
- Semivolatile organics by EPA Method 8270 - 2 samples.
- Metals (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc) using EPA Methods 7040, 7060, 7080, 7090, 7130, 7190, 219.1, 7210, 7420, 7471, 246.1, 7520, 7741, 7760, 7840, 7910, and 7950, respectively - 13 samples.

Of the soil samples collected from Area One, five samples (BH13-10E, BH14-7.5E, BH15-5E, BH16-7.5E, and BH17-7.5E) were analyzed for TPH-G, TPH-D, oil and grease, and BTEX. Analyte concentrations were below reporting limits in samples BH13-10E,

BH14-7.5E, BH15-5E, and BH17-7.5E. However, sample BH16-7.5E contained 0.970 milligrams per kilogram (mg/kg) of TPH-G, 8.0 mg/kg of TPH-D, and 0.082 mg/kg of xylenes. Oil and grease, benzene, ethylbenzene, and toluene concentrations in sample BH16-7.5E were below reporting limits.

One soil sample (BH13-5E) from Area One was analyzed for metals. Concentrations of metals detected above reporting limits are: 15 mg/kg arsenic; 72 mg/kg barium; 0.970 mg/kg cadmium; 130 mg/kg chromium; 2,900 mg/kg copper; 590 mg/kg lead; 13 mg/kg mercury; 18 mg/kg nickel; 0.280 mg/kg silver; 10 mg/kg vanadium; and 1,700 mg/kg zinc.

Of the soil samples collected from Area Two, four samples, BH9-7.5E, BH10-5.0E, BH11-5.0E, and BH12-6E were analyzed for TPH-G, TPH-D, oil and grease, and BTEX. The laboratory analytical results identified concentrations of 0.620 mg/kg TPH-G, 1,100 mg/kg oil and grease, and 0.1167 mg/kg volatile organic compounds (0.0067 mg/kg toluene, 0.016 mg/kg ethylbenzene, and 0.094 mg/kg xylenes) in sample BH9-7.5E. In sample BH11-5.0E analyte concentrations identified are: 9.4 mg/kg TPH-G; 3.7 mg/kg TPH-D; and 0.377 mg/kg total BTEX (0.0087 mg/kg ethylbenzene and 0.290 mg/kg xylenes). Analyte concentrations identified in sample BH12-6E are: 15 mg/kg TPH-G; 140 mg/kg TPH-D; 3,400 mg/kg oil and grease; and 0.4041 volatile organic compounds (0.0091 mg/kg toluene, 0.075 mg/kg ethylbenzene, and 0.320 mg/kg xylenes). Analyte concentrations were below reporting limits in sample BH10-5E.

Area Two soil samples which were analyzed for metals are: BH9-7.5E; BH10-7.5E; BH11-10E; and BH12-10E. Concentrations of metals detected range from: 3.6 mg/kg to 19 mg/kg arsenic; 70 mg/kg to 440 mg/kg barium; 0.120 mg/kg to 0.260 mg/kg beryllium; 21 mg/kg to 37 mg/kg chromium; 42 mg/kg cobalt; 17 mg/kg to 1,800 mg/kg copper; 3.1 mg/kg to 230 mg/kg lead; 0.064 mg/kg to 9.7

mg/kg mercury; <25 mg/kg to 140 mg/kg molybdenum; 16 mg/kg to 48 mg/kg nickel; <0.250 mg/kg to 0.550 mg/kg silver; 14 mg/kg to 65 mg/kg vanadium; and 38 mg/kg to 1,000 mg/kg zinc.

Of the soil samples collected from Area Three, nine samples (BH1-4.5E, BH2-7.5E, BH3-7.5E, BH4-7.5E, BH5-5E, BH6-10E, BH7-7.5E, BH8-7.5E, and BH9-7.5E) were analyzed for TPH-G, TPH-D, BTEX and oil and grease, and two samples (BH1-4.5 and BH2-7.5E) were analyzed for semi-volatile organic compounds. Samples BH1-4.5E, BH2-7.5E, and BH3-7.5E (which were collected from the north side of Area Three) contained concentrations of TPH-G ranging from 2.1 to 250 mg/kg, concentrations of TPH-D ranging from 1.6 to 2,200 mg/kg, and oil and grease concentrations ranging from below the reporting limit to 9,100 mg/kg. In addition, xylenes were identified in concentrations ranging from 0.078 to 4.4 mg/kg. Sample BH4-7.5E contained concentrations of 3.2 mg/kg TPH-G, 6.1 mg/kg TPH-D, and 0.089 mg/kg xylenes. Sample BH5-5E contained 13 mg/kg TPH-G, 43 mg/kg TPH-D, 270 mg/kg oil and grease, and 0.399 mg/kg total BTEX. Sample BH7-1.5E contained 130 mg/kg oil and grease. In the remaining samples, analyte concentrations were below reporting limits.

Semi-volatile organic compounds, including polynuclear aromatic hydrocarbons (PAHs), were detected in the two samples collected from Area Three, BH1-4.5E and BH2-7.5E. Sample BH1-4.5E contained 18 mg/kg fluorene, 4.6 mg/kg anthracene, and 0.720 mg/kg benzo(k)fluoranthene. Sample BH2-7.5E contained 37 mg/kg isophorone and 8.3 mg/kg anthracene.

Area Three soil samples which were analyzed for metals are: BH1-4.5E; BH2-7.5E; BH3-7.5E; BH5-5E; BH6-10E; BH7-7.5E; and BH8-7.5E. Concentrations of metals detected range from: 1.6 mg/kg to 14 mg/kg arsenic; 48 mg/kg to 330 mg/kg barium; <0.120 mg/kg to 0.160 mg/kg beryllium; 2.2 mg/kg to 42 mg/kg chromium; 6.5 mg/kg to 480 mg/kg copper; 3.1 mg/kg to 500 mg/kg lead; 0.140 mg/kg to

19 mg/kg mercury; 16 mg/kg to 78 mg/kg nickel; 15 mg/kg to 57 mg/kg vanadium; and 15 mg/kg to 660 mg/kg zinc.

4.2 Ground-Water Sample Results

The laboratory analytical methods used and the number of water samples analyzed by each method are as follows:

- TPH-G by the DHS/LUFT Field Manual method - three samples.
- TPH-D by the DHS/LUFT Field Manual method - three samples.
- Oil and grease by EPA Method 5520DF - three samples.
- BTEX by EPA Method 8020 - three samples.
- TDS - one sample.
- Salinity - one sample.
- Metals (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc) using EPA Methods 7040, 7060, 7080, 7090, 7130, 7190, 219.1, 7210, 7420, 7471, 246.1, 7520, 7741, 7760, 7840, 7910, and 7950, respectively - 3 samples. (These samples were filtered by the laboratory prior to analysis.)

The ground-water samples were collected from boreholes BH4, BH12, and BH16. Sample BH4 contained 74 milligrams per liter (mg/L) TPH-D, 32 mg/L oil and grease, and 0.00058 mg/L toluene. In sample BH12 concentrations of 0.570 mg/L TPH-G, 1.4 mg/L TPH-D, 24 mg/L oil and grease, 0.00053 mg/L toluene, and 0.0073 mg/L xylenes were identified. Sample BH16 contained concentrations of 0.410 mg/L diesel, 0.0059 mg/L toluene, and 0.0016 mg/L xylenes. Metal concentrations detected in the three ground-water samples range from 0.005 mg/L to 5.7 mg/L.

5.0 SUMMARY AND CONCLUSIONS

The following sections provide a brief summary of the results of Versar's preliminary investigation of the site and Versar's conclusions drawn from the investigation.

5.1 Summary

Petroleum hydrocarbons were identified in only one soil sample collected from Area One. The petroleum hydrocarbon concentrations were less than 10 mg/kg. The copper concentration of 2,900 mg/kg in BH13 exceeds the Total Threshold Limit Concentration (TTLC) value of 2,500 mg/kg. Although three of the metal identified in BH13 concentrations detected fall between Soluble Threshold Limit Concentrations (STLC) and TTLCs, only two of these samples exceed the STLC values by ten or more times. Concentrations of 590 mg/kg lead and 13 mg/kg mercury exceed ten time the STLC values of 5.0 mg/L and 0.2 mg/L, respectively.

Soil samples collected from BH2, located near the winch house in Area Two, contained elevated concentrations of petroleum hydrocarbons (greater than one mg/kg of VOC, or 10 mg/kg TPH-G, or 100 mg/kg TPH-D, or 1,000 mg/kg oil and grease). Of the four soil samples analyzed for metals, 17 metal concentrations detected fall between STLC and TTLC values; however, only five of the concentrations exceed STLC values by ten or more times. Concentrations of copper identified in samples BH9-7.5E (720 mg/kg) and BH11-10E (1,800 mg/kg) exceed ten times the STLC value of 25 mg/L for copper. Concentrations of 190 mg/kg lead identified in samples BH9-7.5E and BH11-10E (230 mg/kg) exceed ten times the STLC values of 5 mg/L for lead. In addition, the concentration of 9.7 mg/kg mercury identified in sample BH9-7.5E exceeds ten times the STLC value of 0.2 mg/L for mercury.

Soil samples collected from BH2 in Area Three contained elevated levels of petroleum hydrocarbons. Although 25 of the metal concentrations detected fall between STLC and TTLC values,

only two of the metal concentrations (480 mg/kg copper and 500 mg/kg lead) identified in sample BH5-5E exceed ten times the STLC values (25 mg/L for copper and 5 mg/L for lead). In addition, the semi-volatile organic compounds fluorene, anthracene, isophorone, and benzo(k) fluoranthene, were identified in two soil samples (BH1-4.5E and BH2-7.5E).

Preliminary ground-water sampling identified petroleum hydrocarbons in all of the samples analyzed. TPH-G was only identified in the sample from BH12 (0.57 mg/L). TPH-D concentrations detected ranged from 0.41 mg/L in BH16 to 74 mg/L in BH4. Benzene was not identified at or above the method's detection limits in any of the samples analyzed.

5.2 Conclusions

Based on the data collected during the field investigation, it is Versar's opinion that the primary areas of concern are petroleum hydrocarbon concentrations in soil that exceed Alameda County's anticipated clean-up levels established for the western section of PDDI (Chan, 1992), concentrations of several semi-volatile compounds, and soils containing a copper concentration in excess of the TTLC value for copper.

Petroleum hydrocarbon contamination was detected in the shallow ground water beneath the site. The probable source of this contamination may be leachate from petroleum hydrocarbons found in the soils, overlying the water table. However, because the ground water has no apparent beneficial uses and is not considered a drinking water source, the petroleum hydrocarbon and metal contamination is not likely to pose a threat to human health or the environment.

Petroleum hydrocarbons in excess of Alameda County's anticipated soil clean-up levels occur in limited vertical and lateral extent. The predominant contaminants identified were TPH-D and oil and grease. The exact source of this contamination

is not known. However, an unregistered UST was discovered in Area Three and may be a potential source.

Low concentrations of semi-volatile and PAH compounds (isophorone, fluorene, anthracene, and benzo(k)fluoroanthene) were detected in Area Three. The source of this contamination has not been identified.

Copper was detected in a concentration which exceeds its TTLC value. The location of the source of contamination is unknown; however, the contamination may be a result of historic sand-blasting operations.

6.0 REFERENCES

Chan, B.M., Alameda County Department of Environmental Health, Division of Hazardous Materials, January 1991. Alameda County Department of Environmental Health, March, 1992.

California Code of Regulations, Title 22, Article 3, Characteristics of Hazardous Waste, Section 66261.24, May 1991.

Central Valley Regional Water Quality Control Board 1991. Tri-Regional Board Staff Recommendations for Preliminary Investigation and Evaluation of Underground Tank Site; Appendix - Reports.

State Water Resources Control Board Resolution Number 88-63, Adoption of Policy Entitled "Sources of Drinking Water".

Versar, Inc., Fair Oaks, California, June 1991. Site Investigation Work Plan, Pacific Dry Dock and Repair Yard I, Eastern Section, Oakland, California.

Versar, Inc., Fair Oaks, California, May 1992. Preliminary Investigation and Evaluation Report (PIER), Pacific Dry Dock and Repair Yard I, Western Section, Oakland, California.

7.0 APPENDIX

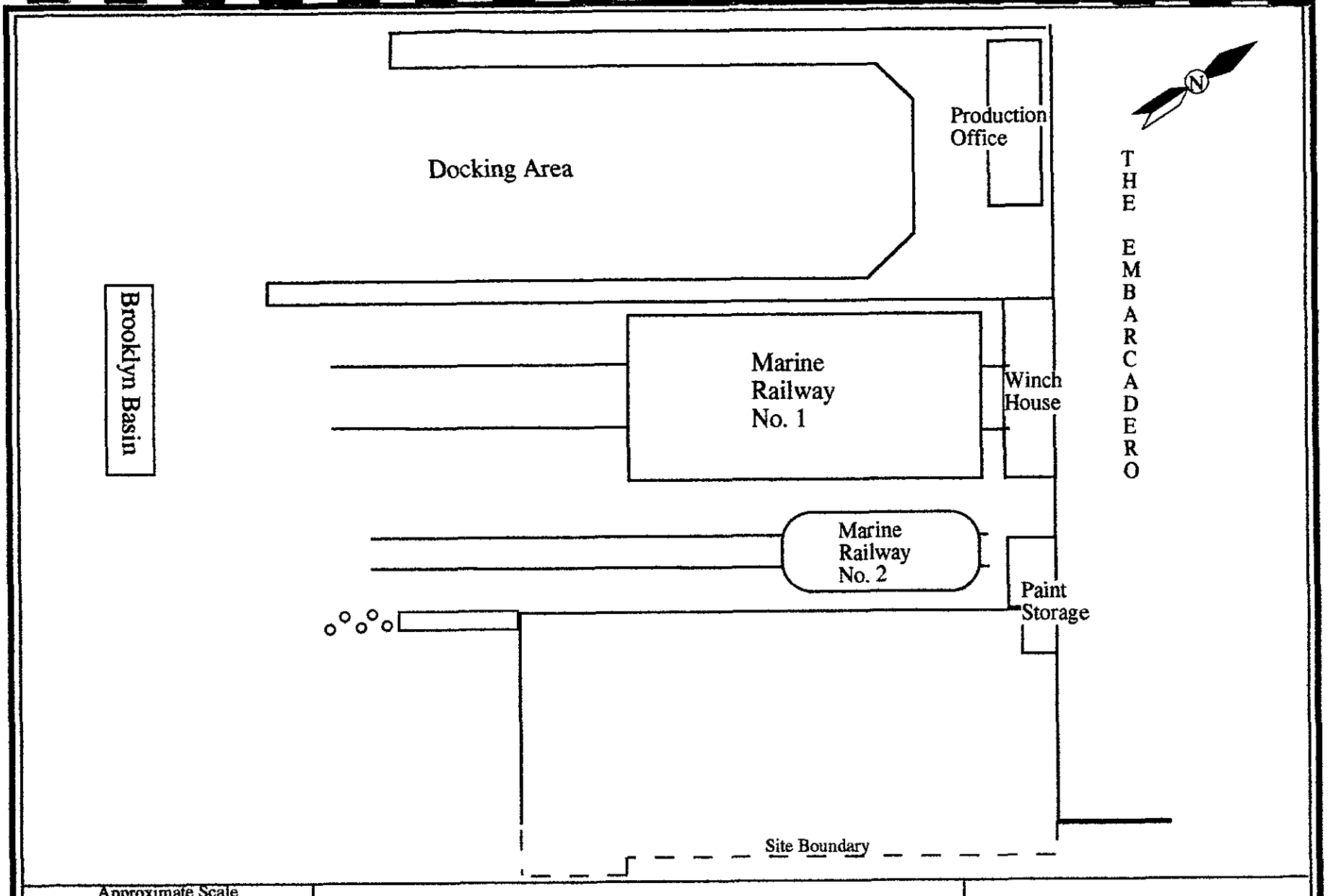
Appendices A thru C comprise the Appendix of this report.

Appendix A. Borehole Logs

Appendix B. Laboratory Analytical Results

Appendix C. Alameda County Flood Control and Water Conservation District Drilling Permit

Scale (miles) 0 0.25 0.50	Site Location	Figure 1
Project No. 7703.27	Pacific Dry Dock Yard I - Eastern Section Oakland, California	Versar Inc.



Approximate Scale
0 50 100
Feet

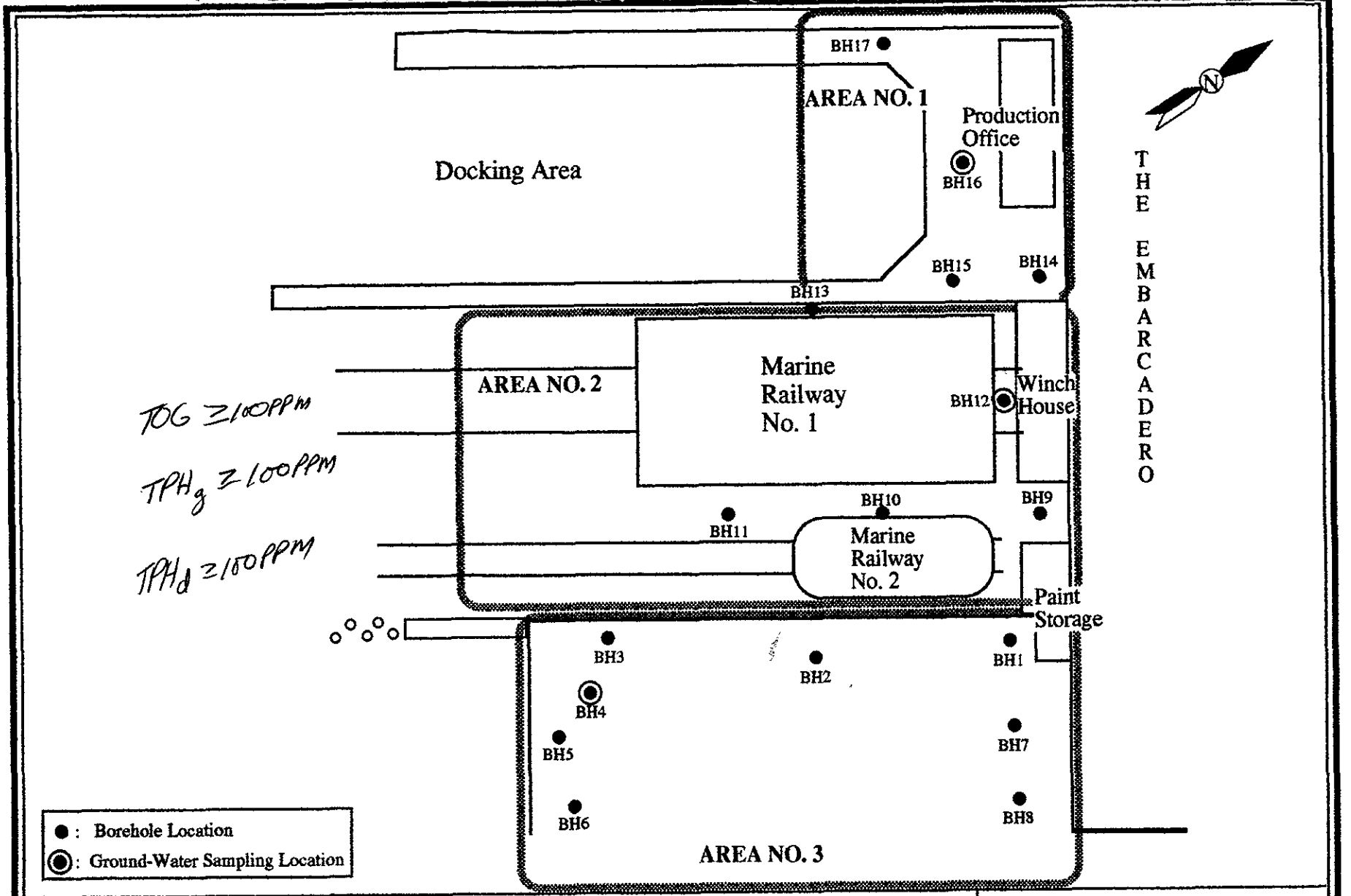
Project No. 7703.27

Site Layout

Pacific Dry Dock Yard I - Eastern Section
Oakland, California

Figure 2

Versar Inc.



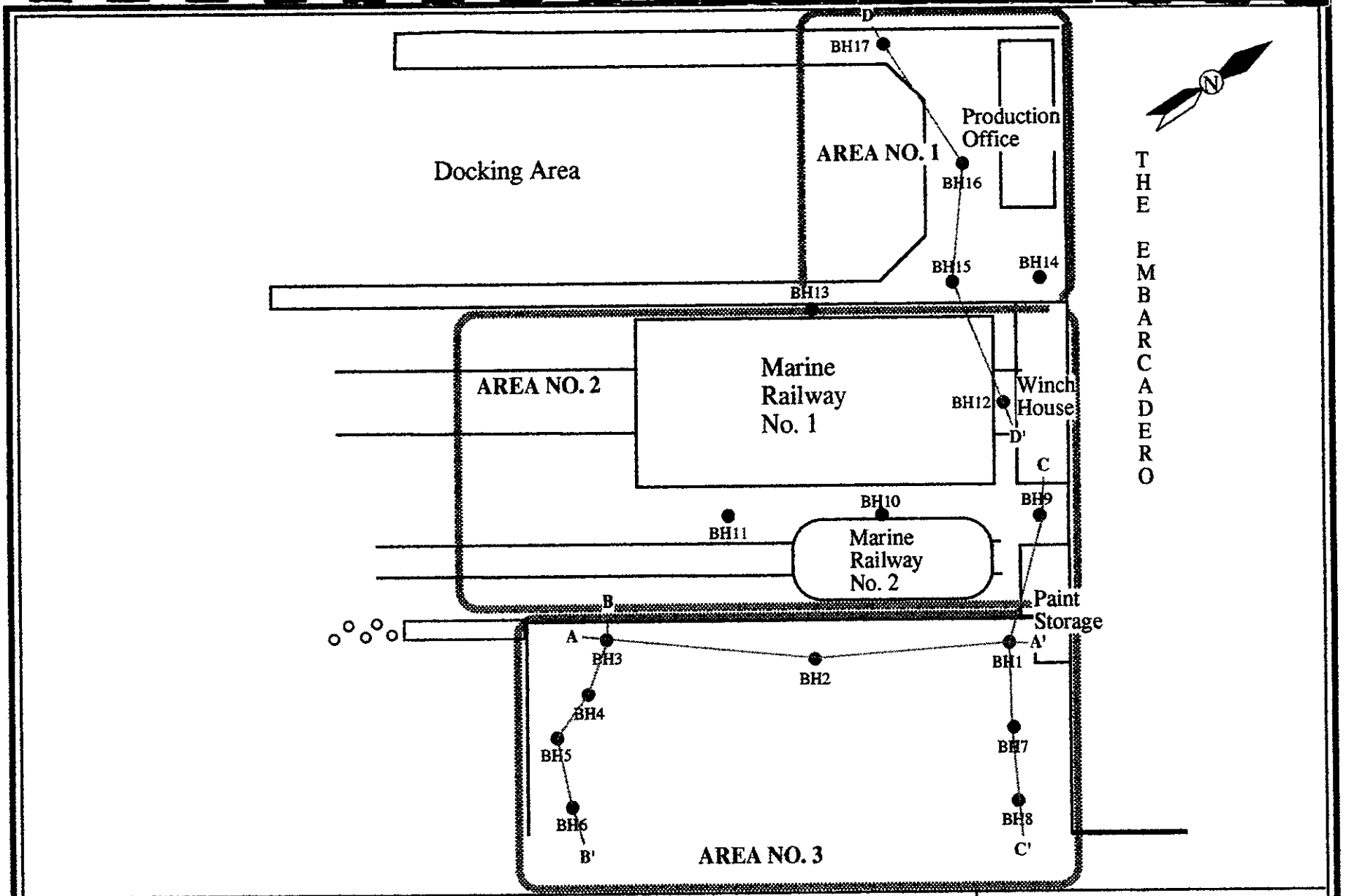
Preliminary Investigation Soil Sampling and Ground-Water Sampling Locations

Pacific Dry Dock Yard I - Eastern Section
Oakland, California

Figure 3

Project No. 7703.27

Versar Inc.



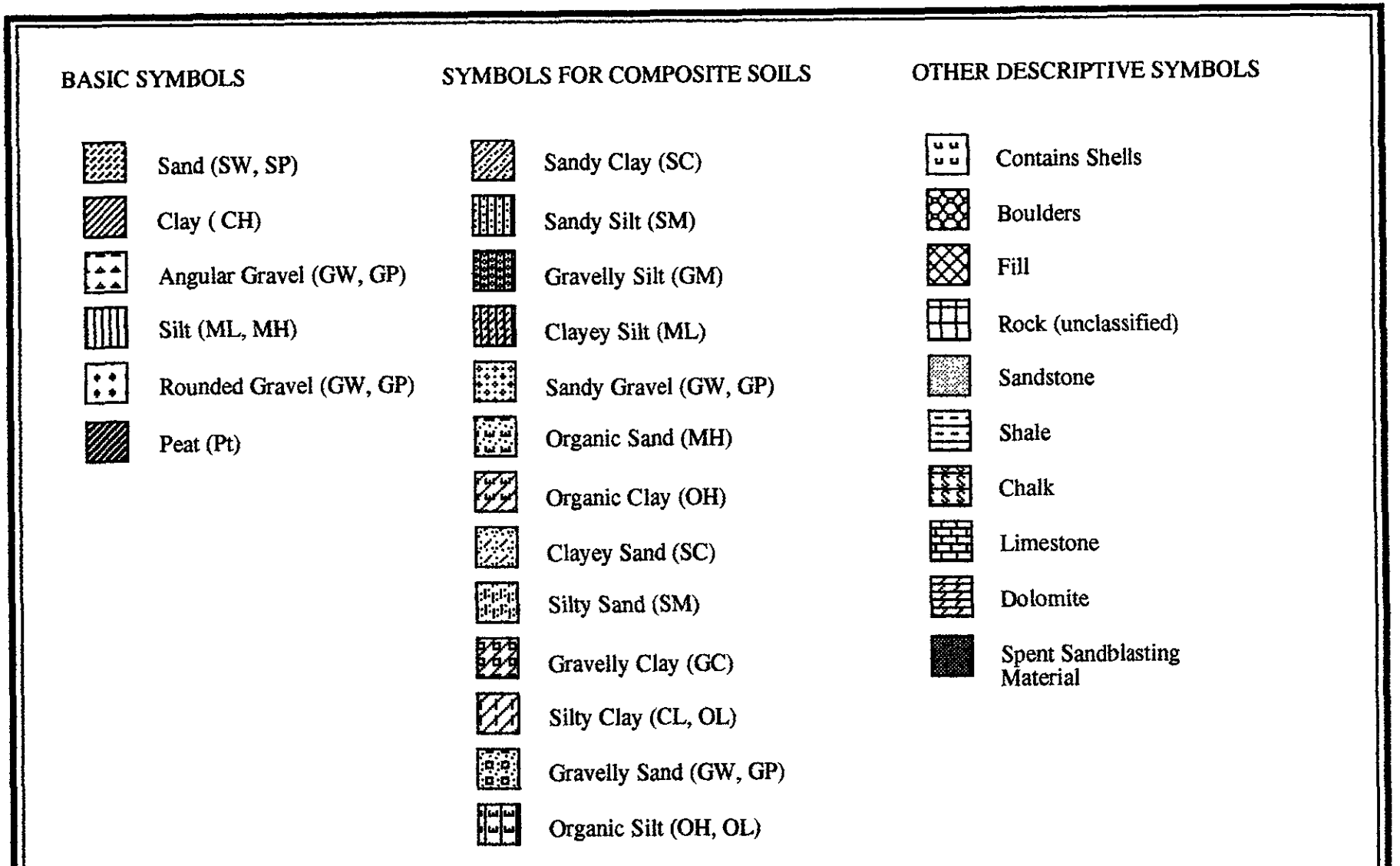
Cross-Section Lines-of-Reference

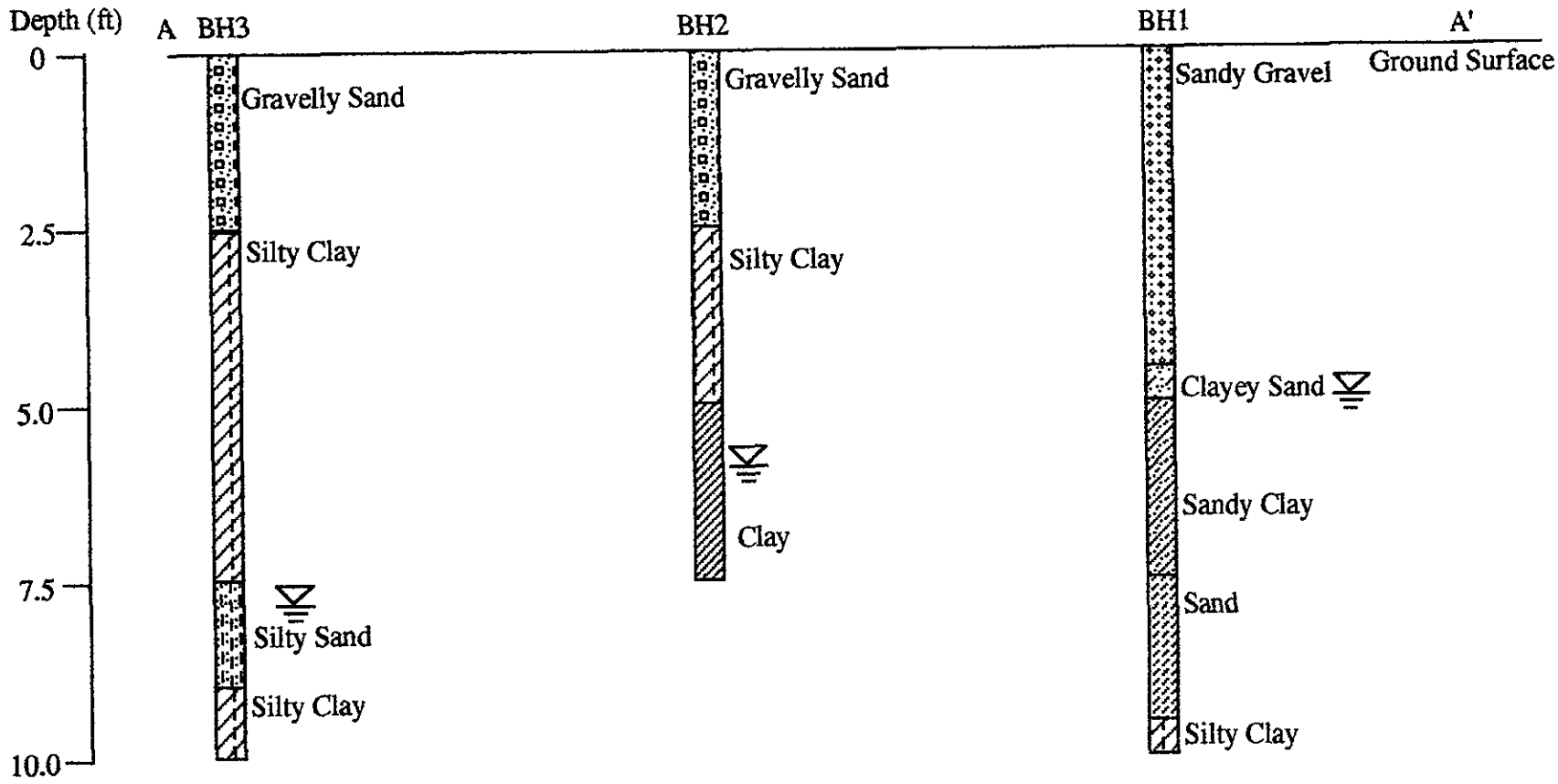
Figure 4

Project No. 7703.27

Pacific Dry Dock Yard I - Eastern Section
Oakland, California

Versar Inc.

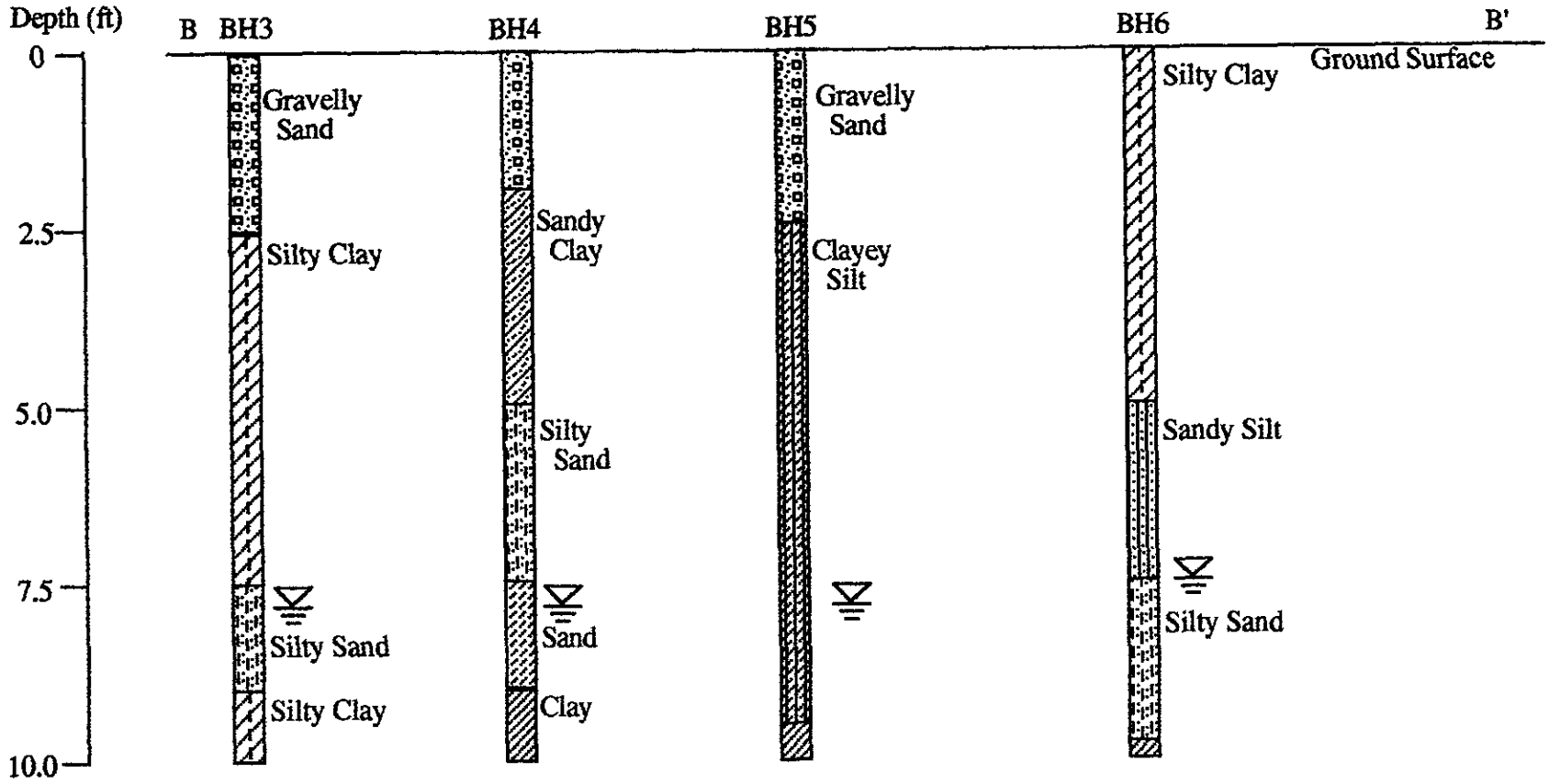

BASIC SYMBOLS
Sand (SW, SP)
Clay (CH)
Angular Gravel (GW, GP)
Silt (ML, MH)
Rounded Gravel (GW, GP)
Peat (Pt)
SYMBOLS FOR COMPOSITE SOILS
Sandy Clay (SC)
Sandy Silt (SM)
Gravelly Silt (GM)
Clayey Silt (ML)
Sandy Gravel (GW, GP)
Organic Sand (MH)
Organic Clay (OH)
Clayey Sand (SC)
Silty Sand (SM)
Gravelly Clay (GC)
Silty Clay (CL, OL)
Gravelly Sand (GW, GP)
Organic Silt (OH, OL)
OTHER DESCRIPTIVE SYMBOLS
Contains Shells
Boulders
Fill
Rock (unclassified)
Sandstone
Shale
Chalk
Limestone
Dolomite
Spent Sandblasting Material
No Scale
Graphic Representation of Standard Symbols for Soil Types
Figure 5
Job No. 7703.27
Pacific Dry Dock Yard I - Eastern Section
Oakland, California
Versar Inc.



Vertical Exaggeration: 20 times

First Ground Water Encountered
See Figure 5 for Soil Legend

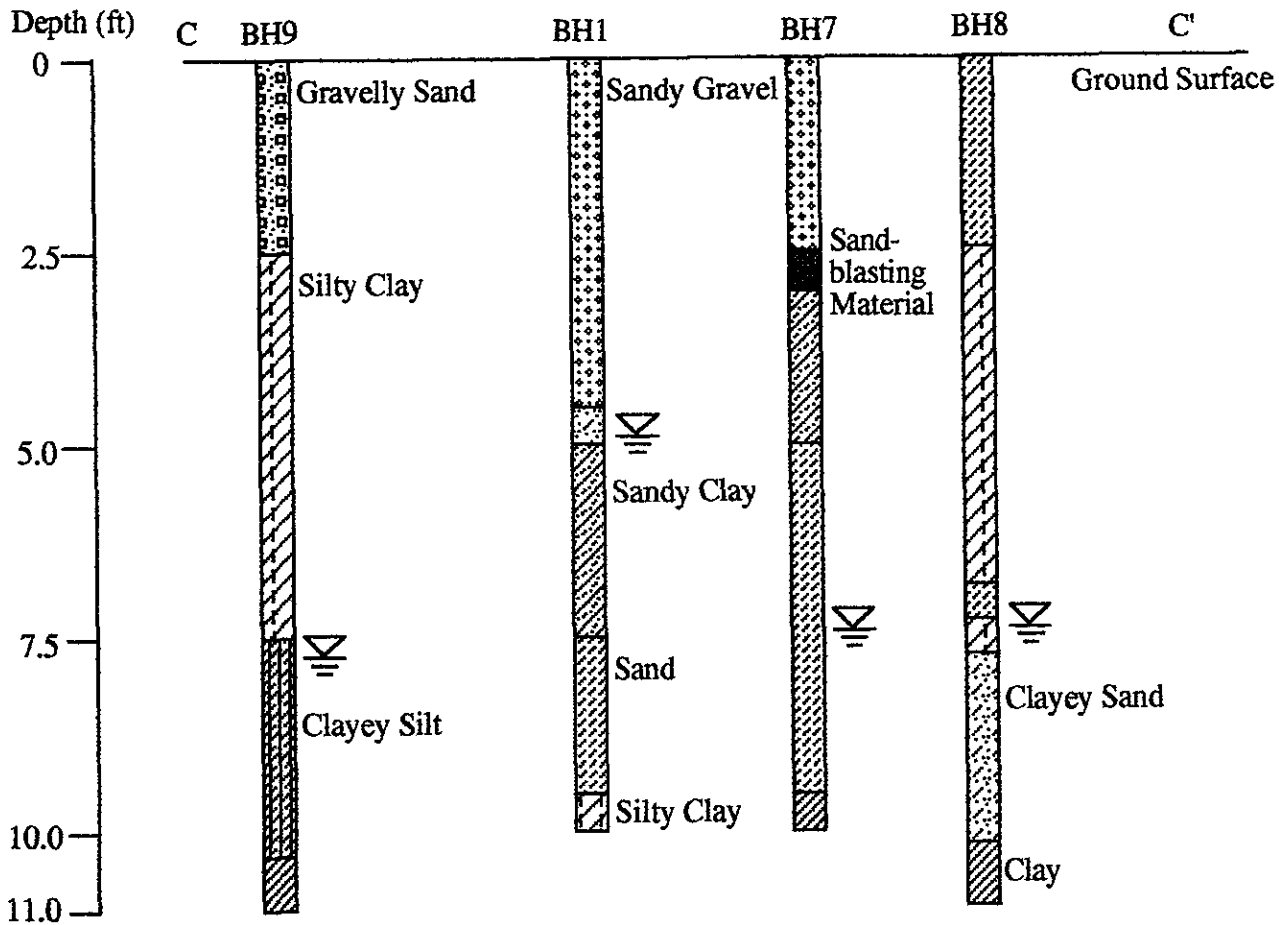
Approximate Horizontal Scale: 1 in = 50 ft Vertical Scale: 1 in = 2.5 ft	Subsurface Cross-Section A-A'	Figure 6
Project No. 7703.27	Pacific Dry Dock Yard I - Eastern Section Oakland, California	**Versar Inc.**



Vertical Exaggeration: 10 times

First Ground Water Encountered
See Figure 5 for Soil Legend

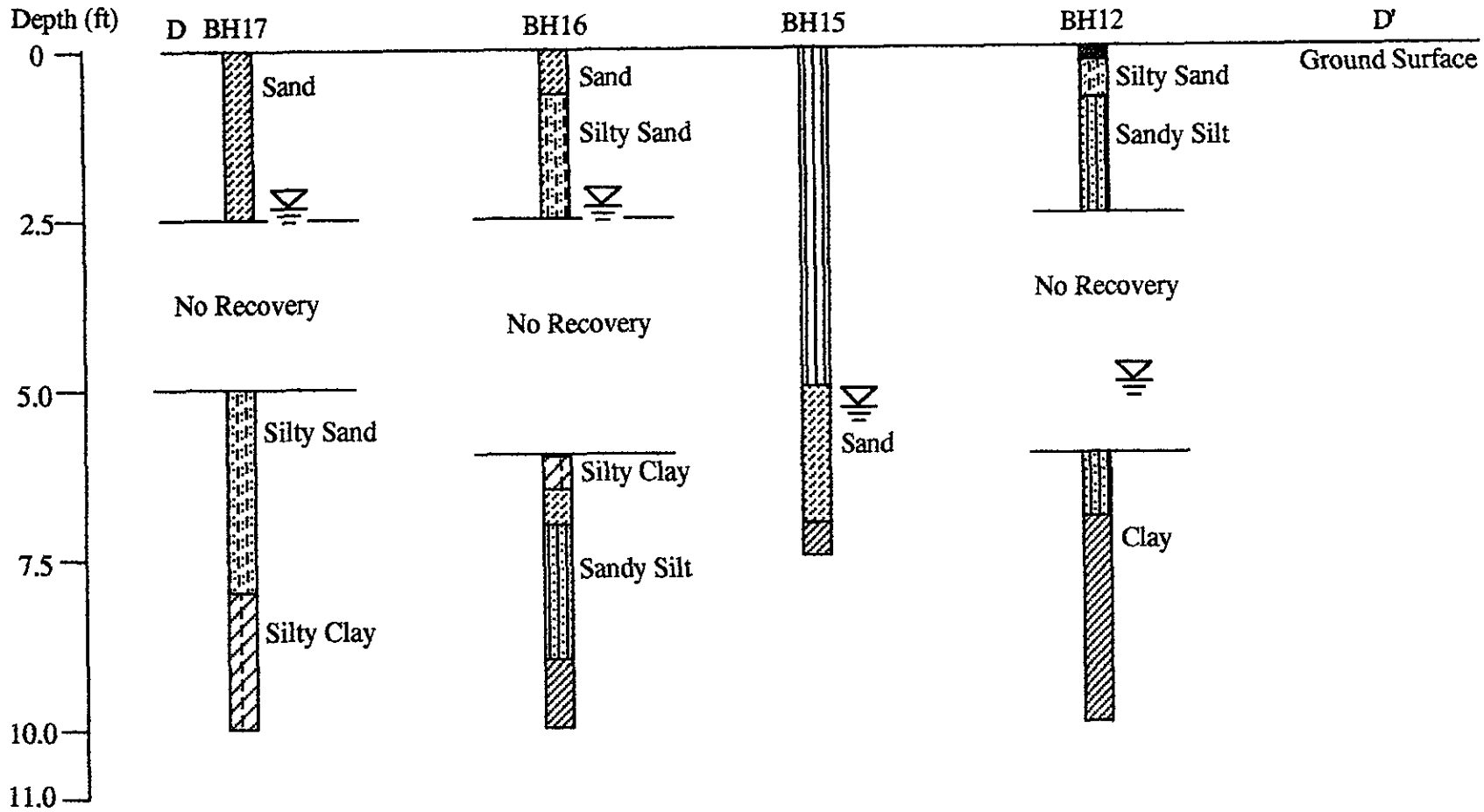
Approximate Horizontal Scale: 1 in = 25 ft Vertical Scale: 1 in = 2.5 ft	Subsurface Cross-Section B-B'	Figure 7
Project No. 7703.27	Pacific Dry Dock Yard I - Eastern Section Oakland, California	**Versar Inc.**



Vertical Exaggeration: 20 times

First Ground Water Encountered
See Figure 5 for Soil Legend

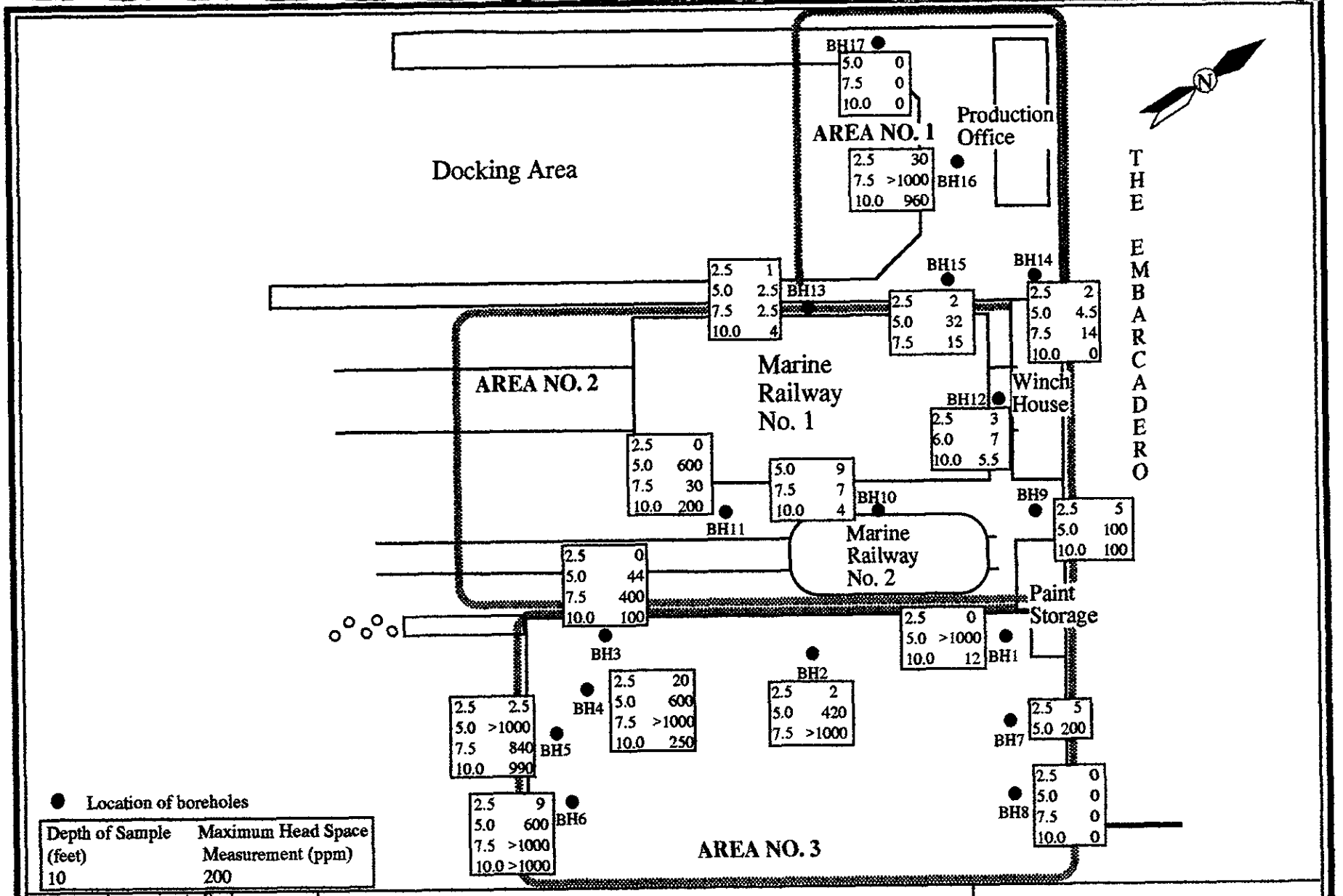
Approximate Horizontal Scale: 1 in = 50 ft Vertical Scale: 1 in = 2.5 ft	Subsurface Cross-Section C-C'	Figure 8
Project No. 7703.27	Pacific Dry Dock Yard I - Eastern Section Oakland, California	**Versar Inc.**



Vertical Exaggeration: 20 times

First Ground Water Encountered
See Figure 5 for Soil Legend

Approximate Horizontal Scale: 1 in = 50 ft Vertical Scale: 1 in = 2.5 ft	Subsurface Cross-Section D-D'	Figure 9
Project No. 7703.27	Pacific Dry Dock Yard I - Eastern Section Oakland, California	**Versar Inc.**



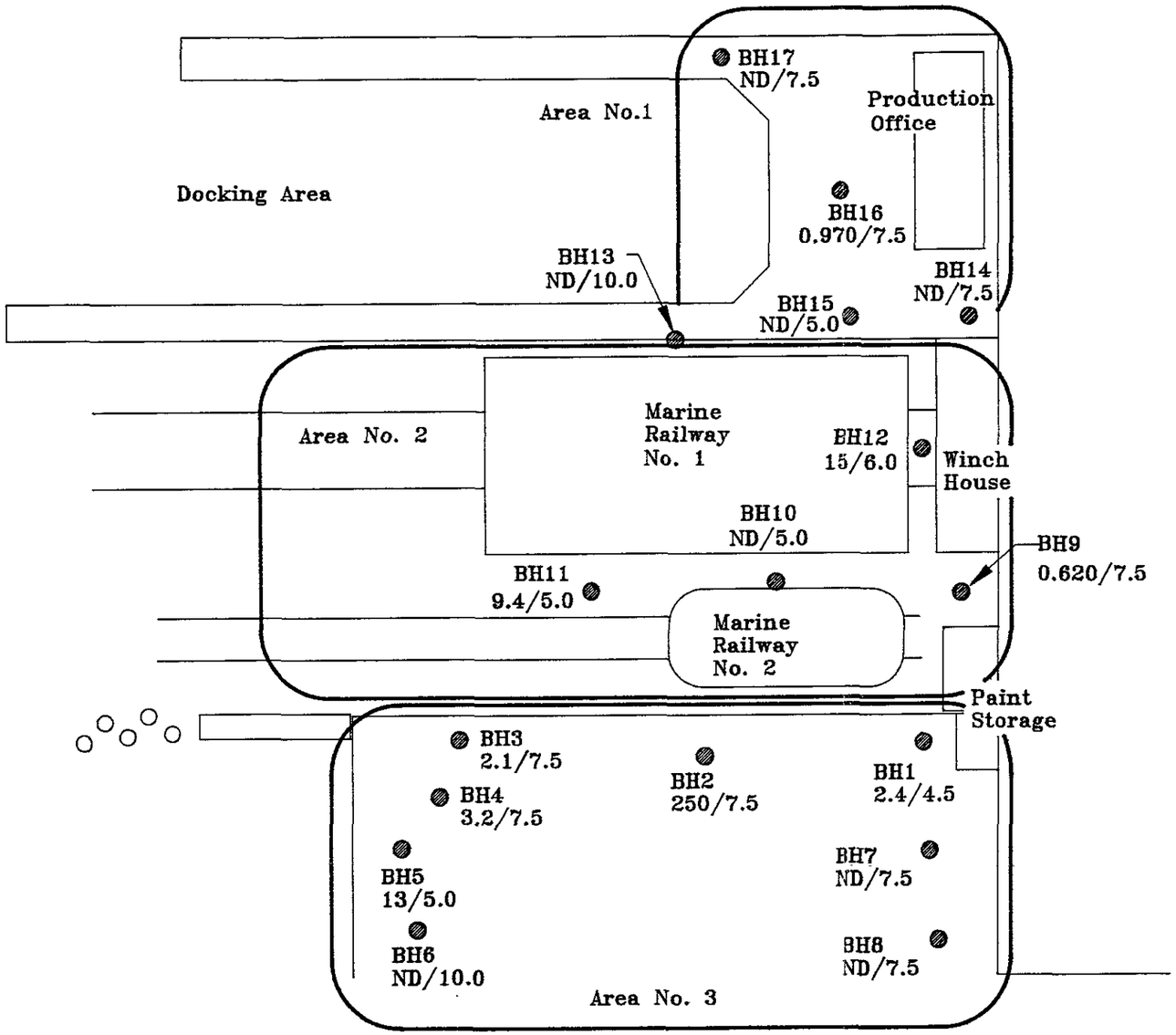
Volatile Organic Compounds
Headspace Analysis

Pacific Dry Dock Yark I - Eastern Section
Oakland, California

Figure 10

Project No. 7703.27

Versar Inc.



THE EMBARCADERO

N

Approximate Scale

0 50 100

LEGEND:

2.4/4.5 = Milligrams per Kilogram/Depth in Feet.

ND = Not Detected

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California,95628
Telephone: (916) 962-1612

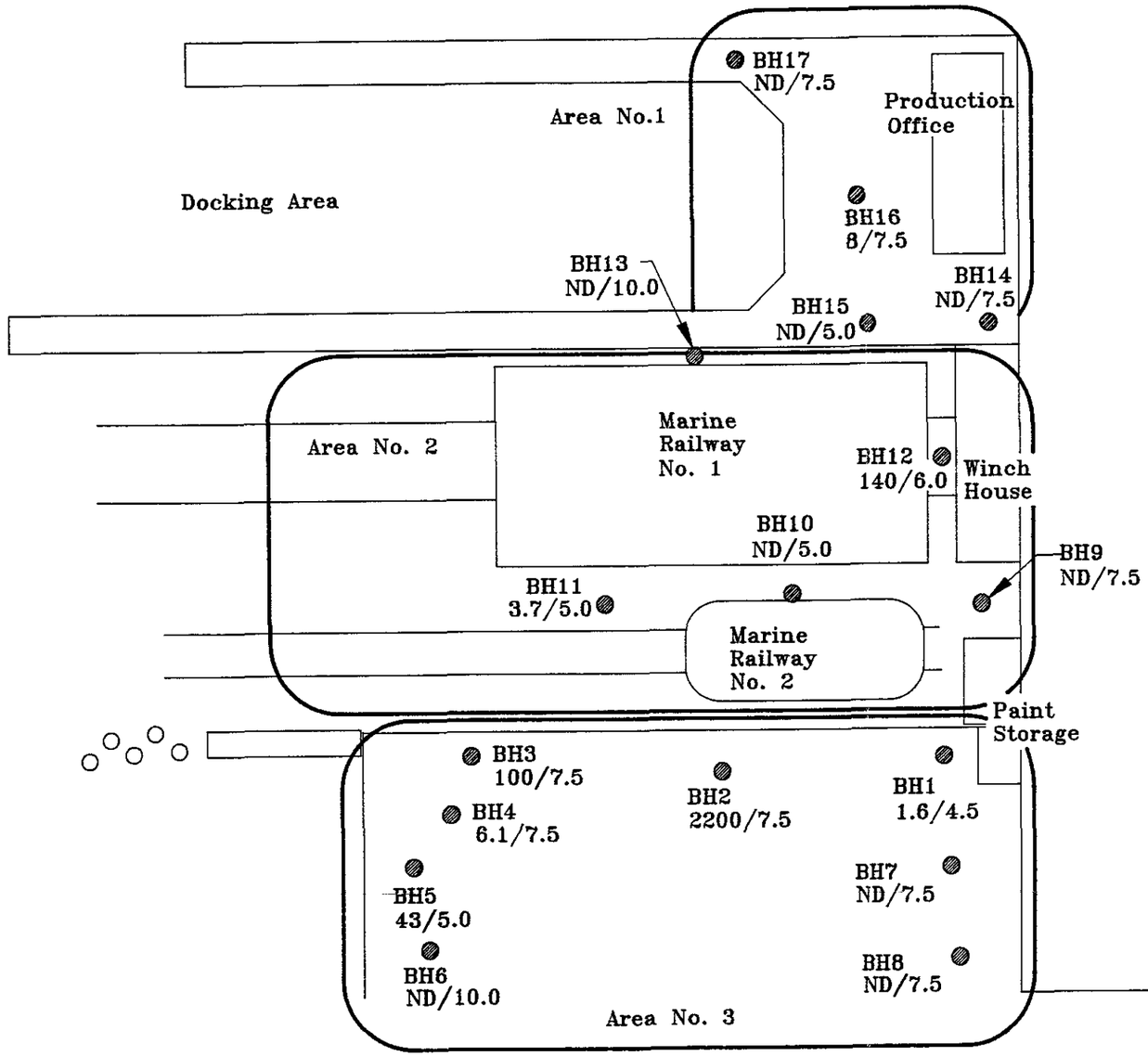
DRAWN BY: Sierra Hi-Tech
SCALE: As Shown
CHECKED/APPROVED
DATE: April,1992

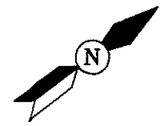
Pacific Dry Dock Yard 1
Eastern Section
Oakland,California

TITLE:
Total Petroleum Hydrocarbons
(as gasoline)in Soils

JOB NO: 7703.27

Figure 11





Approximate Scale

0 50 100

THE EMBARCADERO

LEGEND:

1.6/4.5 = Milligrams per Kilogram/Depth in Feet

ND = Not Detected

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

DRAWN BY: Sierra Hi-Tech

SCALE: As Shown

CHECKED/APPROVED

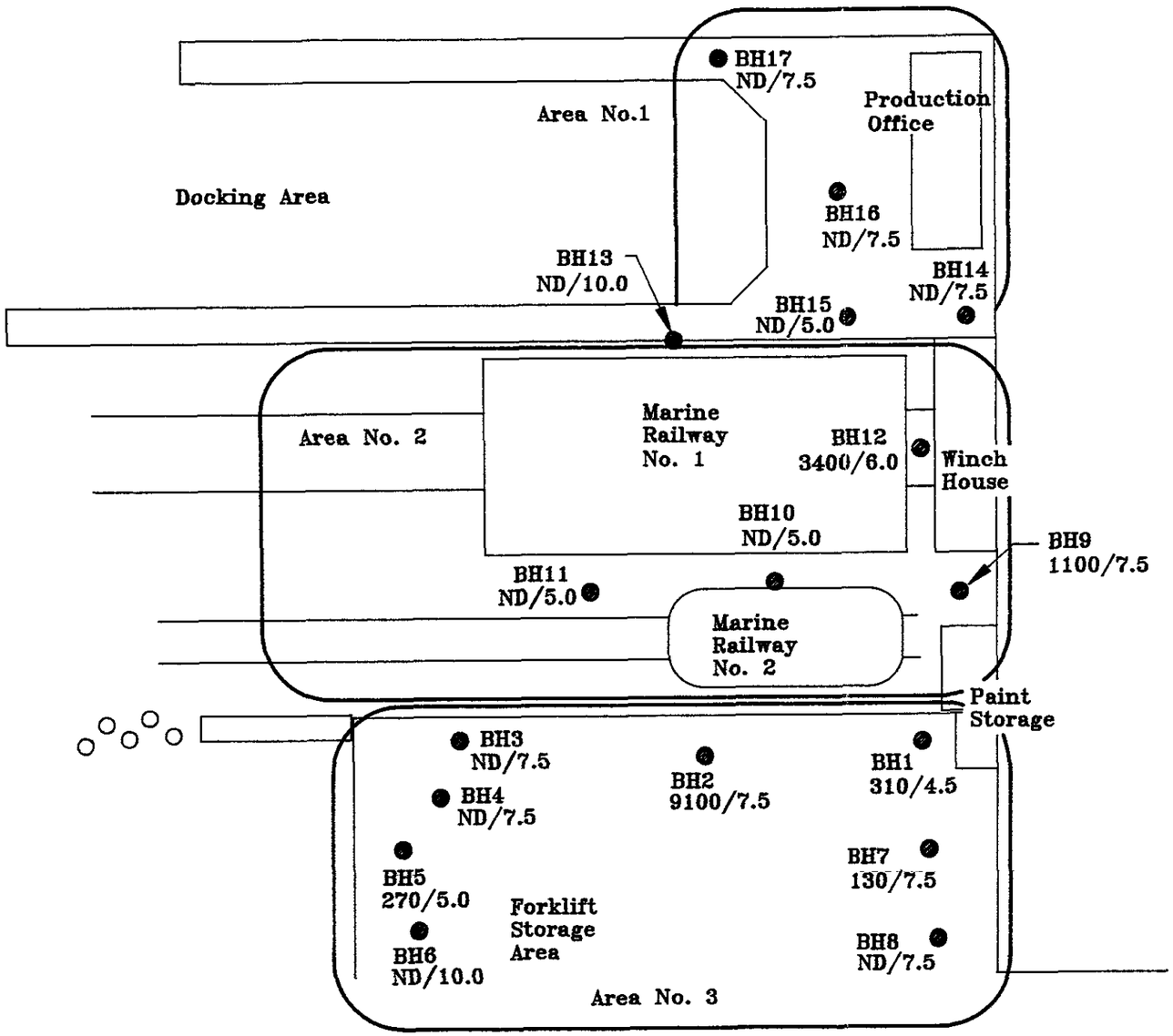
DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE:
Total Petroleum Hydrocarbons
(as diesel) in Soils

JOB NO: 7703.27

Figure 12



Approximate Scale

0 50 100

THE EMBARCADERO

LEGEND:

310/4.5 = Milligrams per Kilogram/Depth in Feet.

ND = Not Detected

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

DRAWN BY: Sierra Hi-Tech

SCALE: As Shown

CHECKED/APPROVED

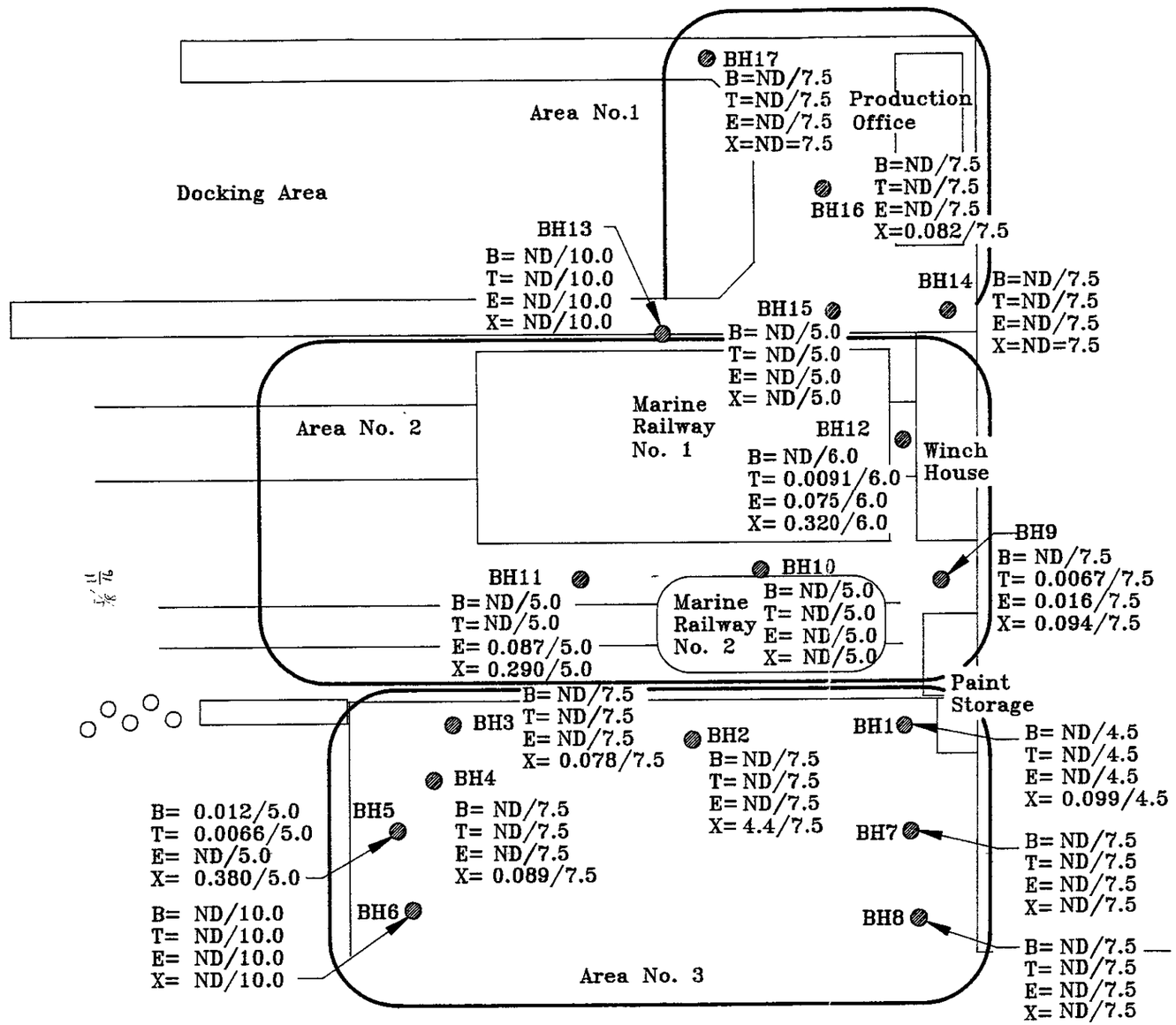
DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE:
Total Petroleum Hydrocarbons
(as oil and grease) in Soils

JOB NO: 7703.27

Figure 13



LEGEND:

2.4/4.5 = Milligrams per Kilogram/Depth in Feet

ND = Not Detected

B=Benzene
T=Toluene
E=Ethylbenzene
X=Xylenes

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

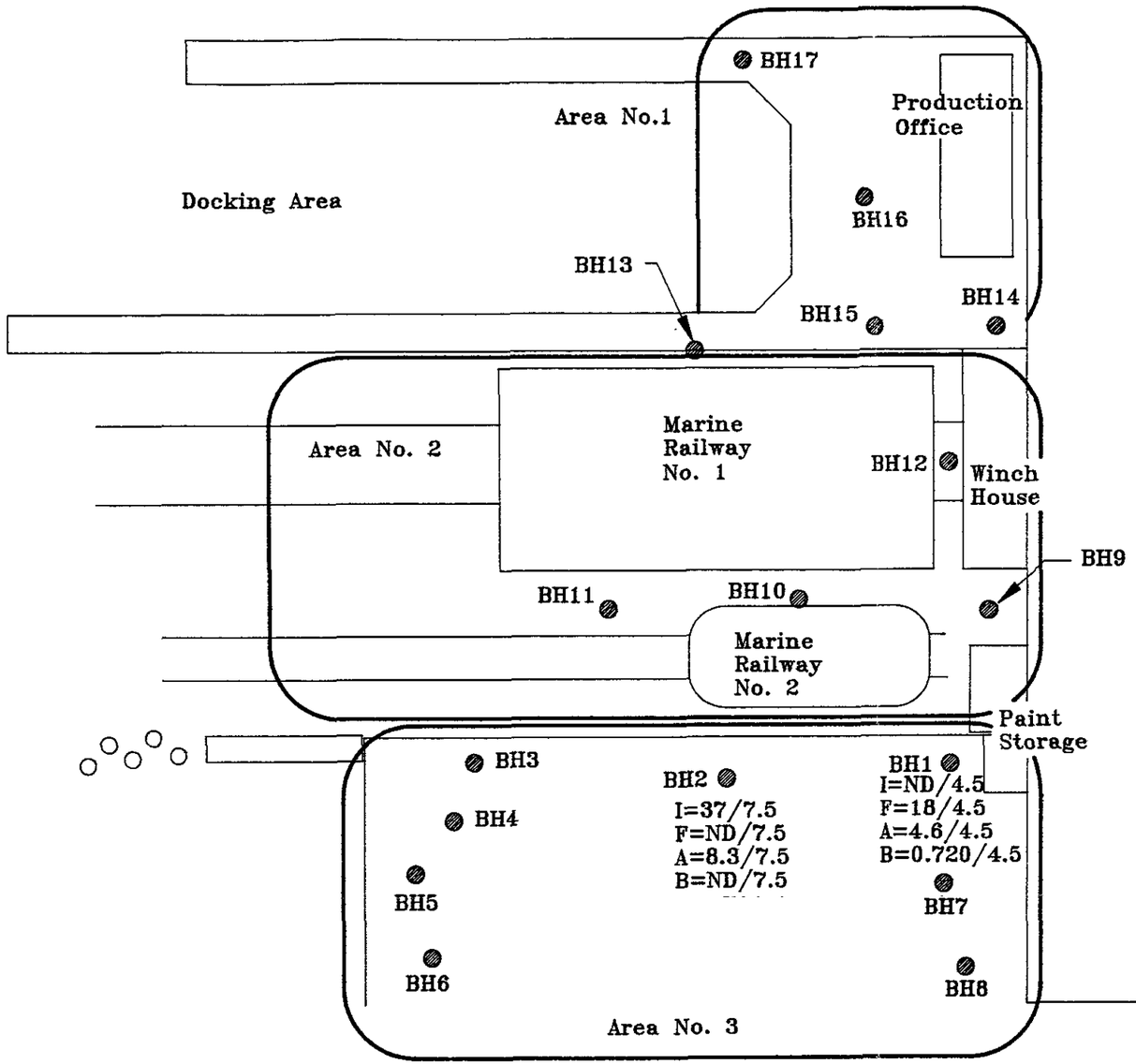
DRAWN BY: Sierra Hi-Tech
SCALE: As Shown
CHECKED/APPROVED
DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE: Volatile Organic Compounds in Soils

JOB NO: 7703.27

Figure 14



Approximate Scale

0 50 100

THE EMBARCADERO

What if others were analyzed for Semivolatile?

LEGEND:

2.4/4.5 = Milligrams per Kilogram/Depth in Feet.

ND = Not Detected

I = Isophorone
F = Fluorene
A = Anthracene
B = Benzo(k)fluoranthene

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

DRAWN BY: Sierra Hi-Tech

SCALE: As Shown

CHECKED/APPROVED

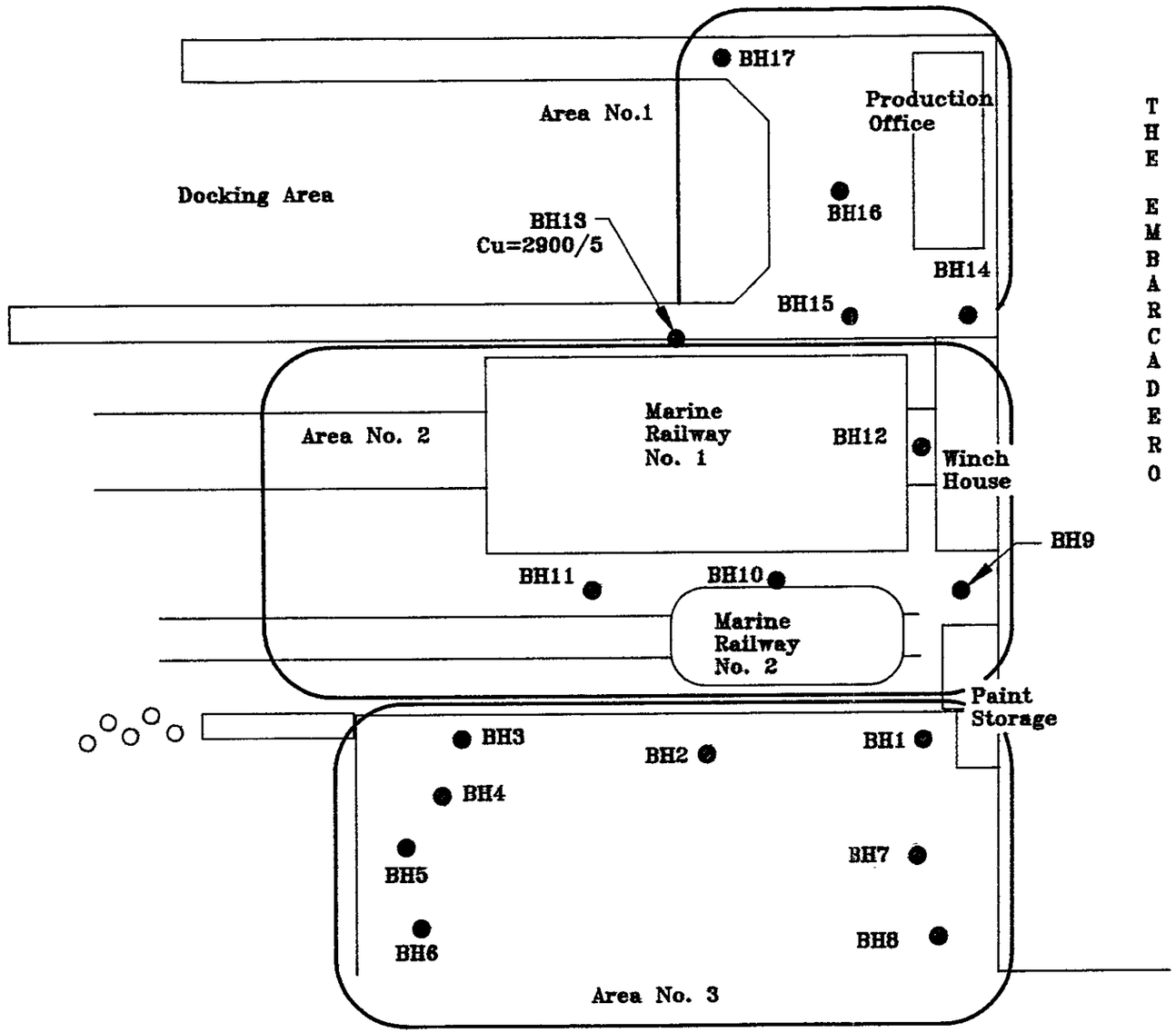
DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE:
Semi-Volatile Organic Compounds in Soils

JOB NO: 7703.27

Figure 15



THE EMBARCADERO

N

Approximate Scale

0 50 100

LEGEND:

480/5 = Milligrams per Kilogram/Depth in Feet.

ND = Not Detected

Cu=Copper TTLC 2500

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

DRAWN BY: Sierra Hi-Tech

SCALE: As Shown

CHECKED/APPROVED

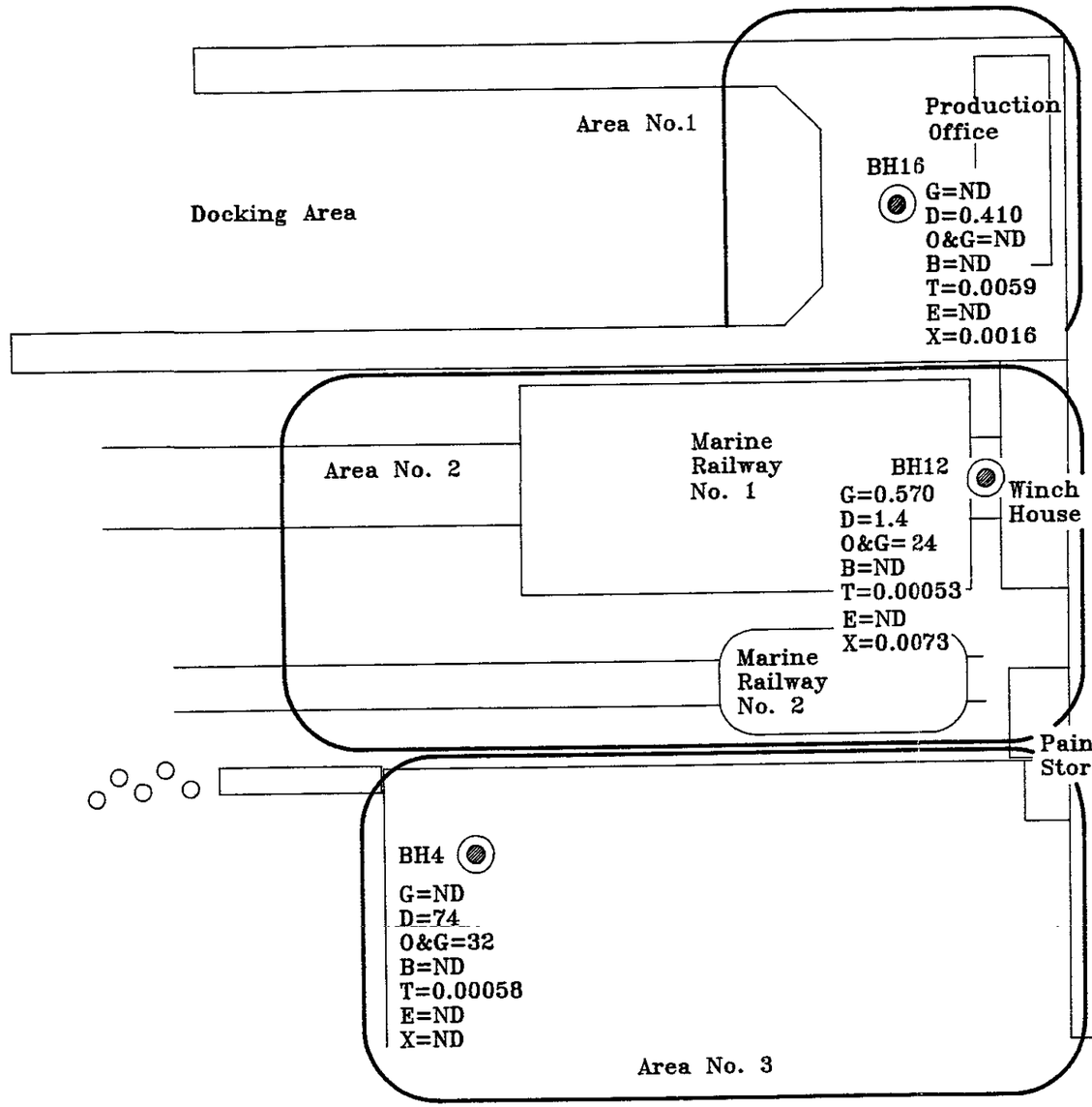
DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE: Copper Concentration exceeding TTLC in Soil

JOB NO: 7703.27

Figure 16



Approximate Scale

0 50 100

THE EMBARCADERO

LEGEND:

All results expressed in milligrams/liter

ND = Not Detected

BH4 ◎ Ground Water Sampling Location

G = TPH-G
D = TPH-D
O&G = Oil and Grease
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylenes

Samples Collected: March 23 and 24, 1992

REVISIONS				
ITEM	DATE		BY	APPR.

Versar Inc.

5330 Primrose Drive, Ste.228
Fair Oaks, California 95628
Telephone: (916) 962-1612

DRAWN BY: Sierra Hi-Tech

SCALE: As Shown

CHECKED/APPROVED

DATE: April 1992

Pacific Dry Dock Yard 1
Eastern Section
Oakland California

TITLE: Composite Analytical Results For Ground Water

JOB NO: 7703.27

Figure 17

Table 1

Laboratory Analytical Results for Soils
(Organics)

Pacific Dry Dock and Repair Yard I
Oakland, California

Sample Number	Sample Depth (feet)	Sample Collection Date	Total Petroleum Hydrocarbons[1]		O&G Hydrocarbons[2]	Volatile Organics[3]			
			Gasoline (mg/kg)[4]	Diesel (mg/kg)	Oil and Grease (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
BH1-4.5E	4.0-4.5	03/23/92	2.4	1.6	310	<0.005	<0.005	<0.005	0.099
BH2-7.5E	7.0-7.5	03/23/92	250	2,200	9,100	<0.28	<0.26	<0.3	4.4
BH3-7.5E	7.0-7.5	03/23/92	2.1	100	<50	<0.005	<0.005	<0.005	0.078
BH4-7.5E	7.0-7.5	03/23/92	3.2	6.1	<50	<0.005	<0.005	<0.005	0.089
BH5-5E	4.5-5.0	03/23/92	13	43	270	0.012	0.0066	<0.005	0.380
BH6-10E	9.5-10.0	03/23/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH7-7.5E	7.0-7.5	03/23/92	<0.5	<1.0	130	<0.005	<0.005	<0.005	<0.015
BH8-7.5E	7.0-7.5	03/23/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH9-7.5E	7.0-7.5	03/23/92	0.620	<1.0	1,100	<0.005	0.0067	0.016	0.094
BH10-5E	4.5-5.0	03/24/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH11-50E	4.5-5.0	03/23/92	9.4	3.7	<50	<0.005	<0.005	0.087	0.290
BH12-6E	5.5-6.0	03/24/92	15	140	3,400	<0.0056	0.0091	0.075	0.320
BH13-10E	9.5-10.0	03/24/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH14-7.5E	7.0-7.5	03/24/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH15-5E	4.5-5.0	03/24/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015
BH16-7.5E	7.0-7.5	03/24/92	0.970	8	<50	<0.005	<0.005	<0.005	0.082
BH17-7.5E	7.0-7.5	03/24/92	<0.5	<1.0	<50	<0.005	<0.005	<0.005	<0.015

[1] DHS/LUFT Manual Method

[2] EPA Method 5220EF

[3] EPA Method 8020

[4] Milligrams per kilogram

Versar INC. SACRAMENTO

Table 2

Laboratory Analytical Results for Soils
(Semi-Volatile Organics)[1]

Pacific Dry Dock and Repair Yard I
Eastern Section
Oakland, California

Sample Number	Sample Depth (feet)	Sample Collection Date	Isophorone (mg/kg)[2]	Fluorene (mg/kg)	Anthracene (mg/kg)	Benzo(k)fluoranthene (mg/kg)
BH1-4.5E	4.0-4.5	03/23/92	<0.330	18	4.6	0.720
BH2-7.5E	7.0-7.5	03/23/92	37	<0.330	8.3	<0.330

[1] EPA Method 8270

[2] Milligrams per kilogram

Table 3

Laboratory Analytical Results for Soils
(Metals)

Pacific Dry Dock and Repair Yard I
Eastern Section
Oakland, California

Analyte	Sample Number Depth (feet) Collection Date	BH1-4.5E 4.0-4.5 03/23/92	BH2-7.5E 7.0-7.5 03/23/92	BH3-7.5E 7.0-7.5 03/23/92	BH4-7.5E 7.0-7.5 03/23/92	BH5-5E 4.5-5.0 03/23/92	BH6-10E 9.5-10.0 03/23/92	BH7-7.5E 7.0-7.5 03/23/92
Antimony		<11[1]	<11	<11	<11	<11	<11	<11
Arsenic		10	3.4	3.4	4.7	14	3.9	4.3
Barium		65	48	48	<25	330	<25	80
Beryllium		<0.120	<0.120	<0.120	<0.120	0.180	<0.120	<0.120
Cadmium		<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Chromium		2.2	18	27	12	37	21	27
Cobalt		<12	<12	<12	<12	<12	<12	<12
Copper		40	14	22	8.8	480	6.5	24
Lead		3.3	3.1	<2.5	<2.5	500	11	6.6
Mercury		1.9	0.770	0.570	0.150	0.410	0.150	0.200
Molybdenum		<25	<25	<25	<25	<25	<25	<25
Nickel		<7.5	28	35	18	78	16	42
Selenium		<0.120	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
Silver		<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Thallium		<5.9	<5.9	<5.9	<5.9	<5.9	<5.9	<3.5
Vanadium		28	18	20	15	57	31	33
Zinc		120	21	31	15	660	31	39

[1] All results reported in milligrams per kilogram

[2] Results listed in bold type exceed Total Threshold Limit Concentration (TTLC)

Table 3

Laboratory Analytical Results for Soils
(Metals)

Pacific Dry Dock and Repair Yard I
Eastern Section
Oakland, California

Analyte	Sample Number Depth (feet) Collection Date	BH8-7.5E 7.0-7.5 03/23/92	BH9-7.5E 7.0-7.5 03/23/92	BH10-7.5E 7.0-7.5 03/24/92	BH11-10E 9.5-10.0 03/24/92	BH12-10E 9.5-10.0 03/24/92	BH13-5E 4.5-5.0 03/24/92
Antimony		<13[1]	<11	<11	<11	<11	<11
Arsenic		1.6	13	3.6	19	6.6	15
Barium		78	76	82	440	70	72
Beryllium		0.160	<0.120	0.130	0.260	0.120	<0.120
Cadmium		<0.250	<0.250	<0.250	<0.250	<0.250	0.970
Chromium		42	25	28	37	21	130
Cobalt		<12	<12	<12	42	<12	<12
Copper		45	720	22	1,800	17	**2,900**[2]
Lead		24	190	3.1	230	<2.5	590
Mercury		0.140	9.7	0.130	0.120	0.064	13
Molybdenum		<25	<25	<25	140	<25	<25
Nickel		59	45	48	16	48	18
Selenium		<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Silver		<0.250	<0.250	<0.250	0.550	<0.250	0.280
Thallium		<5.9	<5.9	<5.9	<5.9	<5.9	<5.9
Vanadium		36	40	25	65	14	10
Zinc		95	340	38	1,000	41	1,700

[1] All results reported in milligrams per kilogram

[2] Results listed in **bold type** exceed Total Threshold Limit Concentration (TTLC)

Table 4

Laboratory Analytical Results for Water
(Organics)

Pacific Dry Dock and Repair Yard I
Eastern Section
Oakland, California

Sample Number	Sample Collection Date	Total Petroleum Hydrocarbons[1]		O&G Hydrocarbons[2]	Volatile Organics[3]			
		Gasoline (mg/L)[4]	Diesel (mg/L)	Oil and Grease (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
BH4	03/24/92	<0.05	74	32	<0.0005	0.00058	<0.0005	<0.0015
BH12	03/24/92	0.570	1.4	24	<0.0005	0.00053	<0.0005	0.0073
BH16	03/24/92	<0.05	0.410	<5	<0.0005	0.0059	<0.0005	0.0016

[1] DHS/LUFT Manual Method

[2] EPA Method 5820EF

[3] EPA Method 602

[4] Milligrams per liter

Table 5

Laboratory Analytical Results for Water
(Metals)

Pacific Dry Dock and Repair Yard I
Eastern Section
Oakland, California

Analyte	Collection Date	BH4	BH12	BH16
Antimony	03/24/92	<0.200[1]	<0.200	<0.200
Arsenic	03/24/92	0.061	0.011	<0.005
Barium	03/24/92	6.9	<1.0	5.7
Beryllium	03/24/92	0.0085	<0.005	0.005
Cadmium	03/24/92	<0.010	<0.010	<0.010
Chromium	03/24/92	1.4	0.180	1.2
Cobalt	03/24/92	<0.5	<0.5	<0.5
Copper	03/24/92	4.3	0.30	0.820
Lead	03/24/92	3.5	<0.10	0.640
Mercury	03/24/92	0.093	0.015	0.10
Molybdenum	03/24/92	<1.0	<1.0	<1.0
Nickel	03/24/92	2.1	0.37	1.9
Selenium	03/24/92	<0.005	<0.005	<0.005
Silver	03/24/92	<0.01	<0.01	<0.01
Thallium	03/24/92	<0.15	<0.15	<0.15
Vanadium	03/24/92	1.4	0.230	1.0
Zinc	03/24/92	5.3	0.270	2.0

[1] All results reported in milligrams per liter

Table 6

Laboratory Analytical Results for Water
(Dissolved Phase)

Pacific Dry Dock and Repair Yard 1
Eastern Section
Oakland, California

Sample Number	Sample Collection Date	Total Dissolved Solids (mg/L)[1]	Salinity ppt[2]
BH4	03/24/92	3700	3

[1] Milligrams per liter

[2] Parts per trillon

Versar INC. SACRAMENTO

APPENDIX A

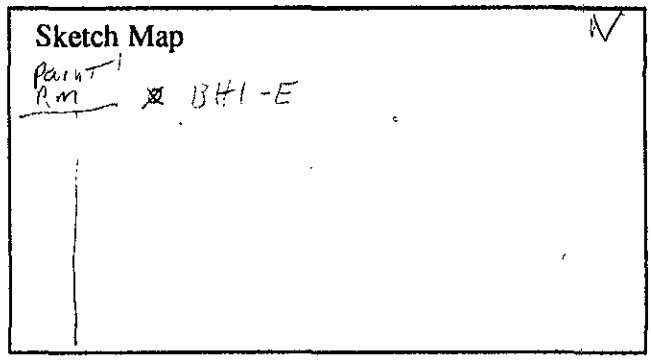
Borehole Logs

DRILLING LOG

Job Number 7703 27

Project PDQ E
Location BH1-East
Borehole Number BH1-E
Date Drilled 03/23/02
Contractor Powerforce
Drilling Method Direct
Driller Mike N
Hole Diameter 2 in
Log By Kleineke
Total Depth 10'

Sketch Map



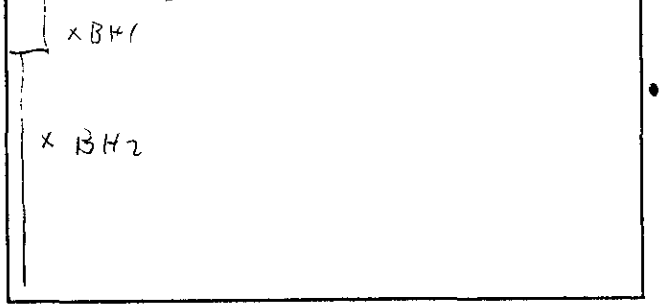
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
1	24/18				gvls to 1 inch	
					EP	
2.5	24/3				Org brn sandy gvls dry angular No odor	0
					25% fine sand 50% gvls to 1/2"	
					SC	
5.0	24/18		▽		wt 4.5' AA becoming clayey med sand at 4.5'	420
					30% clay 30% fine sand 40% med sand	
7.5	24/6				SC Grey sandy clay w angular gvls to 1/2"	
					No odor wet No headspace sample	
					60% clay 30% med sands	
10	24/24				SC	
					lt Grey fine sand wet w shell fragments	12
					No odor 90% fine sand 10% clay	
					Clay rounds in 9.5" sample Tube	
					CL Grey silty clay w shell frags med plastic	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock + Repair
Location East Side
Borehole Number BH2-E
Date Drilled 3-23-92
Contractor Powerscore
Drilling Method Core
Driller Mike N.
Hole Diameter 3 in
Log By L. Kleinecke
Total Depth 7.5'

Sketch Map



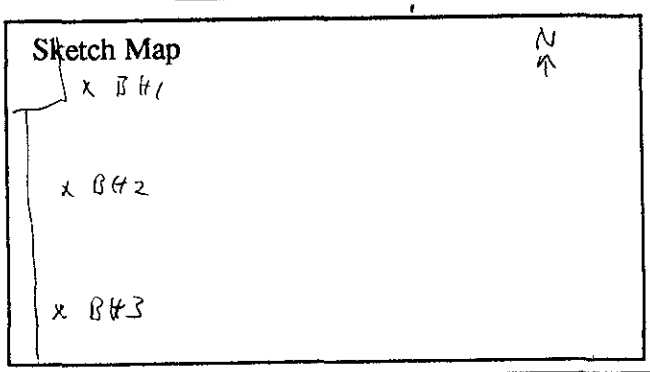
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/12				GP Asphalt surf w angular org brn guls To 1'	
2.5	24/12				GP Gravelly sand dry org-brn angular slight odor 10% Fines 40% med 10% coarse 40% guls To 1/2" diam	2
5.0	24/18		▽		CL Grey brn silty clay moist, shell frags Mod plastic strong odor 10% shells	420
7.5	24/24				CL Grey clay low plastic black+white layer of shell frags +GW shells oily w strong odor	7/1000
					end of hole at 7.5'	

DRILLING LOG

Job Number 770327

Project Pacific Dry Dock and Repair
Location East Side
Borehole Number BH3-E
Date Drilled 3-23-92
Contractor Powercore
Drilling Method Hammer Core
Driller Mike N.
Hole Diameter 2 in
Log By L. Kleinecke
Total Depth 10'

Sketch Map



Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVM (ppm)
0	24/10				GP Asphalt surface w angular org-brn gvls To 1"	
2.5	24/10				GP gravelly sand dry org-brn angular slight odor 10% Fines 40% med 10% coarse 40% gvls To 1/2"	0
5					CL silty clay med grey w 20% sand + shell frags Med odor Low plastic MOIST	44
7.5					CL AA	400
10			▽		Silty Sand wet. Grey-brn w shell frags	100
					becoming silty clay at 9.0' med plastic Lt Tan w shell frags End of hole at 10'	

DRILLING LOG

Job Number 7703.27

Project Pac Gc Dry Dock and Repair
Location East side
Borehole Number BH4
Date Drilled 2-23-92
Contractor Powercore
Drilling Method Hammer Core
Driller Mike N
Hole Diameter 2"
Log By L. Kleinecke
Total Depth 10'

Sketch Map

x BH1

x BH2

x BH3

x BH4

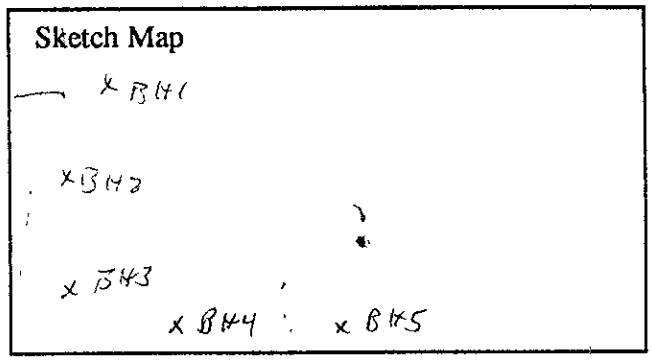
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/20				Asphalt 3" Then org brn angular gvls	-
2.5	24/20				Gravelly sand To 2.0' Then blk sandy clay mod odor dry crumbly	20
5.0	24/24				Greyblack sandy clay firm mod odor damp Lt grey soft rocks to 2"	600
7.5	24/24				Blk silty sand w shell frags wet strong odor 15% shells 60% sand 25% silt	>1000
10	24/24				Sp loose Blk sand w shells 40% fine sand 30% med sand 20% coarse sand 10% shells	250
					CL becoming Lt brn stiff clay at 9'	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East Side
Borehole Number BH5
Date Drilled 03/23/92
Contractor Power Core
Drilling Method core
Driller Mike N
Hole Diameter 2"
Log By I Klemencic
Total Depth 10'

Sketch Map



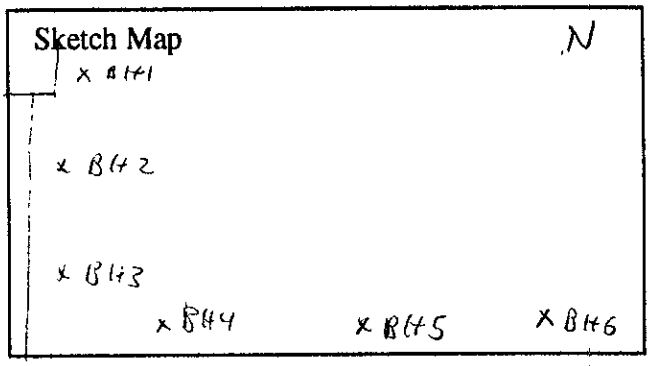
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVM (ppm)
0	24/12				GP sandy surface becoming Org brn angular gvl	
2.5	24/12				AA becoming gravelly sand org brn dry no odor 25% fine sand 25% med sand 25% cobs to 1/2" else gvls to 1"	2,5
5.0	24/24				CL BLK clayey silt moist no odor high plastic	>1000
7.5	24/24				AA CL	840
10.0	24/24				AA CL	990
					becoming LT brn firm clay at 9.5'	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East Side
Borehole Number BH6
Date Drilled 3-24-92
Contractor Powercore
Drilling Method Hammer Core
Driller Mike N.
Hole Diameter 2"
Log By L. Kleinrecke
Total Depth 10'

Sketch Map



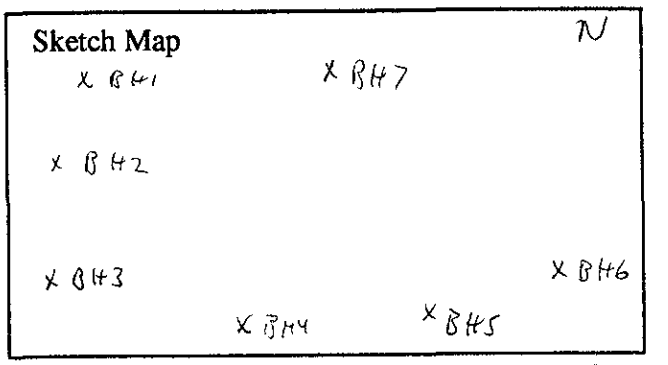
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/18				GP 3" asphalt becoming Org brn ang gvl to 1" diam	
2.5	24/18				CL blk fum silty clay beg at 1' No odor Med - low plastic	9
5	24/24				CL AA	600
7.5	24/12				SM blk sandy silt wet No odor Sands fine 40%	>1000
10	24/24				SM blk silty sand wet No odor shell frags 20% fine 60% med 20% coarse	>1000
					lt brn clay at 10 FT end of hole	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East Side
Borehole Number BH 7
Date Drilled 3-24-92
Contractor Powercove
Drilling Method Hammer Core
Driller Mike N.
Hole Diameter 2"
Log By B. Kleinecke
Total Depth 10'

Sketch Map



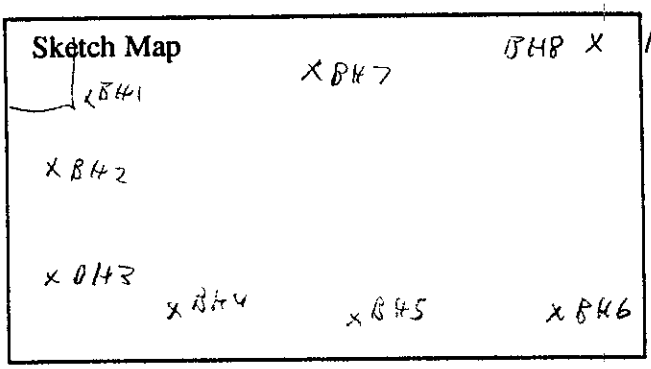
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	
0	24/18				GP 3" asphalt Followed by org brn angular gvls 1" diam dry No odor	OVA (ppm)
2.5	24/18				GP org Brn sandy gvl dry No odor 20% fine 40% med 20% conse 20% gvl 6" spent sandblasting mat'l at 3'	5
5	24/24				CL Grey sandy clay moist med plastic 40% sand	200
7.5	24/6			▽	SP wet sand 30% fine 70% med w shells No odor No headspace sample	
10	24/6				SP AA becoming Grey clay at 9.5 FT end of hole at 10' No headspace	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East side
Borehole Number BH8
Date Drilled 3-24-92
Contractor Powercore
Drilling Method Hammer Core
Driller Mike N
Hole Diameter 2"
Log By L. Kleinecke
Total Depth 11'

Sketch Map



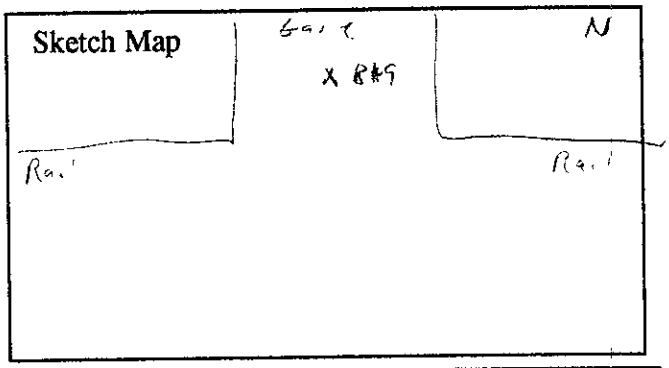
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/12				GP 3" asphalt	
2.5	24/12				SP	0
5	24/18				CL Lt brn silty clay w shell frags (10%) damp low plastic no odor	0
7.5	24/18			▽	CL Lt brn silty clay AA w 6" layer of shell frags + sand at 7.0-7.5 becoming Lt brn silty clay 7.5 wet	0
10	24/12				SP Lt brn clayey sand wet 10% fine sand 20% med 50% coarse w shell frags 20% clay	0
					Lt Grey clay at 11 ft	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East Side
Borehole Number BH9
Date Drilled 3-24-92
Contractor Bowercove
Drilling Method Hammer Core
Driller Mike N.
Hole Diameter 3"
Log By L. Kleinecke
Total Depth 11'

Sketch Map



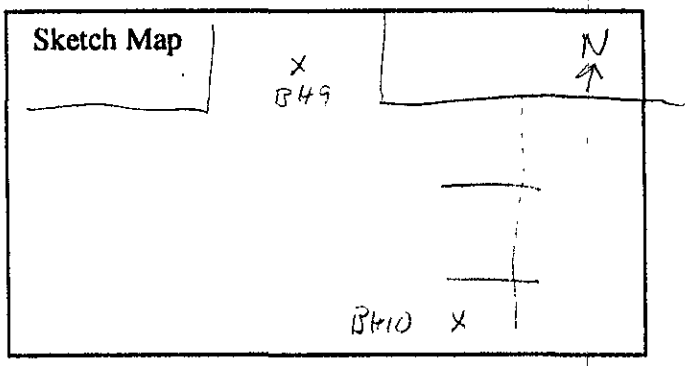
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/18				GP 3" asphalt becoming org brn ang gvl To 1"	
2.5	24/18				SP Org brn gravelly sand moist No odor 10% fine 20% med 20% Coarse 50% gvl To 1"	5
5	24/12				CH Grn Grey silty clay moist No odor High Plastic	100
7.5	24/16			Y	CH AA No headspace	100
10	24/24				CH Grn Grey clayey silt w some fine sands wet very sticky	
					Becoming Grey clay at 11' Firm wet	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location East side
Borehole Number BH10
Date Drilled 3-24-92
Contractor Powercore
Drilling Method Hammer Drill
Driller Mike N.
Hole Diameter 2"
Log By L. Steinecke
Total Depth 10'

Sketch Map



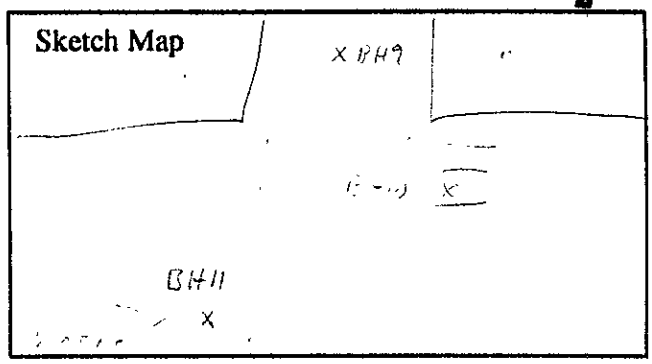
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/6				3" Asphalt becoming org brn angular gvl To 1" No odor	
2.5	24/6				SP Gravelly sand org brn dry No odor 10%F 20%M 30% C 40% gvl No headspace	
5	24/24				SC Clayey sand Grn brn wet sticky 50% clay 50% Fine sand No odor	9
7.5	24/24				SC clayey sand Grn brn wet No odor 60% Fine sand 20% coarse sand + shells 20% clay	7
10	24/24				SP Grn Grey Fine-coarse sand wet No odor 50% Fine sand 50% Coarse sand w shells. Med brn med-stiff clay at 9' end of hole	4

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock ... repair
Location East side
Borehole Number BH11
Date Drilled 3-24-92
Contractor Pan Geo
Drilling Method Hand auger
Driller Mike N
Hole Diameter 2"
Log By Tracy M
Total Depth 10'

Sketch Map



Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVM (PPM)
2.5				SP	fine sand, ... sorting, Subang, wet, ... sand blasting mat	0
5.0					... plastering ... 4.0 ft silty clay grey ..., mod-high plasticity, slight odor 4.5 ft.	600
					orange-grn silty sand, fine to med, wet; slight odor 4.5 to 5.0 ft	
7.5					silty-clay, grn grey, with ... ing med plast, moist, mod odor to 7.0 ft	30
					... sand, ... ments, fine to med	
10					Silty clay, grey-grn shell frag, mod plast, moist, mod odor to 10 feet	200

DRILLING LOG

Job Number 7703.27

Project Pacific Drydock Repair
Location Yard 1 East
Borehole Number BH2A
Date Drilled 3-24-92
Contractor Powermole
Drilling Method Hammer Core
Driller Mike N
Hole Diameter 2"
Log By Mike Werle
Total Depth 10'

Sketch Map

BH2 x Large marine Railway No 1

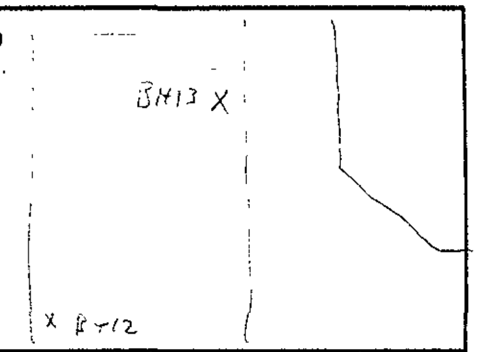
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/8				SW 3in Black sandblasting mtl moist becoming SILTY sand w shell frags	
2.5	24/18				Sandy SILT w shell frags wet wnd odor Grey Green mod plastic	3
5	24/10		▽		No recovery	
7.5	24/10				to 6' AA sheen strong odor sample at 6' becoming Grnbrn clay w 30% shell frags mod plastic	7
10	24/21				AA to 10' end of hole	5.5

DRILLING LOG

Job Number ____________________

Project: P cific Dry Dock and Repair
Location: Yard 1 East
Borehole Number: BH13
Date Drilled: 3-24-92
Contractor: Power Core
Drilling Method: Geoprobe Core
Driller: Mike N
Hole Diameter: 2"
Log By: L. Kleinecke
Total Depth: 10'

Sketch Map



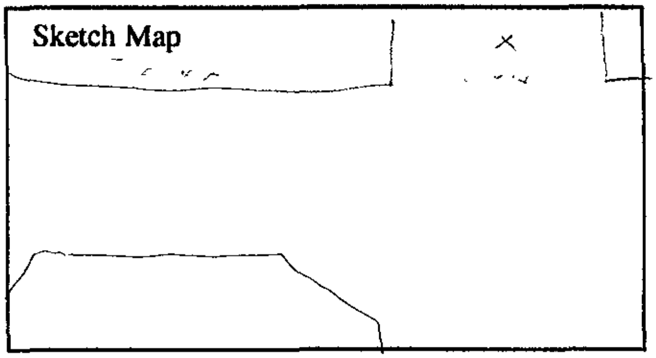
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24" / 18				SW mixed med sand + sandblast mat'l blk + multi moist mod odor	
2.5	24" / 17"		∇		SW AA becoming more silt to 4.75' then Grey silty clay high plastic wet mod odor	1
5	24" / 12"					2.5
7.5	24" / 24				MH silt w/ fine sand grey w black lenses	2.5
10	24" / 24				MH AA becoming stiff AT brn clay at 10'	4

DRILLING LOG

Job Number ______________________

Project Pacific Dry Dock [illegible] Repair
Location [illegible] East
Borehole Number [illegible]
Date Drilled 3-24-02
Contractor Powercore
Drilling Method Hammercore
Driller Mike [illegible]
Hole Diameter 2"
Log By L. Kleinecke
Total Depth 10'

Sketch Map



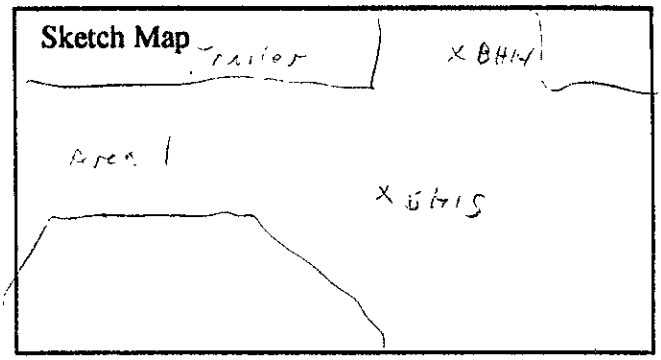
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (PPM)
0	24/24				ML Grey blk F [illegible] silt wet no odor	
2.5	24/24				AA	2
5	24/24				AA	4.5
7.5	24/24				AA	14
10	24/24				AA becoming [illegible] [illegible] stiff clay at 10'	0

DRILLING LOG

Job Number _____

Project Pacific Dry Dock and Repair
Location Yard 1 East
Borehole Number B-15
Date Drilled 3-24-92
Contractor Powercove
Drilling Method Hammer Cove
Driller Mike N.
Hole Diameter 2"
Log By L. Kleinecke
Total Depth 10'

Sketch Map



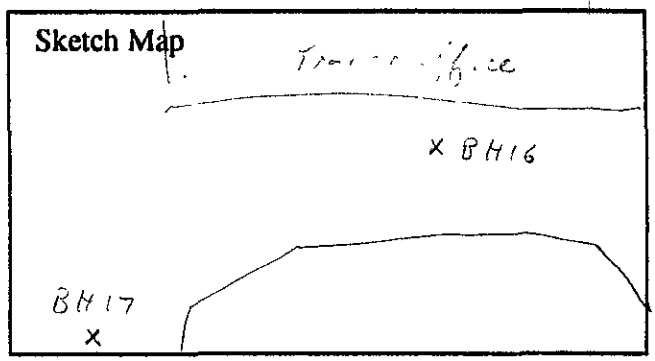
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (PPM)
0	24/12"				1'- Fine Grn Grey silT 10% Fine sand moist	
2.5	24/12"				MH AA no odor	20
5	24/12"				MH Fine Grn Grey silT w 20% shells moist sticky No odor	32
7.5	24/24		Y		SP F-m Grn Grey sand 10% silT 60% Fine sand 30% med sand wet No odor	15
					Lt brn stiff clay at 7.0 FT	
					End of boring	

DRILLING LOG

Job Number 7703.27

Project Pacific Dry Dock and Repair
Location Yard 1 East
Borehole Number EH17
Date Drilled 3-24-92
Contractor Powercove
Drilling Method Hammer Core
Driller Mike NJ
Hole Diameter 2"
Log By L. Kleinecke
Total Depth 10'

Sketch Map



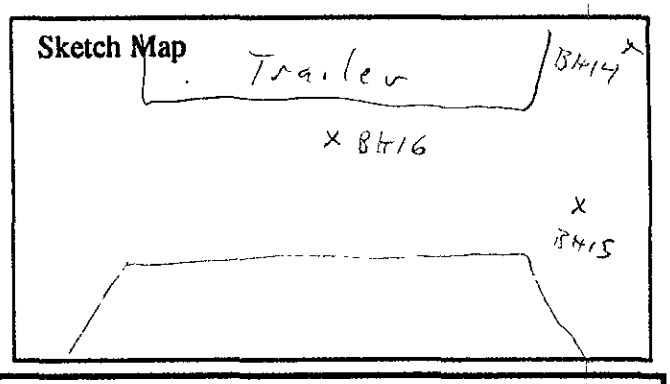
Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA(PPM)
0	24/12				3" Fibrous cotton plant in surf sample	
2.5	24/12			Y	Rusty ova-yel gvls To 1" damp NO odor angular w 20% rounded med sands Headspace only No Lab sample	0
5	24/10				No recovery	
7.5	24/24				Fine Grey Gvn Silty sand wet 70% fine sand No odor	0
10	24/12				CL Grey silty clay beginning at 8 FT 10% shells No odor med firm	0

DRILLING LOG

Job Number _____

Project Pacific Dry Dock and Repair
Location Yard 1 East
Borehole Number BH16
Date Drilled 2-24-92
Contractor Powercore
Drilling Method Hammercore
Driller Mike N.
Hole Diameter 2"
Log By L. Kleinecke
Total Depth _____

Sketch Map



Depth (ft)	Advanced/ Recovered	Blow Counts per Six Inches	Water Table	Well Construction	Sample Description (Soil or Rock Type, Color, Grain Size, Sorting, Roundness, Plasticity, Moisture Content, Trace Materials, Odor, Staining, Trace Gas Readings)	OVA (ppm)
0	24/12				7" F/M Sand w heavy sheen then Grey Fine Silty Sand 50/50 mod odor wood frags	
2.5	24/12		Y		SW Fine Grey Silty Sand 50/50 mod odor Moist-Wet	30
5	24/10				No recovery Silty clay 6-6.5 Grey brn slight odor becoming fine sand 6.5-7 F SW Grey wet slight odor	>1000
7.5	24/24				Sandy silt 7-9' Soft Grn Grey No odor	
10	24/24				becoming Grn Grey Clay at 9' med st. ff Shell frags	960

Versar INC. SACRAMENTO

APPENDIX B

Laboratory Analytical Results

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

April 10, 1992

Mr. Lawrence Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received thirty five soil samples on March 23, 1992 for your Project No. 7703.27, PDDI-E (our custody log number 1928).

These samples were analyzed according to your chain of custody. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

Jennifer Pekol
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/01/92
DATE ANALYZED: 04/07/92 and 04/08/92
DATE REPORTED: 04/10/92

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: No. 7703.27, PDDI-E

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	BH3-7.5E Concentration	BH3-7.5E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	1,600	1,000	2,200,000	32,000	100,000	1,000

Method and Constituent:	Units	BH4-7.5E Concentration	BH4-7.5E Reporting Limit	BH5-5E Concentration	BH5-5E Reporting Limit	BH6-10E Concentration	BH6-10E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	6,100	1,000	43,000	1,000	ND	1,000

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/01/92
DATE ANALYZED: 04/07/92 and 04/07/92
DATE REPORTED: 04/10/92
PAGE: Two

Sample Type: Soil

Method and Constituent:	Units	BH7-7.5E Concentration	BH7-7.5E Reporting Limit	BH9-7.5E Concentration	BH9-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	ND	1,000	ND	1,000	ND	1,000

QC Summary:

% Recovery: 115*
% RPD: 11

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Labortory Control Sample due to the high concentration in the spiked sample.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/02/92
DATE ANALYZED: 04/03/92 and 04/04/92
DATE REPORTED: 04/10/92
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	BH4-7.5E Concentration	BH4-7.5E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	2,400	500	250,000	5,800	3,200	500
EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	280	ND	5.0
Toluene	ug/kg	ND	5.0	ND	260	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	300	ND	5.0
Xylenes	ug/kg	99	15	4,400	800	89	15

Method and Constituent:	Units	BH5-5E Concentration	BH5-5E Reporting Limit	BH6-10E Concentration	BH6-10E Reporting Limit	BH7-7.5E Concentration	BH7-7.5E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	13,000	500	ND	500	ND	500
EPA Method 8020 for:							
Benzene	ug/kg	12	5.0	ND	5.0	ND	5.0
Toluene	ug/kg	6.6	5.0	ND	5.0	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Xylenes	ug/kg	380	15	ND	15	ND	15

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/02/92
DATE ANALYZED: 04/04/92
DATE REPORTED: 04/10/92
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	BH9-7.5E Concentration	BH9-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Gasoline	ug/kg	620	500	ND	500
EPA Method 8020 for:					
Benzene	ug/kg	ND	5.0	ND	5.0
Toluene	ug/kg	6.7	5.0	ND	5.0
Ethylbenzene	ug/kg	16	5.0	ND	5.0
Xylenes	ug/kg	94	15	ND	15

QC Summary:

% Recovery: 111 and 74
% RPD: 1.8 and 4.0

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/07/92
DATE ANALYZED: 04/08/92
DATE REPORTED: 04/10/92
PAGE: Five

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	BH3-7.5E Concentration	BH3-7.5E Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	310,000	50,000	9,100,000	50,000	ND	50,000

Method and Constituent:	Units	BH4-7.5E Concentration	BH4-7.5E Reporting Limit	BH5-5E Concentration	BH5-5E Reporting Limit	BH6-10E Concentration	BH6-10E Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	270,000	50,000	ND	50,000

Method and Constituent:	Units	BH7-7.5E Concentration	BH7-7.5E Reporting Limit	BH8-7.5E Concentration	BH8-7.5E Reporting Limit	BH9-7.5E Concentration	BH9-7.5E Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	130,000	50,000	ND	50,000	1,100,000	50,000

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit
Standard Method 5520CF Hydrocarbons:			
Oil and Grease	ug/kg	ND	50,000

QC Summary:

% Recovery: 112
% RPD: 1.8

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92
DATE ANALYZED: 03/28/92
DATE REPORTED: 04/10/92
PAGE: Six

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8270:							
N-Nitrosodimethylamine	ug/kg	ND	330	ND	330	ND	330
Phenol	ug/kg	ND	330	ND	330	ND	330
Bis (-2-Chloroethyl) ether	ug/kg	ND	330	ND	330	ND	330
2-Chlorophenol	ug/kg	ND	330	ND	330	ND	330
1,3-Dichlorobenzene	ug/kg	ND	330	ND	330	ND	330
1,4-Dichlorobenzene	ug/kg	ND	330	ND	330	ND	330
1,2-Dichlorobenzene	ug/kg	ND	330	ND	330	ND	330
N-Nitroso-Di-N-Propylamine	ug/kg	ND	330	ND	330	ND	330
Hexachloroethane	ug/kg	ND	330	ND	330	ND	330
Nitrobenzene	ug/kg	ND	330	ND	330	ND	330
Isophorone	ug/kg	ND	330	37,000	330	ND	330
2-Nitrophenol	ug/kg	ND	330	ND	330	ND	330
2,4-Dimethylphenol	ug/kg	ND	330	ND	330	ND	330
Bis(-2-Chloroethoxy) Methane	ug/kg	ND	330	ND	330	ND	330
2,4-Dichlorophenol	ug/kg	ND	330	ND	330	ND	330
1,2,4-Trichlorobenzene	ug/kg	ND	330	ND	330	ND	330
Naphthalene	ug/kg	ND	330	ND	330	ND	330

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92
DATE ANALYZED: 03/28/92
DATE REPORTED: 04/10/92
PAGE: Seven

Sample Type: Soil

Method and Constituent	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8270 (Continued):							
Hexachlorobutadiene	ug/kg	ND	330	ND	330	ND	330
4-Chloro-3-Methyl-phenol	ug/kg	ND	330	ND	330	ND	330
Hexachlorocyclo-pentadiene	ug/kg	ND	330	ND	330	ND	330
2,4,6-Trichlorophenol	ug/kg	ND	330	ND	330	ND	330
2-Chloronaphthalene	ug/kg	ND	330	ND	330	ND	330
Dimethyl Phthalate	ug/kg	ND	330	ND	330	ND	330
Acenaphthylene	ug/kg	ND	330	ND	330	ND	330
Acenaphthene	ug/kg	ND	330	ND	330	ND	330
2,4-Dinitrophenol	ug/kg	ND	330	ND	330	ND	330
4-Nitrophenol	ug/kg	ND	330	ND	330	ND	330
2,4-Dinitrotoluene	ug/kg	ND	330	ND	330	ND	330
2,6-Dinitrotoluene	ug/kg	ND	330	ND	330	ND	330
Diethylphthalate	ug/kg	ND	330	ND	330	ND	330
4-Chlorophenylphenyl Ether	ug/kg	ND	330	ND	330	ND	330
Fluorene	ug/kg	18,000	330	ND	330	ND	330
N-Nitrosodiphenylamine	ug/kg	ND	330	ND	330	ND	330
4-Bromophenylphenyl Ether	ug/kg	ND	330	ND	330	ND	330
Hexachlorobenzene	ug/kg	ND	330	ND	330	ND	330
Pentachlorophenol	ug/kg	ND	330	ND	330	ND	330
Phenanthrene	ug/kg	ND	330	ND	330	ND	330
Anthracene	ug/kg	4,600	330	8,300	330	ND	330

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92
DATE ANALYZED: 03/28/92
DATE REPORTED: 04/10/92
PAGE: Eight

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8270 (Continued):							
Di-N-Butylphthalate	ug/kg	ND	330	ND	330	ND	330
Fluoranthene	ug/kg	ND	330	ND	330	ND	330
Benzidine	ug/kg	ND	330	ND	330	ND	330
Pyrene	ug/kg	ND	330	ND	330	ND	330
Butylbenzylphthalate	ug/kg	ND	330	ND	330	ND	330
3,3'-Dichlorobenzidine	ug/kg	ND	330	ND	330	ND	330
Benzo(a)Anthracene	ug/kg	ND	330	ND	330	ND	330
Bis(2-Ethylhexyl) Phthalate	ug/kg	ND	330	ND	330	ND	330
Chrysene	ug/kg	ND	330	ND	330	ND	330
Di-N-Octyl Phthalate	ug/kg	ND	330	ND	330	ND	330
Benzo(b)Fluoranthene	ug/kg	ND	330	ND	330	ND	330
Benzo(k)Fluoranthene	ug/kg	720	330	ND	330	ND	330
Benzo(a)Pyrene	ug/kg	ND	330	ND	330	ND	330
Indeno(1,2,3-cd)Pyrene	ug/kg	ND	330	ND	330	ND	330
Dibenzo(a,h)Anthracene	ug/kg	ND	330	ND	330	ND	330
Benzo(g,h,i)Perylene	ug/kg	ND	330	ND	330	ND	330
Surrogate % Recovery:							
Pentafluorophenol		75		51		125	
4-Fluoroaniline		38		91		135	
Decafluorobiphenyl		90		133		116	

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/10/92
PAGE: Nine

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	BH3-7.5E Concentration	BH3-7.5E Reporting Limit
EPA Method 7040: Antimony	ug/kg	ND	11,000	ND	11,000	ND	11,000
EPA Method 7060: Arsenic	ug/kg	10,000	120	3,400	120	3,400	120
EPA Method 7080: Barium	ug/kg	65,000	25,000	48,000	25,000	48,000	25,000
EPA Method 7090: Beryllium	ug/kg	ND	120	ND	120	ND	120
EPA Method 7130: Cadmium	ug/kg	ND	250	ND	250	ND	250
EPA Method 7190: Chromium	ug/kg	2,200	1,200	18,000	1,200	27,000	1,200
EPA Method 219.1: Cobalt	ug/kg	ND	12,000	ND	12,000	ND	12,000
EPA Method 7210: Copper	ug/kg	40,000	5,000	14,000	5,000	22,000	5,000
EPA Method 7420: Lead	ug/kg	3,300	2,500	3,100	2,500	ND	2,500

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92, 03/27/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/10/92
PAGE: Ten

Sample Type: Soil

Method and Constituent:	Units	BH1-4.5E Concentration	BH1-4.5E Reporting Limit	BH2-7.5E Concentration	BH2-7.5E Reporting Limit	BH3-7.5E Concentration	BH3-7.5E Reporting Limit
EPA Method 7471: Mercury	ug/kg	1,900	50	770	50	570	50
EPA Method 246.1 Molybdenum	ug/kg	ND	25,000	ND	25,000	ND	25,000
EPA Method 7520: Nickel	ug/kg	ND	7,500	28,000	7,500	35,000	7,500
EPA Method 7741: Selenium	ug/kg	ND	120	ND	120	ND	120
EPA Method 7760: Silver	ug/kg	ND	250	ND	250	ND	250
EPA Method 7840: Thallium	ug/kg	ND	5,900	ND	5,900	ND	5,900
EPA Method 7910: Vanadium	ug/kg	28,000	5,000	18,000	5,000	20,000	5,000
EPA Method 7950: Zinc	ug/kg	120,000	1,200	21,000	1,200	31,000	1,200

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
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DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/10/92
PAGE: Eleven

Sample Type: Soil

Method and Constituent:	Units	BH4-7.5E Concentration	BH4-7.5E Reporting Limit	BH5-5E Concentration	BH5-5E Reporting Limit	BH6-10E Concentration	BH6-10E Reporting Limit
EPA Method 7040: Antimony	ug/kg	ND	11,000	ND	11,000	ND	11,000
EPA Method 7060: Arsenic	ug/kg	4,700	120	14,000	120	3,900	120
EPA Method 7080: Barium	ug/kg	ND	25,000	330,000	25,000	ND	25,000
EPA Method 7090: Beryllium	ug/kg	ND	120	180	120	ND	120
EPA Method 7130: Cadmium	ug/kg	ND	250	ND	250	ND	250
EPA Method 7190: Chromium	ug/kg	12,000	1,200	37,000	1,200	21,000	1,200
EPA Method 219.1: Cobalt	ug/kg	ND	12,000	ND	12,000	ND	12,000
EPA Method 7210: Copper	ug/kg	8,800	5,000	480,000	5,000	6,500	5,000
EPA Method 7420: Lead	ug/kg	ND	2,500	500,000	2,500	11,000	2,500

Concentrations reported as ND were not detected at or above the reporting limit.

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DATE REPORTED: 04/10/92
PAGE: Twelve

Sample Type: Soil

Method and Constituent:	Units	BH4-7.5E Concentration	BH4-7.5E Reporting Limit	BH5-5E Concentration	BH5-5E Reporting Limit	BH6-10E Concentration	BH6-10E Reporting Limit
EPA Method 7471: Mercury	ug/kg	150	50	410	50	150	50
EPA Method 246.1 Molybdenum	ug/kg	ND	25,000	ND	25,000	ND	25,000
EPA Method 7520: Nickel	ug/kg	18,000	7,500	78,000	7,500	16,000	7,500
EPA Method 7741: Selenium	ug/kg	ND	120	ND	120	ND	120
EPA Method 7760: Silver	ug/kg	ND	250	ND	250	ND	250
EPA Method 7840: Thallium	ug/kg	ND	5,900	ND	5,900	ND	5,900
EPA Method 7910: Vanadium	ug/kg	15,000	5,000	57,000	5,000	31,000	5,000
EPA Method 7950: Zinc	ug/kg	15,000	1,200	660,000	1,200	31,000	1,200

Concentrations reported as ND were not detected at or above the reporting limit.

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DATE EXTRACTED: 03/26/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/10/92
PAGE: Thirteen

Sample Type: Soil

Method and Constituent:	Units	BH7-7.5E Concentration	BH7-7.5E Reporting Limit	BH9-7.5E Concentration	BH9-7.5E Reporting Limit
EPA Method 7040:					
Antimony	ug/kg	ND	11,000	ND	11,000
EPA Method 7060:					
Arsenic	ug/kg	4,300	120	13,000	120
EPA Method 7080:					
Barium	ug/kg	80,000	25,000	76,000	25,000
EPA Method 7090:					
Beryllium	ug/kg	ND	120	ND	120
EPA Method 7130:					
Cadmium	ug/kg	ND	250	ND	250
EPA Method 7190:					
Chromium	ug/kg	27,000	1,200	25,000	1,200
EPA Method 219.1:					
Cobalt	ug/kg	ND	12,000	ND	12,000
EPA Method 7210:					
Copper	ug/kg	24,000	5,000	720,000	5,000
EPA Method 7420:					
Lead	ug/kg	6,600	2,500	190,000	2,500

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DATE REPORTED: 04/10/92
PAGE: Fourteen

Sample Type: Soil

Method and Constituent:	Units	BH7-7.5E Concentration	BH7-7.5E Reporting Limit	BH9-7.5E Concentration	BH9-7.5E Reporting Limit
EPA Method 7471: Mercury	ug/kg	200	50	9,700	50
EPA Method 246.1 Molybdenum	ug/kg	ND	25,000	ND	25,000
EPA Method 7520: Nickel	ug/kg	42,000	7,500	45,000	7,500
EPA Method 7741: Selenium	ug/kg	ND	120	ND	120
EPA Method 7760: Silver	ug/kg	ND	250	ND	250
EPA Method 7840: Thallium	ug/kg	ND	5,900	ND	5,900
EPA Method 7910: Vanadium	ug/kg	33,000	5,000	40,000	5,000
EPA Method 7950: Zinc	ug/kg	39,000	1,200	340,000	1,200

Concentrations reported as ND were not detected at or above the reporting limit.

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DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/10/92
PAGE: Fifteen

Sample Type: Soil

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7040:					
Antimony	ug/kg	ND	11,000	65*	**
EPA Method 7060:					
Arsenic	ug/kg	ND	120	74*	20
EPA Method 7080:					
Barium	ug/kg	ND	25,000	81	3.3
EPA Method 7090:					
Beryllium	ug/kg	ND	120	69	**
EPA Method 7130:					
Cadmium	ug/kg	ND	250	87	**
EPA Method 7190:					
Chromium	ug/kg	ND	1,200	66	1.0
EPA Method 219.1:					
Cobalt	ug/kg	ND	12,000	86	**
EPA Method 7210:					
Copper	ug/kg	ND	5,000	94*	0.9
EPA Method 7420:					
Lead	ug/kg	ND	2,500	62*	15

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1928
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 03/26/92, 03/27/92 and 03/30/92
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DATE REPORTED: 04/10/92
PAGE: Sixteen

Sample Type: Soil

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7471:					
Mercury	ug/kg	ND	50	95	16
EPA Method 246.1					
Molybdenum	ug/kg	ND	25,000	78	**
EPA Method 7520:					
Nickel	ug/kg	ND	7,500	76	2.2
EPA Method 7741:					
Selenium	ug/kg	ND	120	90	**
EPA Method 7760:					
Silver	ug/kg	ND	250	96*	**
EPA Method 7840:					
Thallium	ug/kg	ND	5,900	67	**
EPA Method 7910:					
Vanadium	ug/kg	ND	5,000	70	9.3
EPA Method 7950:					
Zinc	ug/kg	ND	1,200	104*	0.2

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, JET FUEL OR MOTOR OIL FOR SOIL

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

Approximately 50 grams of soil are extracted with 80 ml of solvent on a mechanical shaker for 4 hours. The extract is filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250° C
DETECTOR TEMPERATURE:	300° C
INITIAL TEMPERATURE:	40° C
Hold for 4 minutes	
PROGRAM RATE:	10° C/min.
FINAL TEMPERATURE:	265° C
Hold for 10 minutes	

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

2/20/91

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR SOIL, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample to the sum of the area of peaks in the gasoline standard.

3/13/91

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR SOIL, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

3/13/91

PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE FOR SOIL

Method:

This is EPA method 418.1 from Methods for Chemical Analysis of Water and Wastes, March 1983. This test eliminates oil and grease from animal and vegetable sources.

Sample Preparation and Analysis

Oil and grease are extracted from the sample with freon by agitation, sonication or soxhlet extraction.

The freon extract is dried with sodium sulfate and then treated with silica gel. Non-petroleum oil and grease is removed by absorption onto the silica gel. The absorbance of the remaining extract is measured with an infrared spectrophotometer.

Calculation

The oil and grease content is calculated by comparison to standards.

EPA METHOD 8270, SEMIVOLATILE ORGANICS FOR SOIL

Method:

This is EPA Method 8270 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protecton Agency.

Sample Preparation:

Sample preparation is by EPA Method 3550, solvent extraction with sonication. Methylene chloride is the solvent used. The extraction is followed by a concentration process using a Kuderna-Danish apparatus.

Sample Introduction:

Samples are introduced by direct injection.

Gas Chromatography Analysis:

The semivolatile organics are separated on a capillary gas chromatography column. A mass spectrometer is used to detect the compounds.

Calculation:

Compounds are identified by comparing ion spectra with the ion spectra of the 8270 compounds in our standards. The compounds are quantified by using the internal standard method of calibration.

EPA METHOD 7040 - ANTIMONY (Sb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Antimony
Wavelength:	217.6 nm
Heat Source:	Flame

Atomic Absorption Analysis:

A portion of the sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7060 - ARSENIC (As) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Arsenic
Wavelength:	193.7 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7080 - BARIUM (Ba) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Barium
Wavelength:	553.6 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7090 - BERYLLIUM (Be) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Beryllium
Wavelength:	234.9 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7130 - CADMIUM (Cd) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cadmium
Wavelength:	228.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7190 - CHROMIUM (Cr) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Chromium
Wavelength:	357.9 nm
Heat Source:	Nitrous Oxyde-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 219.1 - COBALT (Co) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cobalt
Wavelength:	240.7 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7210 - COPPER (Cu) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Copper
Wavelength:	324.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7420 - LEAD (Pb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Lead
Wavelength:	283.3 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit then displays the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHODS 7470 and 7471 - MERCURY (Hg) BY COLD VAPOR

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7470. The sample is digested with acid, potassium permanganate, and heat.

Soil samples are prepared by EPA Method 7471. The sample is dried, sifted, and digested with aqua regia, potassium permanganate, and heat.

Atomic Absorption Conditions:

Lamp:	Mercury
Wavelength:	253.7
Heat Source:	None

Atomic Absorption Analysis:

The sample is placed into a reaction vessel. A metal hydride gas is formed. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 246.1 - MOLYBDENUM (Mo) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Molybdenum
Wavelength:	313.3 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7520 - NICKEL (Ni) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Nickel
Wavelength:	231.6 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7740 - SELENIUM (Se) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Selenium
Wavelength:	196.0 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7760 - SILVER (Ag) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7760, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Silver
Wavelength:	328.1 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7840 - THALLIUM (Tl) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 3rd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Thallium
Wavelength:	276.8 nm
Heat Source:	Flame

Atomic Absorption Analysis:

The sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7910 - VANADIUM (V) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Vanadium
Wavelength:	318.4 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7950 - ZINC (Zn) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Zinc
Wavelength:	213.9 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

Versar

CHAIN OF CUSTODY RECORD

per LK 3/25/92 MP

PROJECT NO.	PROJECT NAME
7703.27	PDDI - E

SAMPLERS: (Signature) Laurence Rheinecke (Printed) Larry Kleinecke

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	CAM 17 Metal	O&G 5520 D&F	8270 Semi-VOA				REMARKS
						PARAMETERS									INDUSTRIAL HYGIENE SAMPLE Y X
															1928
BH1-2.5E	03/23/92	0940		X		1									
BH1-4.5E	03/23/92	0945		X		1	X	X	X	X	X				
BH1-7.5E	11	0950		X		1									
BH1-10E	03/23/92	0955		X		1									
BH2-2.5E	03/23/92	1005		X		1									
BH2-5.0E	03/23/92	1005		X		1									
BH2-7.5E	03/23/92	1010		X		1	X	X	X	X	X				pick up soil 1-bt ea on req Y-5
BH3-2.5E	03/24/92	1030		X		1									
BH3-5.0E	03/24/92	1035		X		1									
BH3-7.5E	03/24/92	1040		X		1	X		X	X					
BH3-10E	03/24/92	1045		X		1									Dates corrected to 3/23/92 Digital with error. Okay per L Kleinecke 3/24/92 MP
BH4-2.5E	03/24/92	1050		X		1									

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)	–	(Printed)	(Printed)		(Printed)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
(Printed) Lawrence Rheinecke	3/25/92 1650	(Printed) Maureen Nagorka	3/24/92 16:50	Normal TAT Hold all samples not marked

per LK 3/25/92 OK

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
7703.27	PDOI-E

SAMPLERS: *(Signature)* Lawrence Kleinecke (Printed) ~~Lan~~ L. Kleinecke

PARAMETERS

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-GBTEX	BTEX by	CAM metal-17	OAG 5520 DF	B&TD semi-Vol			INDUSTRIAL HYGIENE SAMPLE Y / N
BH4-5E	03/23/92	1100		X		1									1928
BH4-7.5E	03/23/92	1105		X		1	X	X		X	X				
BH4-10E	03/23/92	1110		X		1									
BH5-5E	03/23/92	1125		X		1	X	X		X	X				
BH5-7.5E	03/23/92	1130		X		1									
BH5-10E	03/23/92	1135		X		1									
BH6-2.5E	03/23/92	1255		X		1									
BH6-5.0E	03/23/92	1320		X		1									
BH6-7.5E	03/23/92	1325		X		1									
BH6-10E	03/23/92	1330		X		1	X	X		X	X				
BH7-2.5E	03/23/92	1400		X		1									
BH7-5E	03/23/92	1405		X											

pick up Soil. on ice 1-bt ea y-S

Dates corrected to 3/23/92 Digital watch error. OK. per L. Kleinecke 3/24/92 MCN

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: *(Signature)* Lawrence Kleinecke	Date / Time 3/24/92 16.50	Received for Laboratory by: *(Signature)* Maureen Negrette	Date / Time 3/23/92 1650	Remarks Normal TAT Hold all samples not Marked	
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette			

Versar

CHAIN OF CUSTODY RECORD

per L.K 3/25/92

PROJECT NO.	PROJECT NAME
7703-27	PDDI-E

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) L. Kleinecke

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	CAM IN Metal	D&G 5520 BF	8270 Semi-Vol				REMARKS
						PARAMETERS									INDUSTRIAL HYGIENE SAMPLE Y / N
															1928
BH7-7.5E	03/23/92	1410		X		1	X	X	X	X					
BH7-10E	03/23/92	1415		X		1									
BH8-2.5E	03/23/92	1435		X		1						cancelled per L. Kleinecke 3/25/92			Pickup soil 1-brass ea Y-5 Ervice Req-14
BH8-5.0E	03/23/92	1440		X		1				(X)					
BH8-7.5E	03/23/92	1445		X		1				X					
BH8-10E	03/23/92	1450		X		1									
BH9-7.5E	03/23/92	1550		X		1	X	X	X	X					
BH9-5E	03/23/92	1545		X		1									
BH9-2.5E	03/23/92	1540		X		1									Dates corrected to 3/23/92 Digital watch error okay per L. Kleinecke 3/24/92 MQ
BH10 2.5E	03/23/92	1615		X		1									
BH9-10 Arrived but not on COC					Hold per LK 3/24/92 MQ										

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
Lawrence Kleinecke	3/23/92 1650	Maureen Negrette	3/23/92 16.50	Normal TAT
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette	TAL	Hold all samples not marked

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

April 13, 1992

Mr. Lawrence Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received twenty five soil samples and eleven water samples on March 24, 1992 for your Project No. 7703.27, PDDIE (our custody log number 1937).

These samples were analyzed according to your chain of custody. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

Jennifer Pekol

Jennifer Pekol
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/01/92
DATE ANALYZED: 04/07/92
DATE REPORTED: 04/13/92

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: No. 7703.27, PDDIE

Sample Type: Soil

Method and Constituent:	Units	BH10-5E Concentration	BH10-5E Reporting Limit	BH11-5.0E Concentration	BH11-5.0E Reporting Limit	BH12-6E Concentration	BH12-6E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	ND	1,000	3,700	1,000	140,000	1,300

Method and Constituent:	Units	BH13-10E Concentration	BH13-10E Reporting Limit	BH14-7.5E Concentration	BH14-7.5E Reporting Limit	BH15-5E Concentration	BH15-5E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	ND	1,000	ND	1,000	ND	1,000

Method and Constituent:	Units	BH16-7.5E Concentration	BH16-7.5E Reporting Limit	BH17-7.5E Concentration	BH17-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	8,000	1,000	ND	1,000	ND	1,000

QC Summary:

% Recovery: 115*
% RPD: 11

Concentrations reported as ND were not detected at or above the reporting limit.

The Recovery is for the Laboratory Control Sample, due to the high concentration in the sample spiked.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 03/31/92
DATE ANALYZED: 04/09/92
DATE REPORTED: 04/13/92
PAGE: Two

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	BH12 Concentration	BH12 Reporting Limit	BH16 Concentration	BH16 Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	74,000	57	1,400	50	410	50

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:			
Total Petroleum Hydrocarbons as Diesel	ug/l	ND	50

QC Summary:

% Recovery: 106
% RPD: 9.5

Concentrations reported as ND were not detected at or above the reporting limit.

These samples contain compounds eluting later than the diesel standard.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/02/92
DATE ANALYZED: 04/03/92, 04/04/92 and 04/05/92
DATE REPORTED: 04/13/92
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	BH10-5E Concentration	BH10-5E Reporting Limit	BH11-5.0E Concentration	BH11-5.0E Reporting Limit	BH12-6E Concentration	BH12-6E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	ND	500	9,400	500	15,000	500
EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	5.6
Toluene	ug/kg	ND	5.0	ND	5.0	9.1	5.2
Ethylbenzene	ug/kg	ND	5.0	87	5.0	75	6.0
Xylenes	ug/kg	ND	15	290	15	320	16

Method and Constituent:	Units	BH13-10E Concentration	BH13-10E Reporting Limit	BH14-7.5E Concentration	BH14-7.5E Reporting Limit	BH15-5E Concentration	BH15-5E Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	ND	500	ND	500	ND	500
EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Toluene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Xylenes	ug/kg	ND	15	ND	15	ND	15

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/02/92
DATE ANALYZED: 04/04/92
DATE REPORTED: 04/13/92
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	BH16-7.5E Concentration	BH16-7.5E Reporting Limit	BH17-7.5E Concentration	BH17-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	970	500	ND	500	ND	500
EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Toluene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Xylenes	ug/kg	82	15	ND	15	ND	15

QC Summary:

% Recovery: 74 and 111
% RPD: 4.0 and 1.8

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE ANALYZED: 04/02/92
DATE REPORTED: 04/13/92
PAGE: Five

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	BH12 Concentration	BH12 Reporting Limit	BH16 Concentration	BH16 Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/l	ND	50	570	50	ND	50
EPA Method 8020 for:							
Benzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Toluene	ug/l	0.58	0.50	0.53	0.50	5.9	0.50
Ethylbenzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Xylenes	ug/l	ND	1.5	7.3	1.5	1.6	1.5

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:			
Total Petroleum Hydrocarbons as Gasoline	ug/l	59	50
EPA Method 8020 for:			
Benzene	ug/l	ND	0.50
Toluene	ug/l	ND	0.50
Ethylbenzene	ug/l	0.78	0.50
Xylenes	ug/l	ND	1.5

QC Summary:

% Recovery: 97
% RPD: 6.2

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/06/92
DATE ANALYZED: 04/10/92
DATE REPORTED: 04/13/92
PAGE: Six

Sample Type: Soil

Method and Constituent:	Units	BH10-5E Concentration	BH10-5E Reporting Limit	BH11-5.0E Concentration	BH11-5.0E Reporting Limit	BH12-6E Concentration	BH12-6E Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	ND	50,000	3,400,000	50,000

Method and Constituent:	Units	BH13-10E Concentration	BH13-10E Reporting Limit	BH14-7.5E Concentration	BH14-7.5E Reporting Limit	BH15-5E Concentration	BH15-5E Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	ND	50,000	ND	50,000

Method and Constituent:	Units	BH16-7.5E Concentration	BH16-7.5E Reporting Limit	BH17-7.5E Concentration	BH17-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	ND	50,000	ND	50,000

QC Summary:

% Recovery: 93*
% RPD: 14

Concentrations reported as ND were not detected at or above the reporting limit.

The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE ANALYZED: 03/26/92
DATE REPORTED: 04/13/92
PAGE: Seven

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	BH12 Concentration	BH12 Reporting Limit	BH16 Concentration	BH16 Reporting Limit
Standard Method 5520CF Hydrocarbons:							
Oil and Grease	ug/l	32,000	5,000	24,000	5,000	ND	5,000

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit
Standard Method 5520CF Hydrocarbons:			
Oil and Grease	ug/l	ND	5,000

QC Summary:
% Recovery: 87

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 03/26/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/13/92
PAGE: Eight

Sample Type: Soil

Method and Constituent:	Units	BH10-7.5E Concentration	BH10-7.5E Reporting Limit	BH11-10E Concentration	BH11-10E Reporting Limit	BH12-10E Concentration	BH12-10E Reporting Limit
EPA Method 7040: Antimony	ug/kg	ND	11,000	ND	11,000	ND	11,000
EPA Method 7060: Arsenic	ug/kg	3,600	120	19,000	120	6,600	120
EPA Method 7080: Barium	ug/kg	82,000	25,000	440,000	25,000	70,000	25,000
EPA Method 7090: Beryllium	ug/kg	130	120	260	120	120	120
EPA Method 7130: Cadmium	ug/kg	ND	250	ND	250	ND	250
EPA Method 7190: Chromium	ug/kg	28,000	1,200	37,000	1,200	21,000	1,200
EPA Method 219.1: Cobalt	ug/kg	ND	12,000	42,000	12,000	ND	12,000
EPA Method 7210: Copper	ug/kg	22,000	5,000	1,800,000	5,000	17,000	5,000
EPA Method 7420: Lead	ug/kg	3,100	2,500	230,000	2,500	ND	2,500

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 03/26/92, 03/27/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/13/92
PAGE: Nine

Sample Type: Soil

Method and Constituent:	Units	BH10-7.5E Concentration	BH10-7.5E Reporting Limit	BH11-10E Concentration	BH11-10E Reporting Limit	BH12-10E Concentration	BH12-10E Reporting Limit
EPA Method 7471: Mercury	ug/kg	130	50	120	50	64	50
EPA Method 246.1 Molybdenum	ug/kg	ND	25,000	140,000	25,000	ND	25,000
EPA Method 7520: Nickel	ug/kg	48,000	7,500	16,000	7,500	48,000	7,500
EPA Method 7741: Selenium	ug/kg	ND	120	ND	120	ND	120
EPA Method 7760: Silver	ug/kg	ND	250	550	250	ND	250
EPA Method 7840: Thallium	ug/kg	ND	5,900	ND	5,900	ND	5,900
EPA Method 7910: Vanadium	ug/kg	25,000	5,000	65,000	5,000	14,000	5,000
EPA Method 7950: Zinc	ug/kg	38,000	1,200	1,000,000	1,200	41,000	1,200

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 03/26/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/13/92
PAGE: Ten

Sample Type: Soil

Method and Constituent:	Units	BH13-5E Concentration	BH13-5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7040:							
Antimony	ug/kg	ND	11,000	ND	11,000	65*	**
EPA Method 7060:							
Arsenic	ug/kg	15,000	120	ND	120	74*	20
EPA Method 7080:							
Barium	ug/kg	72,000	25,000	ND	25,000	81	3.3
EPA Method 7090:							
Beryllium	ug/kg	ND	120	ND	120	69	**
EPA Method 7130:							
Cadmium	ug/kg	970	250	ND	250	87	**
EPA Method 7190:							
Chromium	ug/kg	130,000	1,200	ND	1,200	66	1.0
EPA Method 219.1:							
Cobalt	ug/kg	ND	12,000	ND	12,000	86	**
EPA Method 7210:							
Copper	ug/kg	2,900,000	5,000	ND	5,000	94*	0.9
EPA Method 7420:							
Lead	ug/kg	590,000	2,500	ND	2,500	62*	15

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1937
DATE SAMPLED: 03/23/92 and 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 03/26/92, 03/27/92 and 03/30/92
DATE ANALYZED: 03/30/92, 03/31/92 and 04/01/92
DATE REPORTED: 04/13/92
PAGE: Eleven

Sample Type: Soil

Method and Constituent:	Units	BH13-5E Concentration	BH13-5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7471:							
Mercury	ug/kg	13,000	50	ND	50	95	16
EPA Method 246.1							
Molybdenum	ug/kg	ND	25,000	ND	25,000	78	**
EPA Method 7520:							
Nickel	ug/kg	18,000	7,500	ND	7,500	76	2.2
EPA Method 7741:							
Selenium	ug/kg	ND	120	ND	120	90	**
EPA Method 7760:							
Silver	ug/kg	280	250	ND	250	96*	**
EPA Method 7840:							
Thallium	ug/kg	ND	5,900	ND	5,900	67	**
EPA Method 7910:							
Vanadium	ug/kg	10,000	5,000	ND	5,000	70	9.3
EPA Method 7950:							
Zinc	ug/kg	1,700,000	1,200	ND	1,200	104*	0.2

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/01/92 and 04/03/92
DATE ANALYZED: 04/02/92, 04/03/92 and 04/07/92
DATE REPORTED: 04/13/92
PAGE: Twelve

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	BH12 Concentration	BH12 Reporting Limit	BH16 Concentration	BH16 Reporting Limit
EPA Method 7040: Antimony	ug/l	ND	200	ND	200	ND	200
EPA Method 7060: Arsenic	ug/l	61	5.0	11	5.0	ND	5.0
EPA Method 7080: Barium	ug/l	6,900	1,000	ND	1,000	5,700	1,000
EPA Method 7090: Beryllium	ug/l	8.5	5.0	ND	5.0	5.0	5.0
EPA Method 7130: Cadmium	ug/l	ND	10	ND	10	ND	10
EPA Method 7190: Chromium	ug/l	1,400	50	180	50	1,200	50
EPA Method 219.1: Cobalt	ug/l	ND	500	ND	500	ND	500
EPA Method 7210: Copper	ug/l	4,300	200	300	200	820	200
EPA Method 7420: Lead	ug/l	3,500	100	ND	100	640	100

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/01/92 and 04/03/92
DATE ANALYZED: 04/03/92 and 04/07/92
DATE REPORTED: 04/13/92
PAGE: Thirteen

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	BH12 Concentration	BH12 Reporting Limit	BH16 Concentration	BH16 Reporting Limit
EPA Method 7471: Mercury	ug/l	93	1.0	15	1.0	100	1.0
EPA Method 246.1 Molybdenum	ug/l	ND	1,000	ND	1,000	ND	1,000
EPA Method 7520: Nickel	ug/l	2,100	300	370	300	1,900	300
EPA Method 7741: Selenium	ug/l	ND	5.0	ND	5.0	ND	5.0
EPA Method 7760: Silver	ug/l	ND	10	ND	10	ND	10
EPA Method 7840: Thallium	ug/l	ND	150	ND	150	ND	150
EPA Method 7910: Vanadium	ug/l	1,400	200	230	200	1,000	200
EPA Method 7950: Zinc	ug/l	5,300	50	270	50	2,000	50

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/01/92 and 04/03/92
DATE ANALYZED: 04/02/92, 04/03/92 and 04/07/92
DATE REPORTED: 04/13/92
PAGE: Fourteen

Sample Type: Water

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7040:					
Antimony	ug/l	ND	200	65*	**
EPA Method 7060:					
Arsenic	ug/l	ND	5.0	110	22
EPA Method 7080:					
Barium	ug/l	ND	1,000	85	6.9
EPA Method 7090:					
Beryllium	ug/l	ND	5.0	82	18
EPA Method 7130:					
Cadmium	ug/l	ND	10	86	**
EPA Method 7190:					
Chromium	ug/l	ND	50	74	0.0
EPA Method 219.1:					
Cobalt	ug/l	ND	500	84	**
EPA Method 7210:					
Copper	ug/l	ND	200	88	1.2
EPA Method 7420:					
Lead	ug/l	ND	100	68*	0.0

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE EXTRACTED: 04/01/92 and 04/03/92
DATE ANALYZED: 04/03/92 and 04/07/92
DATE REPORTED: 04/13/92
PAGE: Fifteen

Sample Type: Water

Method and Constituent:	Units	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7471:					
Mercury	ug/l	ND	1.0	124	**
EPA Method 246.1					
Molybdenum	ug/l	ND	1,000	68	**
EPA Method 7520:					
Nickel	ug/l	ND	300	80	0.5
EPA Method 7741:					
Selenium	ug/l	ND	5.0	93*	**
EPA Method 7760:					
Silver	ug/l	ND	10	102	**
EPA Method 7840:					
Thallium	ug/l	ND	150	74	**
EPA Method 7910:					
Vanadium	ug/l	ND	200	65	4.8
EPA Method 7950:					
Zinc	ug/l	ND	50	82	0.3

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE ANALYZED: 03/30/92
DATE REPORTED: 04/13/92
PAGE: Sixteen

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	BH4 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 160.1:					
Total Dissolved Solids	ug/l	3,700,000	10,000	ND	10,000

QC Summary:

% Recovery: 100
% RPD: 0.0

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1937
DATE SAMPLED: 03/24/92
DATE RECEIVED: 03/24/92
DATE ANALYZED: 04/07/92
DATE REPORTED: 04/13/92
PAGE: Seventeen

Sample Type: Water

Method and Constituent:	Units	BH4 Concentration	Method Blank Concentration
EPA Method 210C:			
Salinity	ppt *	3	ND

QC Summary:

% Recovery: 100
% RPD: 0.0

Concentrations reported as ND were not detected at or above the reporting limit.

The units, ppt are parts per thousand.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, JET FUEL OR MOTOR OIL FOR SOIL

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

Approximately 50 grams of soil are extracted with 80 ml of solvent on a mechanical shaker for 4 hours. The extract is filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250° C
DETECTOR TEMPERATURE:	300° C
INITIAL TEMPERATURE:	40° C
Hold for 4 minutes	
PROGRAM RATE:	10° C/min.
FINAL TEMPERATURE:	265° C
Hold for 10 minutes	

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

2/20/91

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, OR JET FUEL FOR WATER

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

EPA Method 3510 (separatory funnel liquid-liquid extraction) is used to prepare water samples. The sample is extracted with methylene chloride three times. The extracts are combined, then filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250° C
DETECTOR TEMPERATURE:	300° C
INITIAL TEMPERATURE:	40° C
Hold for 4 minutes	
PROGRAM RATE:	10° C/min.
FINAL TEMPERATURE:	265° C
Hold for 10 minutes	

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

1/2/90

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR SOIL, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample to the sum of the area of peaks in the gasoline standard.

3/13/91

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR SOIL, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

3/13/91

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR WATER, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample, to the sum of the area of peaks in the gasoline standard.

1/2/90

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR WATER, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

1/2/90

PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE FOR SOIL

Method:

This is EPA method 418.1 from Methods for Chemical Analysis of Water and Wastes, March 1983. This test eliminates oil and grease from animal and vegetable sources.

Sample Preparation and Analysis

Oil and grease are extracted from the sample with freon by agitation, sonication or soxhlet extraction.

The freon extract is dried with sodium sulfate and then treated with silica gel. Non-petroleum oil and grease is removed by absorption onto the silica gel. The absorbance of the remaining extract is measured with an infrared spectrophotometer.

Calculation

The oil and grease content is calculated by comparison to standards.

PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE FOR WATER

Method:

This is EPA method 418.1 from Methods for Chemical Analysis of Water and Wastes, March 1983. This test eliminates oil and grease from animal and vegetable sources.

Sample Preparation and Analysis

A separatory funnel liquid-liquid extraction is used to prepare water samples. Oil and grease are extracted from the sample with freon in a separatory funnel by shaking. The freon extract is collected and the sample is extracted two more times.

The freon extract is dried with sodium sulfate and then treated with silica gel. Non-petroleum oil and grease is removed by absorption onto the silica gel. The absorbance of the remaining extract is measured with an infrared spectrophotometer.

Calculation

The oil and grease content is calculated by comparison to standards.

EPA METHOD 7040 - ANTIMONY (Sb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Antimony
Wavelength:	217.6 nm
Heat Source:	Flame

Atomic Absorption Analysis:

A portion of the sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7060 - ARSENIC (As) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Arsenic
Wavelength:	193.7 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7080 - BARIUM (Ba) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Barium
Wavelength:	553.6 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7090 - BERYLLIUM (Be) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Beryllium
Wavelength:	234.9 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7130 - CADMIUM (Cd) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cadmium
Wavelength:	228.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7190 - CHROMIUM (Cr) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Chromium
Wavelength:	357.9 nm
Heat Source:	Nitrous Oxyde-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 219.1 - COBALT (Co) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cobalt
Wavelength:	240.7 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7210 - COPPER (Cu) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Copper
Wavelength:	324.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7420 - LEAD (Pb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Lead
Wavelength:	283.3 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit then displays the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHODS 7470 and 7471 - MERCURY (Hg) BY COLD VAPOR

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7470. The sample is digested with acid, potassium permanganate, and heat.

Soil samples are prepared by EPA Method 7471. The sample is dried, sifted, and digested with aqua regia, potassium permanganate, and heat.

Atomic Absorption Conditions:

Lamp:	Mercury
Wavelength:	253.7
Heat Source:	None

Atomic Absorption Analysis:

The sample is placed into a reaction vessel. A metal hydride gas is formed. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 246.1 - MOLYBDENUM (Mo) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Molybdenum
Wavelength:	313.3 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7520 - NICKEL (Ni) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Nickel
Wavelength:	231.6 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7740 - SELENIUM (Se) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Selenium
Wavelength:	196.0 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7760 - SILVER (Ag) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7760, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Silver
Wavelength:	328.1 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7840 - THALLIUM (Tl) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 3rd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Thallium
Wavelength:	276.8 nm
Heat Source:	Flame

Atomic Absorption Analysis:

The sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7910 - VANADIUM (V) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Vanadium
Wavelength:	318.4 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7950 - ZINC (Zn) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Zinc
Wavelength:	213.9 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

TOTAL DISOLVED SOLIDS

Method:

This is method 2540 C from Standard Methods for the Examination of Water and Wastewater, 17th edition.

Sample Preparation:

The sample must be well mixed.

Sample Analysis and Calculation:

The sample is filtered. The filtrate is evaporated to dryness in a weighed dish. The increase in dish weight represents the total dissolved solids.

12/31/90

Versar INC.

CHAIN OF CUSTODY RECORD

2263

PROJECT NO.	PROJECT NAME
7703.27	PDDIE

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) Lawrence Kleinecke

PARAMETERS

INDUSTRIAL HYGIENE SAMPLE Y / N

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	O+G	CONTAMINANTS OF CONCERN	REMARKS
BH11-5.0E	3/23/92	16:55		X		1	X	X	X		log 1937 Soil
BH13-10E	3/24/92	0930		X		1	X	X	X		
BH14-7.5E	3/24/92	1010		X		1	X	X	X		
BH17-10E	3/24/92	1310		X		1					
BH17-7.5E	3/24/92	1300		X		1	X	X	X		
BH16-10E	3/23/92	1630		X		1					
BH15-7.5E	3/24/92	1040		X		1					
BH14-5E	3/24/92	1005		X		1					
BH10-7.5E	3/23/92	1625		X		1				X	
BH16-2.5E	3/24/92	1100		X		1					
BH15-5E	3/24/92	1035		X		1	X	X	X		
BH15-2.5E	3/24/92	1030		X		1					

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
Lawrence Kleinecke	3/24/92 1505	Maureen Negrette	3/24/92 1615	Normal TAT Hold unmarked Samples
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette		

- 25 soil + BTEX on ice
- 3 water: 1-liter preserved
  1-liter unpres
  1-500 ml H2O
  2-40 ml HCl

Green Tag

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Versar INC.

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
7703.27	PODIE

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) Lawrence Kleinecke

PARAMETERS — INDUSTRIAL HYGIENE SAMPLE: Y / N

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	O&G 5520 F/HF	CAM 17 Metals	
BH11-2.5E	3/23/92	1650		X		1					Soil
BH16-7.5E	3/24/92	1110		X		1	X	X	X		
BH16-9E	3/24/92	1120		X		1					
BH14-2.5E	3/24/92	1000		X		1					
BH12-6E	3/24/92	0900		X		1	X	X	X		
BH12-2.5E	3/24/92	0845		X		1					
BH12-10E	3/24/92	0910		X		1					
BH13-5E	3/24/92	0920		X		1					
BH11-7.5E	3/23/92	1700		X		1					
BH13-7.5E	3/24/92	0925		X		1	X	X	X		Hold
BH10-5E	3/23/92	1625		X		1	X	X	X		
BH13-2.5E	3/24/92	0915		X		1					

1937

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
Lawrence Kleinecke	3/24/92 1505	Maureen Negrette	3/24/92 1545	Normal TAT Hold unmarked samples
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette		

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Versar INC.

CHAIN OF CUSTODY RECORD

Kleinecke 3/25/92 GB

PROJECT NO.	PROJECT NAME
7703.27	PDDIE

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) Lawrence Kleinecke

PARAMETERS

INDUSTRIAL HYGIENE SAMPLE: Y / N

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	O+G 5520 C+F	CAM 17 Metals (for Lab)	TDS	Salinity	REMARKS
													log 1937
BH11-10E	3/23/92	1605		X		1				X			5 jar
BH4	3/24/92	1145		X		2		X			X	X	water
BH4	3/24/92	1155		X		1	X						
BH4	3/24/92	1400		X		1			X				
BH4	3/24/92	1420		X		1				X			
BH12	3/24/92	1100		X		2		X					
BH12	3/24/92	1105		X		1	X						
BH12	3/24/92	1115		X		1			X				
BH12	3/24/92	1125		X		1				X			
BH16	3/24/92	1300		X			X	X					
BH16	3/24/92	1320		X					X				
BH16	3/24/92	1330		X						X			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks
Lawrence Kleinecke	3/24/92 1505	Maureen Negrette	3/24/92 3.05p	Normal TAT Hold unmarked samples
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette		

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

April 15, 1992

Mr. Lawrence Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received thirty five soil samples on March 23, 1992 for your Project No. 7703.27, PDDI-E (our custody log number 1928A).

Two of these samples were analyzed according to your March 25, 1992 request. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

Jennifer Pekol
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

LOG NUMBER: 1928A
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/01/92
DATE ANALYZED: 04/04/92
DATE REPORTED: 04/15/92

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: No. 7703.27, PDDI-E

Sample Type: Soil

Method and Constituent:	Units	BH8-7.5E Concentration	BH8-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	ug/kg	ND	1,000	ND	1,000

QC Summary:

% Recovery: 115*
% RPD: 11

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample due to the high concentration in the sample spiked.

LOG NUMBER: 1928A
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/02/92
DATE ANALYZED: 04/03/92
DATE REPORTED: 04/15/92
PAGE: Two

Sample Type: Soil

Method and Constituent:	Units	BH3-7.5E Concentration	BH3-7.5E Reporting Limit	BH8-7.5E Concentration	BH8-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	2,100	500	ND	500	ND	500
EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Toluene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Xylenes	ug/kg	78	15	ND	15	ND	15

QC Summary:

% Recovery: 74
% RPD: 4.0

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 1928A
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/07/92 and 04/14/92
DATE ANALYZED: 04/08/92, 04/10/92, 04/13/92, 04/14/92 and 04/15/92
DATE REPORTED: 04/15/92
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	BH8-7.5E Concentration	BH8-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7040:							
Antimony	ug/kg	ND	13,000	ND	13,000	67*	**
EPA Method 7060:							
Arsenic	ug/kg	1,600	120	ND	120	98	20
EPA Method 7080:							
Barium	ug/kg	78,000	25,000	ND	25,000	72	6.2
EPA Method 7090:							
Beryllium	ug/kg	160	120	ND	120	82	0.0
EPA Method 7130:							
Cadmium	ug/kg	ND	250	ND	250	96	**
EPA Method 7190:							
Chromium	ug/kg	42,000	1,200	ND	1,200	68	9.4
EPA Method 219.1:							
Cobalt	ug/kg	ND	12,000	ND	12,000	92	**
EPA Method 7210:							
Copper	ug/kg	45,000	5,000	ND	5,000	84	51
EPA Method 7420:							
Lead	ug/kg	24,000	2,500	ND	2,500	63	4.1

Concentrations reported as ND were not detected at or above the reporting limit.

* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 1928A
DATE SAMPLED: 03/23/92
DATE RECEIVED: 03/23/92
DATE EXTRACTED: 04/07/92, 04/09/92 and 04/14/92
DATE ANALYZED: 04/10/92, 04/13/92, 04/14/92 and 04/15/92
DATE REPORTED: 04/15/92
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	BH8-7.5E Concentration	BH8-7.5E Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit	QC Summary % Recovery	QC Summary % RPD
EPA Method 7471:							
Mercury	ug/kg	140	50	ND	50	106	9.6
EPA Method 246.1							
Molybdenum	ug/kg	ND	25,000	ND	25,000	75	**
EPA Method 7520:							
Nickel	ug/kg	59,000	7,500	ND	7,500	89	1.3
EPA Method 7741:							
Selenium	ug/kg	ND	120	ND	120	93*	**
EPA Method 7760:							
Silver	ug/kg	ND	250	ND	250	76	**
EPA Method 7840:							
Thallium	ug/kg	ND	3,500	ND	3,500	75	**
EPA Method 7910:							
Vanadium	ug/kg	36,000	5,000	ND	5,000	63	6.7
EPA Method 7950:							
Zinc	ug/kg	95,000	1,200	ND	1,200	60	70

Concentrations reported as ND were not detected at or above the reporting limit.
* The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
** The RPD is not reportable since the sample prepared in duplicate was not detectable.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
7703.27	PDDI - E

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) Larry Kleinecke

INDUSTRIAL HYGIENE SAMPLE: Y

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	PARAMETERS * TPH-D	TPH-G/BTEX	CAM 17 Metal	D&G 5520 DF	8270 Semi-VOA				REMARKS
															1928A
BH1-2.5E	03/23/92	0940		X		1									
BH1-4.5E	03/23/92	0945		X		1	X	X	X	X	X				* additional analyses requested By L Kleinecke 3/25/92
BH1-7.5E	11	0950		X		1									
BH1-10E	03/23/92	0955		X		1									
BH2-2.5E	03/23/92	1005		X		1									
BH2-5.0E	03/23/92	1005		X		1									
BH2-7.5E	03/23/92	1010		X		1	X	X	X	X	X				
BH3-2.5E	03/23/92	1030		X		1									pick up soil 1-bt ea on ice Y-5
BH3-5.0E	03/23/92	1035		X		1		*							
BH3-7.5E	03/23/92	1040		X		1	X	X	X	X					
BH3-10E	03/23/92	1045		X		1									Dates corrected to 3/23/92 Digital watch error. Okay per L Kleinecke 3/24/92 MJN
BH4-2.5E	03/23/92	1050		X		1									

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: (Signature) Lawrence Kleinecke	Date / Time 3/23/92 1650	Received for Laboratory by: (Signature) Maureen Negrette	Date / Time 3/24/92 16:50	Remarks Normal TAT Hold all samples not Marked	
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette			

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
7703.27	PDOI-E

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) ~~LKK~~ L. Kleinecke

1928A

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-GASTEX BTEX ltr	CAM Metal-17	OAG 5520 DF	BATD Semi-Vol	INDUSTRIAL HYGIENE SAMPLE Y/N
BH4-5E	03/23/92	1100		X		1						
BH4-7.5E	03/23/92	1105		X		1	X	X	X	X		
BH4-10E	03/23/92	1110		X		1						
BH5-5E	03/23/92	1125		X		1	X	X	X	X		
BH5-7.5E	03/23/92	1130		X		1						
BH5-10E	03/23/92	1135		X		1						
BH6-2.5E	03/23/92	1255		X		1						
BH6-5.0E	03/23/92	1320		X		1						
BH6-7.5E	03/23/92	1325		X		1						
BH6-10E	03/23/92	1330		X		1	X	X	X	X		
BH7-2.5E	03/23/92	1400		X		1						
BH7-5E	03/23/92	1405		X		1						

PARAMETERS

Pick up Soil on ice 1-liter jar Y-S

Dates corrected to 3/23/92 Digital watch error. OK per L. Kleinecke 3/24/92 MGN

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: (Signature) Lawrence Kleinecke	Date / Time 3/24/92 1650	Received for Laboratory by: (Signature) Maureen Negrette	Date / Time 3/24/92 1650	Remarks Normal TAT Hold all samples not Marked	
(Printed) Lawrence Kleinecke		(Printed) Maureen Negrette			

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
7703-27	PDDI-E

SAMPLERS: (Signature) Lawrence Kleinecke (Printed) L. Kleinecke

PARAMETERS

INDUSTRIAL HYGIENE SAMPLE Y / N

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	TPH-G/BTEX	CAM 17 Metal	D&O 5520 DF	8270 Semi-Vol	REMARKS
												1928A
BH7-7.5E	03/23/92	1410		X		1	X	X	X	X		
BH7-10E	03/23/92	1415		X		1						
BH8-2.5E	03/23/92	1435		X		1						Pickup Soil 1-bt ea Y-5 Brice Reg-14
BH8-5.0E	03/23/92	1440		X		1				X		
BH8-7.5E	03/23/92	1445		X		1	X	X	X	X		
BH8-10E	03/23/92	1450		X		1						
BH9-7.5E	03/23/92	1550		X		1	X	X	X	X		
BH9-5E	03/23/92	1545		X		1						
BH9-2.5E	03/23/92	1540		X		1						Date corrected to 3/23/92 Digital watch error Okay per L. Kleinecke 3/24/92 MLM
BH10 2.5E	03/23/92	1615		X		1						
BH9-10 Arrived but not on COC												

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: (Signature) Lawrence Kleinecke	Date / Time 3/23/92 1650	Received for Laboratory by: (Signature) Maureen Nazrette	Date / Time 3/24/92 16:50	Remarks Normal TAT Hold all samples not marked	
(Printed) Lawrence Kleinecke		(Printed) Maureen Nazrette			

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, JET FUEL OR MOTOR OIL FOR SOIL

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

Approximately 50 grams of soil are extracted with 80 ml of solvent on a mechanical shaker for 4 hours. The extract is filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250° C
DETECTOR TEMPERATURE:	300° C
INITIAL TEMPERATURE:	40° C
Hold for 4 minutes	
PROGRAM RATE:	10° C/min.
FINAL TEMPERATURE:	265° C
Hold for 10 minutes	

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

2/20/91

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR SOIL, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample to the sum of the area of peaks in the gasoline standard.

3/13/91

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR SOIL, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

3/13/91

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, OR JET FUEL FOR WATER

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

EPA Method 3510 (separatory funnel liquid-liquid extraction) is used to prepare water samples. The sample is extracted with methylene chloride three times. The extracts are combined, then filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250° C
DETECTOR TEMPERATURE:	300° C
INITIAL TEMPERATURE:	40° C
Hold for 4 minutes	
PROGRAM RATE:	10° C/min.
FINAL TEMPERATURE:	265° C
Hold for 10 minutes	

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

1/2/90

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR WATER, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample, to the sum of the area of peaks in the gasoline standard.

1/2/90

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR WATER, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass

EPA METHOD 7040 - ANTIMONY (Sb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Antimony
Wavelength:	217.6 nm
Heat Source:	Flame

Atomic Absorption Analysis:

A portion of the sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7060 - ARSENIC (As) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Arsenic
Wavelength:	193.7 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7080 - BARIUM (Ba) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Barium
Wavelength:	553.6 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7090 - BERYLLIUM (Be) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Beryllium
Wavelength:	234.9 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7130 - CADMIUM (Cd) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cadmium
Wavelength:	228.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7190 - CHROMIUM (Cr) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Chromium
Wavelength:	357.9 nm
Heat Source:	Nitrous Oxyde-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 219.1 - COBALT (Co) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cobalt
Wavelength:	240.7 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7210 - COPPER (Cu) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Copper
Wavelength:	324.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7420 - LEAD (Pb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Lead
Wavelength:	283.3 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit then displays the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHODS 7470 and 7471 - MERCURY (Hg) BY COLD VAPOR

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7470. The sample is digested with acid, potassium permanganate, and heat.

Soil samples are prepared by EPA Method 7471. The sample is dried, sifted, and digested with aqua regia, potassium permanganate, and heat.

Atomic Absorption Conditions:

Lamp:	Mercury
Wavelength:	253.7
Heat Source:	None

Atomic Absorption Analysis:

The sample is placed into a reaction vessel. A metal hydride gas is formed. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 246.1 - MOLYBDENUM (Mo) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Molybdenum
Wavelength:	313.3 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7520 - NICKEL (Ni) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Nickel
Wavelength:	231.6 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7740 - SELENIUM (Se) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Selenium
Wavelength:	196.0 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7760 - SILVER (Ag) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7760, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Silver
Wavelength:	328.1 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7840 - THALLIUM (Tl) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 3rd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Thallium
Wavelength:	276.8 nm
Heat Source:	Flame

Atomic Absorption Analysis:

The sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7910 - VANADIUM (V) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Vanadium
Wavelength:	318.4 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7950 - ZINC (Zn) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Zinc
Wavelength:	213.9 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

APPENDIX C

Alameda County Flood Control and Water Conservation District Drilling Permit

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94588 • (510) 484-2600

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT Pacific Dry Dock and Repair
1441 Embarcadero
Oakland, California

CLIENT
Name Crowley Maritime Corporation
Address P.O. Box 2287 Phone (206)443-7882
City Seattle, WA Zip 98111

APPLICANT
Name Lawrence Kleinecke
Versar, Inc.
Address 6330 Primrose Dr.#228 Phone (916)962-1612
City Fair Oaks, CA Zip 95628

TYPE OF PROJECT
Well Construction
Cathodic Protection ___
Water Supply ___
Monitoring ___
Geotechnical Investigation
General ___
Contamination X
Well Destruction ___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger ___
Cable ___ Other Coring

DRILLER'S LICENSE NO. ___

WELL PROJECTS
Drill Hole Diameter ___ in. Maximum
Casing Diameter ___ in. Depth ___ ft.
Surface Seal Depth ___ ft. Number ___

GEOTECHNICAL PROJECTS
Number of Borings 17 Maximum
Hole Diameter 2 in. Depth 12 ft.

ESTIMATED STARTING DATE March 23, 1992
ESTIMATED COMPLETION DATE March 25, 1992

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] Date 3-10-92

FOR OFFICE USE

PERMIT NUMBER 92119
LOCATION NUMBER ___

PERMIT CONDITIONS

~~Circled Permit Requirements Apply~~

A. GENERAL
(1.) A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
(3.) Permit is void if project not begun within 90 days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

(C.) GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved [signature] Date 11 Mar 92
Wyman Hong

51991