J. Eberle

DRAFT FINAL REVISED UST INVESTIGATION REPORT

Volume 1 - Text, Tables, and Figures

Former Underground Storage Tank Sites
211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845

at

Fleet and Industrial Supply Center,
Oakland, California

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Prepared by:

ERM-West, Inc.
455 Capitol Mall, Suite 800
Sacramento, California 95814

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LIST OF ABBREVIATIONS

AST	Aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
bgs	Below ground surface
BNAs	Base, neutrals, and acids
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
btoc	Below top of casing
CAD	Computer aided drafting
CAM	California assessment metals
cm/sec	Centimeters per second
cu. yd.	Cubic yard
DTSC	California Department of Toxic Substances Control
EBMUD	East Bay Municipal Utility District
EBS	Environmental Baseline Survey
EFA-West	Engineering Field Activities - Western Division
ERM	ERM-West, Inc.
FID	Flame ionization detector
FISC	Fleet and Industrial Supply Center
ft/ft	Foot per foot
gpd/ft2	Gallons per day per square foot
gpm	Gallons per minute
HASP	Health and Safety Plan
LLNL	Lawrence Livermore National Laboratory
MCLs	Maximum Contamination Levels
MTBE	Methyl-tert-butyl Ether
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MW	Monitoring well
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	Photoionization detector
PRC	PRC Environmental Management, Inc.
PRGs	Preliminary remediation goals
PWC	Public Works Center (Navy)

LIST OF ABBREVIATIONS

RBCA	Risk Based Corrective Action (ASTM E 1739-95)
RBSLs	Risk Based Screening Levels
RWQCB	Regional Water Quality Control Board
SPTCo	Southern Pacific Transportation Company
SVOC	Semivolatile organic compound
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
VOCs	Volatile organic compounds
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter

EXECUTIVE SUMMARY

Underground Storage Tanks (USTs) at Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845 at Fleet and Industrial Supply Center (FISC) in Oakland, California, were removed by the Navy's Public Works Center (PWC) between 1990 and 1994. Samples collected after removal of the USTs indicated that the soil and/or groundwater at each of the ten sites had potentially been impacted by hydrocarbons originating from the USTs. Under Contracts N62474-92-D-3608-0006 and 0015 with Engineering Field Activity West (EFA West), ERM-West, Inc. (ERM) conducted soil and groundwater investigations at the ten former USTs sites to assess the extent of hydrocarbon-impacted soil and groundwater. Site investigation activities included the collection of soil and groundwater samples using a Geoprobe sampler, the installation, sampling, and limited monitoring of groundwater monitoring wells, and the identification of storm drains and sanitary sewers in the vicinity of the site. The results of the site characterization and investigation activities at each site are presented in this document.

Conclusions based on the results of the soil, groundwater, and storm drain investigations conducted at each of the ten former UST sites were evaluated with respect to the criteria for low-risk soil and groundwater fuel sites outlined in the Interim Guidance Technical Memorandum issued by the San Francisco Bay Regional Water Quality Control Board on January 6, 1996. The conclusions indicated that with the exception of Site 332, the extent/and or concentrations of hydrocarbons in the groundwater at the other FISC UST sites precluded them from being categorized as low risk soil cases. For that reason, and because the vadose zone soil at FISC is relatively thin and rarely impacted by the contents of the former USTs, conclusions for the FISC UST sites were evaluated and discussed with respect to the six criteria for a low-risk groundwater case:

- The leak has been stopped and ongoing sources, including free product, removed or remediated;
- The site has been adequately characterized;
- The dissolved hydrocarbon plume is not migrating;
- No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted;
- The site presents no significant risk to human health; and
- The site presents no significant risk to the environment

Using a Risk-Based-Corrective-Action (RBCA) Tier 1 evaluation and with guidance from the RWQCB, each site was evaluated with respect

to the six criteria to determine whether the site may be categorized as a low risk groundwater case.

The evaluations indicated that only one of the former UST sites (332) satisfies the criteria for a "low risk" groundwater case and may be approved for closure with no further action required. The remaining nine UST sites (211, 331N, 331S, 331E, 334, 511D, 750, 842, and 845) do not satisfy the criteria for "low risk" cases.

Recommendations presented in this report propose additional action(s) to be implemented at the nine former UST sites to achieve a low-risk groundwater case status and be requested for closure. A table summarizing the site description, potential exposure pathways, and the recommended actions is included on the following page.

SUMMARY TABLE

Site Descriptions, Potential Exposure Pathways, and Recommendations
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Site	Site Description		Potential Exposure Pathways						Recommendations	
			Groundwater			Surface Water				
	Groundwater impacted?	Surface cover	Direct contact	Ingestion	Inhalation	Direct Migration	Storm drains	Utilities	Low-Risk GW Case?	Proposed Additional Work
211	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Install 4 monitoring wells to complete groundwater evaluation. Implement groundwater monitoring. Evaluate site following completion of monitoring program.
331N	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Implement groundwater monitoring. Evaluate site following completion of monitoring program.
331S	YES	Asphalt	NO	NO	YES	NO	YES	NO	NO	Collect five Geoprobe groundwater samples and install 3 monitoring wells to evaluate VOCs in groundwater. Actively remediate VOCs in groundwater. Evaluate hydrocarbon vapors in Building 331. Storm drain investigation. Groundwater monitoring.
331E	YES	Asphalt	NO	NO	YES	NO	YES	NO	NO	Install one monitoring well to complete groundwater evaluation. Actively remediate benzene in groundwater. Evaluate benzene vapor in air above plume. Storm drain investigation. Groundwater monitoring.
332	NO	Asphalt	NO	NO	NO	NO	NO	NO	YES	Request for site closure.
334	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Install one monitoring well. Groundwater monitoring. Evaluate site following completion of monitoring program.
511D	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Install 6 monitoring wells to complete groundwater evaluation. Implement groundwater monitoring. Evaluate site following competion of monitoring program.
750	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Collect 6 Geoprobe samples to complete evaluation of groundwater. Implement groundwater monitoring. Evaluate site following completion of monitoring program.
842	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Install 1 monitoring well to evaluate free product. Collect 5 Geoprobe groundwater samples to complete groundwater evaluation. Implement groundwater monitoring. Evaluate site following completion of monitoring program.
845	YES	Asphalt	NO	NO	NO	NO	NO	NO	NO	Collect 2 Geoprobe samples and install 1 monitoring well to complete groundwater evaluation. Implement groundwater monitoring. Evaluate site following completion of monitoring program.

NOTES:

Tier 1 Risk Based Screening Levels (RBSLs) were used to evaluate whether a site has the potential to impact water wells, surface water, humans, or environmental receptors.

SECTION 1

INTRODUCTION

This document constitutes the Underground Storage Tank (UST) Investigation Report for ten former UST sites at the Fleet and Industrial Supply Center (FISC) in Oakland, California (Figures 1-1 and 1-2). This UST Investigation Report has been prepared for Engineering Field Activity - West (EFA-West) by ERM-West, Inc., (ERM) under Contract No. N62474-92-D-3608 Delivery Orders No. 0031 for submittal to the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). This document has been prepared in accordance with applicable regulatory guidelines, specifically the *Corrective Action Regulations, Article 11, Chapter 16, Underground Storage Tank Regulations (Title 23, California Code of Regulations),* and the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites,* dated August 10, 1990.

The ten UST sites studied in this report are Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845.

The purpose of this report is to summarize the site characterization and investigation activities undertaken to date at each of the sites, present conclusions based on the results of the investigations, and present recommendations to achieve closure at each site based on interim guidelines (Lawrence Livermore National Laboratory recommendations) provided by the RWQCB, San Francisco Region (January 5, 1996).

This UST Investigation Report is organized into three sections, as follows:

- Section 1 describes the objectives and strategy of the UST investigations.
- Section 2 describes the soil and groundwater investigations conducted at each of the UST sites to date and presents the results of the investigations.
- Section 3 discusses the criteria for determining if a UST site may be considered a low-risk to human health and the environment.
- Section 4 presents conclusions based on the results of the investigations, discusses the conclusions with respect to the low-

risk criteria, and provides recommendations for further action and/or closure of each site.

UST Investigation Objectives and Strategy

The UST investigation portion of this report includes a summary of previous investigation activities and findings at each UST site and discusses the recent sampling activities and results. This information is presented in Section 2 of this report.

UST Investigation Objectives

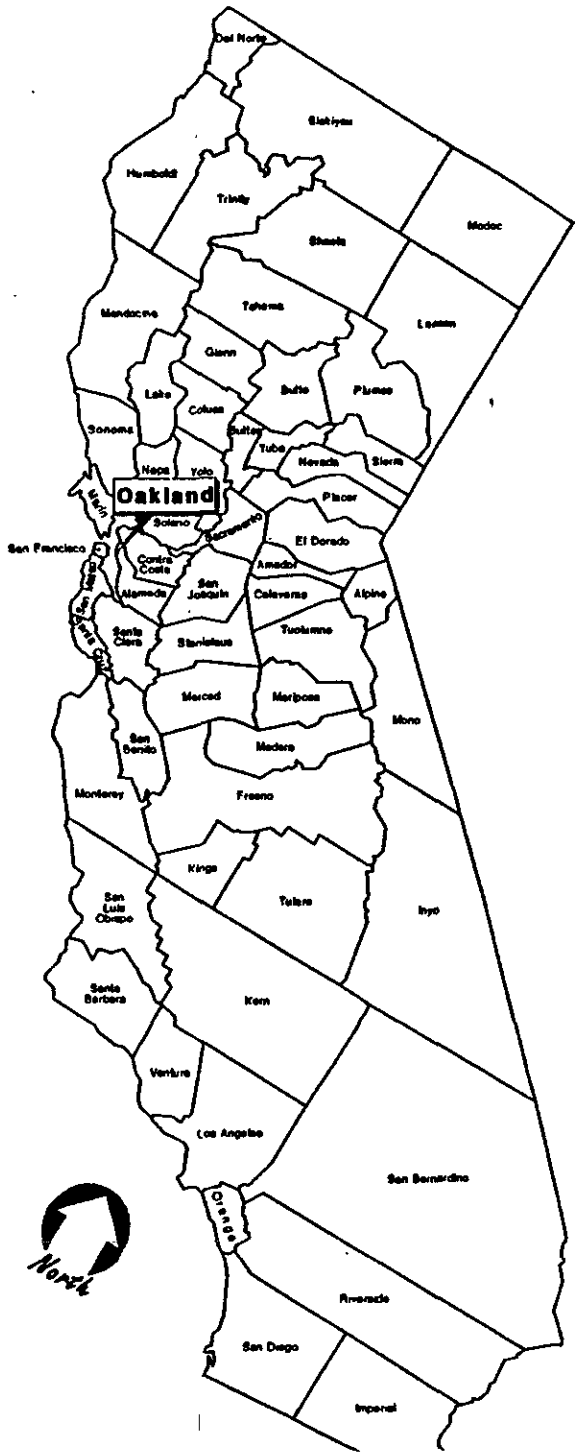
Based on information provided by the Navy, the objectives of the investigations conducted by ERM were to:

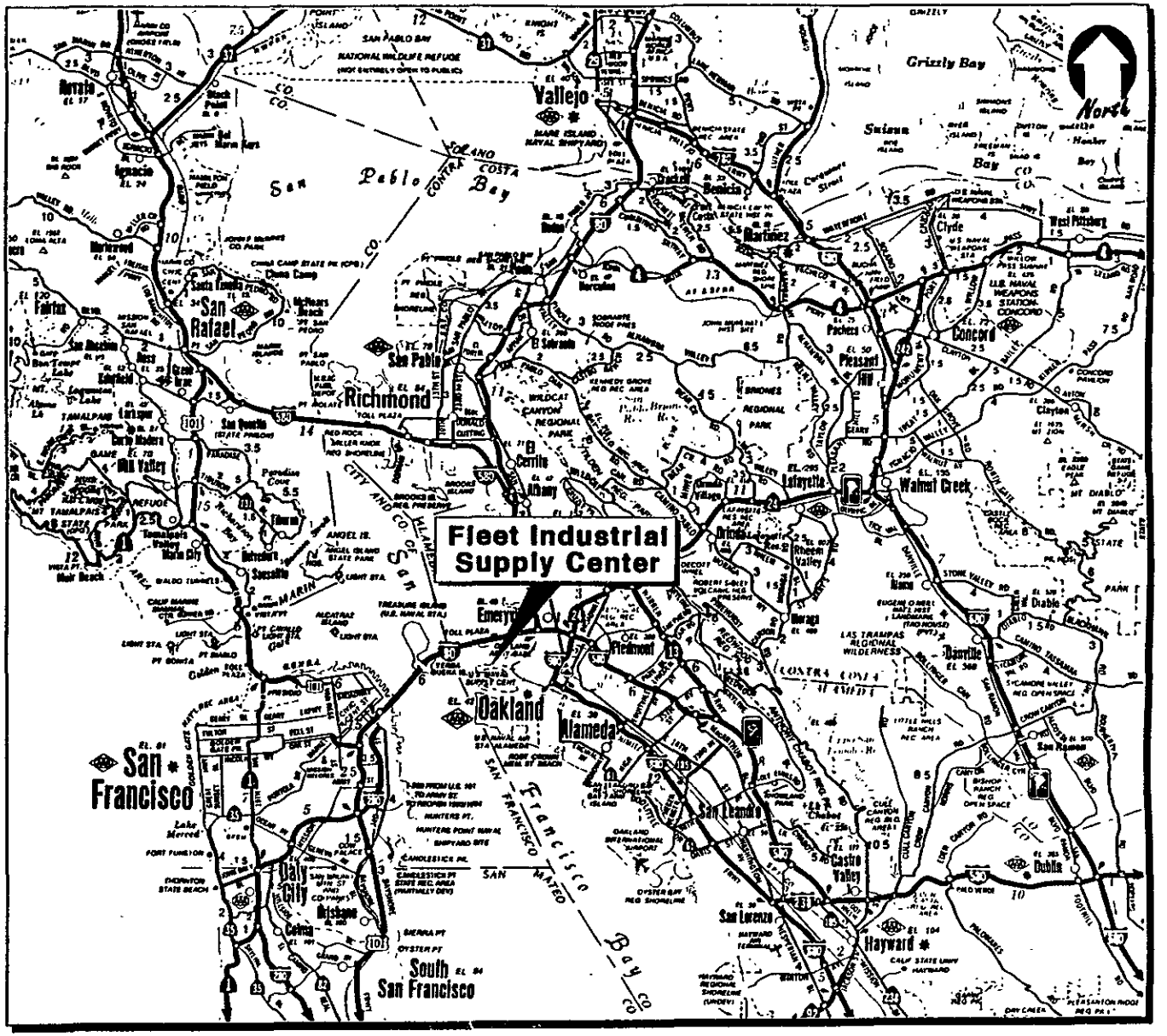
- Measure the current groundwater flow direction at each of the ten UST sites;
- Assess the extent of hydrocarbon-impacted soil;
- Assess the extent of hydrocarbon-impacted groundwater; and
- Evaluate the physical, chemical, and hydraulic properties of the soil to assist in a risk evaluation and, if necessary, the selection of appropriate remediation technologies.

UST Investigation Strategy

In accordance with existing information and the contract scope of work, the UST investigation was conducted in two phases:

- Phase 1: Soil and groundwater samples were collected in the vicinity of the ten former UST locations and associated piping to determine if any release had occurred and, if so, assess the extent of hydrocarbon-impacted soil and groundwater.
- Phase 2: The results of the initial soil and groundwater sampling efforts were used to identify locations for the installation of groundwater monitoring wells. Three groundwater monitoring wells were installed at each of the ten sites so that the groundwater flow direction could be determined, and the potential impact of hydrocarbons on the groundwater could be assessed.





Scale in Miles

0 5.5

Figure 1-1
Site Location Map
Fleet Industrial Supply Center
Oakland, California

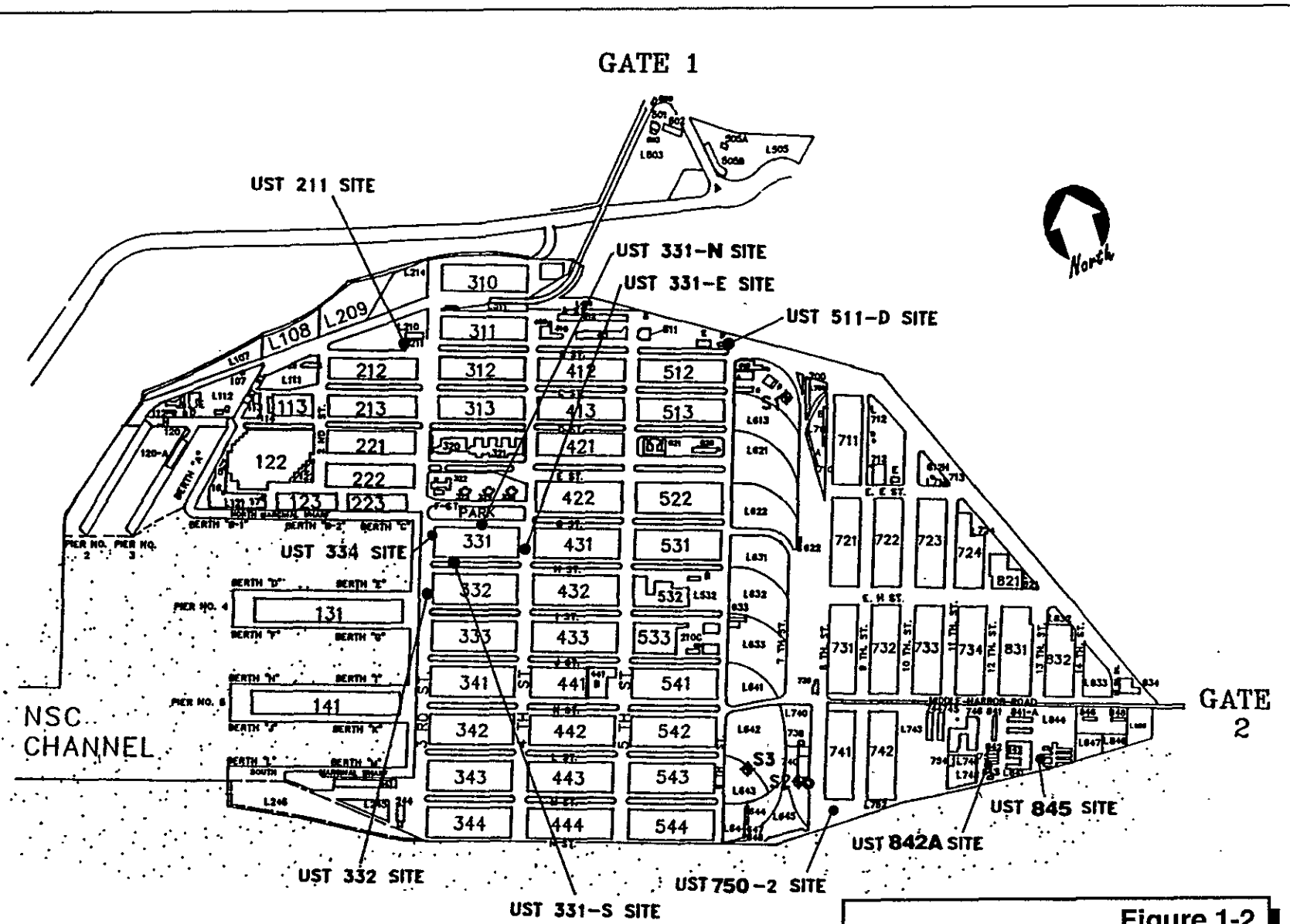


Figure 1-2

UST Site Location Map
Fleet Industrial Supply Center
Oakland, California

SECTION 2

UST INVESTIGATIONS

Introduction

UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845 are located at the Fleet and Industrial Supply Center (FISC) in Oakland, California (Figure 1-2). This section presents background information and summarizes the previous investigations at the sites, details the results of the soil and groundwater investigations performed by ERM, and discusses the geology and hydrogeology for each site.

ERM performed the UST Investigations at each site in two phases in accordance with the *Remedial Investigation Workplans* (ERM, 1994). Deviations from the Workplans are noted, where applicable, in this report. Phase 1 included the collection of soil and groundwater samples using a Geoprobe, and Phase II included the installation and sampling of groundwater monitoring wells.

Site 211 Soil and Groundwater Investigation

Phase I of the investigation, consisting of the collection of soil and groundwater samples using a Geoprobe, was conducted at Site 211 on December 2, 1994. Phase II, consisting of the installation and development of three groundwater monitoring wells, was conducted on January 4 and 6, 1995. Following review of the Geoprobe and monitoring well groundwater analytical results, additional screening level groundwater samples were collected at Site 211 on August 22, 1995.

In the Workplan, it was proposed that up to two soil samples and one groundwater sample be collected at each of the 12 proposed Geoprobe locations at Site 211. However, the actual number and placement of Geoprobe sampling locations and the number of soil and groundwater samples collected at each location was based on four field-determined criteria: 1) the presence of underground utilities which may prevent the collection of subsurface samples; 2) the presence of surface features which may prohibit the collection of samples at specific locations; 3) the results of the field screening of soil samples; and 4) the results of the chemical analysis of soil and groundwater samples performed by an on-site mobile laboratory. Although every effort was made to position

the site to verify the presence of manholes and catch basins presented on the CAD drawing and to measure the depth to the bottom of those features.

The CAD drawing indicated that a 10-inch and 12-inch diameter storm drain crossed the estimated area of hydrocarbon-impacted groundwater at Site 511D (Figure 2-38) The plume does not appear to follow either storm drain, indicating that the fill material surrounding the drains does not provide a preferential pathway for the movement of affected groundwater.

As presented on Figure 2-38, the 10-inch storm sewer traverses the site from north to south, then connects with the 12-inch storm drain which runs toward the southeast and terminates at a catch basin located just south of the former location of UST 511D-1. The depth to the base of the 12-inch storm sewer at the catch basin is approximately 3.5 feet bgs.

To determine if affected groundwater comes into contact with the storm drain, a cross-section showing the water table elevation in January 1995, the catch basin, and the approximate locations of the two storm drains was prepared (Figure 2-39). Ground surface elevations for the catch basin and storm drains were based on the survey data for the closest Geoprobe and monitoring well locations. The January 1995 groundwater measurements were taken during a period of above-average rainfall and most likely represent a higher than normal groundwater level. Figure 2-39 illustrates that the high groundwater in January 1995 did not come in contact with the storm drains. During years of normal or low rainfall, groundwater levels would be consistently lower than those observed in January 1995, and unlikely to come in contact with the storm drains.

Water, electrical, and fuel lines are typically buried shallow enough (less than 3 feet bgs) to enable access for repairs and modifications. Depth to groundwater measurements taken at Site 511D in January 1995 ranged from 3.11 to 4.21 feet bgs; not high enough to come in contact with most buried utilities. As discussed earlier, the January 1995 measurements most likely represent a higher than normal groundwater level. During years of normal or low rainfall, depth to groundwater would consistently be greater than 3 feet bgs and unlikely to come into contact with buried utilities.

Site 750 Soil and Groundwater Investigation

Phase I of the investigation, consisting of the collection of soil and groundwater samples using a Geoprobe, was conducted at Site 750 on November 14, 1994. As part of Phase II, two groundwater monitoring wells were installed at Site 750 on December 19, 1994. Because the

analytical results for the Geoprobe samples indicated that hydrocarbons at Site 750 may be migrating beneath the Union Pacific property south of the site, installation of the third monitoring well was delayed until the Navy could obtain access to the Union Pacific property. Because a Right-of-Entry agreement could not be reached with Union Pacific, the third well was installed at the southern edge of the Navy property on July 29, 1996. The three groundwater monitoring wells were sampled on August 2, 1996.

In the Workplan, it was proposed that at least one soil sample and one groundwater sample be collected at each of the six proposed Geoprobe locations at Site 750. However, the actual number and placement of Geoprobe sampling locations and the number of soil and groundwater samples collected at each location was based on four field-determined criteria: 1) the presence of underground utilities which may prevent the collection of subsurface samples; 2) the presence of surface features which may prohibit the collection of samples at specific locations; 3) the results of the field screening of soil samples; and 4) the results of the chemical analyses of soil and groundwater samples performed by an on-site mobile laboratory. A total of four soil samples and nine screening-level groundwater samples were collected at Site 750 using a Geoprobe.

The three groundwater monitoring wells installed during Phase II of the investigation were selected to provide sufficient difference in groundwater gradient to enable determination of groundwater flow direction and assess the lateral extent of dissolved hydrocarbons in the groundwater.

Site 750 Background and Summary of Previous Investigations

Former USTs 750-1 and 750-2 were located near the southwestern corner of Building 750 near the southern boundary of FISC, as presented on Figure 2-40. The tanks had reportedly contained diesel fuel and, possibly, gasoline. Information regarding the removal and sampling of UST 750-1 were unavailable.

UST 750-2 was 80 percent full of concrete when it was removed in September 1992. Soil observed during excavation activities was predominantly fine-grained, well-sorted sand with some clay. The Bay Mud Formation unit was not encountered in the pit. A strong gasoline odor was noted during soil sampling and UST removal activities. Visual inspection of UST 750-2 revealed numerous small holes. Groundwater was encountered at approximately six feet bgs during removal activities. Water filled two small depressions in the bottom of the excavation but was not present in a quantity sufficient to allow the collection of a sample. The age of the UST and the date of its in-place closure are not known.

Following the removal of UST 750-2, four soil samples were collected from the excavation (one from each sidewall) at the soil/groundwater interface and analyzed for TPH as gasoline and diesel and BTEX.

Site 750 Soil Investigation

A total of nine soil samples were collected from a depth of 5 feet bgs using a Geoprobe. Geoprobe sampling locations are presented on Figure 2-40. The nine soil samples were then field-screened by ERM to assess the potential presence of hydrocarbons in the sample. Procedures for field screening of Geoprobe soil samples are described in Appendix A. The field screening indicated the presence of hydrocarbons (i.e., odors and PID readings) in four soil samples, and the samples were analyzed by an on-site mobile laboratory for TPH as gasoline using modified USEPA Method 8015 and BTEX using USEPA Method 8020. In addition, three of the four samples were also analyzed for TPH as diesel using modified USEPA Method 8015.

Soil samples were collected at a depth of approximately 4.5 feet bgs during the installation of groundwater monitoring wells 750-MW1 and 750-MW2 and at a depth of approximately 4 feet bgs during the installation of 750-MW3. Monitoring well locations are presented on Figure 2-40. Procedures for the collection of soil samples with a split spoon sampler are described in Appendix A. Soil samples collected from monitoring wells 750-MW1 and 750-MW2 were analyzed by a stationary laboratory for TPH as gasoline and diesel using modified USEPA Method 8015, BTEX using USEPA Method 8020, and lead. The soil sample collected from monitoring well 750-MW3 was analyzed for TPH as gasoline and diesel, BTEX, and Methyl-tert-Butyl Ether (MTBE). In addition, one sample collected from monitoring well 750-MW1 was tested for permeability.

Site 750 Soil Investigation Results

Laboratory reports for the Geoprobe soil samples are included in Appendix C and the results are summarized in Table 2-6 and presented on Figure 2-41. Laboratory reports for the soil samples collected during installation of the monitoring wells are included in Appendix C and the results are summarized in Table 2-1 and presented on Figure 2-41.

TPH-diesel up to 1,300 mg/kg and TPH-gasoline up to 9,100 mg/kg were detected in the soil samples collected at the soil/groundwater interface from the excavation sidewalls after removal of UST 750-2. The analytical results for soil samples collected from the excavation following removal of UST 750-1 were unavailable.

Gasoline, diesel, and BTEX were not detected above the laboratory detection limit in the four Geoprobe soil samples analyzed.

Unidentified hydrocarbons in the diesel range at 8.2 mg/kg were detected in the soil sample collected from monitoring well 750-MW1. Hydrocarbons identified as weathered gasoline at 5.9 mg/kg and unidentified hydrocarbons in the diesel range at 210 mg/kg were detected in the soil sample collected from monitoring well 750-MW2. Diesel at 0.98 mg/kg and motor oil at 0.78 mg/kg were detected in the soil sample collected from monitoring well 750-MW3. The analytical laboratory reported that the overall chromatograph pattern for the hydrocarbons in the soil sample collected from monitoring well 750-MW3 is consistent with that of aged Bunker C fuel. Xylenes at 0.005 mg/kg were detected in the soil sample collected from monitoring well 750-MW2. BTEX compounds above their respective laboratory detection limits were not detected in monitoring well 750-MW1 or 750-MW3.

Lead at 14 mg/kg and 9.4 mg/kg were detected in the soil samples collected from monitoring wells 750-MW1 and 750-MW2, respectively.

Site 750 Groundwater Investigation

Nine screening-level groundwater samples were collected using a Geoprobe (Appendix A) and analyzed by an on-site mobile laboratory for TPH as gasoline and diesel using modified USEPA Method 8015 and BTEX using USEPA Method 602. Geoprobe groundwater sampling locations are presented on Figure 2-40.

Following review of the analytical results for the screening-level groundwater samples, two monitoring wells were installed at the site to confirm the results of the screening-level samples and assess the potential impact of hydrocarbons on the groundwater. Because the analytical data for the screening-level groundwater samples suggested that hydrocarbons from Site 750 may have possibly impacted the groundwater beneath the Union Pacific property to the south, installation of the third well was postponed until permission could be obtained from Union Pacific to access their property. However, as of September 1996, Union Pacific and the Navy had not reached an agreement to enter and conduct soil and groundwater sampling on Union Pacific property. The third groundwater monitoring well was, therefore, installed at the southern boundary of the Navy property in July 1996. Details regarding the construction, development, purging, and sampling of the monitoring wells are included in Appendix A and boring logs are included in Appendix D.

Groundwater samples collected from the three monitoring wells were analyzed for TPH as gasoline and diesel using modified USEPA Method 8015, BTEX using USEPA Method 602, and MTBE.

Site 750 Geology and Hydrogeology

The lithologic material encountered during installation of the groundwater monitoring wells consisted of a yellowish brown silty sand to a depth of approximately 6 to 8 feet bgs, underlain by dark greenish gray, high plasticity, silty clay to a depth between 10 and 11 feet bgs. In monitoring well 750-MW2, the silty clay extended to the total depth of the well at 14 feet bgs, but a clayey sand was encountered at a depth of 10 feet in monitoring well 750-MW1 and sandy silt was encountered at a depth of about 11 feet bgs in monitoring well 750-MW2.

Groundwater was encountered at a depth of 6 feet bgs during the removal of UST 750-2. Groundwater was encountered at a depth of approximately 5 feet bgs during the installation of monitoring wells 750-MW1 and 750-MW2 in December 1994 and at a depth of approximately 7 feet bgs during the installation of monitoring well 750-MW3 in July 1996. On August 2, 1996, depth to groundwater in the monitoring wells 750-MW1, 750-MW2, and 750-MW3 was measured at 6.24, 6.21, and 6.25 feet btoc, respectively. Groundwater monitoring and well elevation data are presented in Table 2-2 and field data are included in Appendix F.

Groundwater elevation contours (Figure 2-42) based on the depth to groundwater measurements taken on August 2, 1996, indicate that Groundwater flow direction at Site 760 is toward south-southwest. Hydraulic gradient of the groundwater is relatively flat at 0.002 ft/ft.

Hydraulic conductivity of the sand collected from monitoring well 750-MW1 at a depth of 4.5 feet bgs was determined to be 3.1×10^{-4} cm/sec, or 6.6 gpd/ft^2.

Site 750 Groundwater Investigation Results

Laboratory reports for the screening-level and monitoring well groundwater samples are included in Appendix E. The analytical results for the screening-level and monitoring well groundwater samples are summarized in Tables 2-3 and 2-4, respectively, and are presented on Figure 2-43.

Gasoline at 550 µg/L was detected in screening-level groundwater sample 750-W6, located approximately 25 feet north-northwest of the former location of UST 750-2. Diesel at 950 and 1,800 µg/L was detected in screening-level groundwater samples 750-W1 and 750-W2, located along the southern edge of the Navy property and downgradient of the former location of the two USTs.

Benzene at 24 µg/L, toluene at 2.1 µg/L, ethylbenzene at 2.7 µg/L, and total xylenes at 6.5 µg/L were detected in the screening level

groundwater sample in which gasoline was found (750-W6). Trace concentrations of total xylenes up to 1.3 µg/L were also detected in screening-level groundwater samples 750-W5, 750-W7, 750-W8, and 750-W9.

Groundwater samples collected from the three monitoring wells were analyzed for diesel before and after a silica gel cleanup was performed to remove polar organic compounds. Diesel at 59 and 77 µg/L was detected in the groundwater samples from monitoring wells 750-MW2 and 750-MW3, respectively, before the silica gel cleanup and at 21 and 18 µg/L, respectively, after the silica gel cleanup. The laboratory also reported that the sample chromatograph pattern for the two samples were consistent with those of aged diesel or fuel oil. Diesel was not detected above the laboratory detection limit in the groundwater sample collected from monitoring well 750-MW1.

BTEX compounds and MTBE were not detected above their respective laboratory detection limits in the monitoring well groundwater samples.

Site 750 Storm Drain and Utility Corridor Investigation

A CAD drawing provided by the Navy PWC was reviewed for the location of storm drains, catch basins, and manholes in the vicinity of Site 750. The drawing indicated that no storm drains or associated features were present at the site. A visual survey of the site by ERM on January 12, 1996, confirmed that no catch basins, manholes, or other evidence suggesting the presence of a storm drain were present.

Water, electrical, and fuel lines are typically buried shallow enough (less than 3 feet bgs) to enable access for repairs and modifications. Because depth to groundwater at Site 750 appears to range between 5 and 7 feet bgs, it is unlikely that groundwater at the site will come in contact with buried utilities.

Site 842 Soil and Groundwater Investigation

Phase I of the investigation, consisting of the collection of soil and groundwater samples using a Geoprobe, was conducted at Site 842 on November 28, 1994. Phase II, consisting of the installation of three groundwater monitoring wells, was conducted on December 21, 1994, and the wells were sampled on January 20.

In the Workplan, it was proposed that up to two soil samples and one groundwater sample be collected at each of the 10 proposed Geoprobe locations at Site 842. However, the actual number and placement of Geoprobe sampling locations and the number of soil and groundwater

samples collected at each location was based on four field-determined criteria: 1) the presence of underground utilities which may prevent the collection of subsurface samples; 2) the presence of surface features which may prohibit the collection of samples at specific locations; 3) the results of the field screening of soil samples; and 4) the results of the chemical analyses of soil and groundwater samples performed by an on-site mobile laboratory. A total of nine soil samples and nine screening-level groundwater samples were collected at Site 842 using a Geoprobe.

The Workplan also stated that a lithologic log of each Geoprobe location would be prepared. The lithology of the soil samples collected with the Geoprobe was documented in the field logbook. However, Geoprobe holes were not continuously cored or sampled from surface to total depth and a lithologic log of the material penetrated by the Geoprobe was not prepared. The lithology of the Geoprobe soil samples was used to collaborate the lithologic information obtained during installation of the monitoring wells.

The three groundwater monitoring wells installed during Phase II of the investigation were selected to provide sufficient difference in groundwater gradient to enable determination of groundwater flow direction and assess the lateral extent of dissolved hydrocarbons in the groundwater.

Site 842 Background

USTs 842A-1 and 842A-2 were located between Buildings 842 and 842A near the southeastern corner of FISC (Figure 2-44). The two steel USTs each had a capacity of 12,500 gallons and both were used to store fuel oil for boilers. The USTs were removed from a single excavation in October 1992. At that time, both USTs were full of sand, water, and a fuel oil-like residue. Soil observed during excavation activities was predominantly fine-grained, well-sorted sand with some clay. The Bay Mud Formation was encountered in the bottom of the pit beneath the tank. Pit soils were stained and were noted to have a strong hydrocarbon odor during sampling and removal activities. In addition, product was observed to be floating on the groundwater at approximately 8 feet bgs. Numerous corrosion holes were observed in the USTs. The age of the USTs and the dates of their in-place closure are not known.

Site 842 Summary of Previous Investigations

Four soil samples were collected from the pit walls (one from each wall) at the soil and groundwater interface. Pit wall soil samples were analyzed for BTEX and TPH-diesel. A groundwater sample was taken from the pit and analyzed for BTEX and TPH-diesel.

The pit wall soil samples contained TPH-diesel in concentrations ranging from 740 mg/kg at the north end to 2,400 mg/kg at the south end of the excavation. In addition, analyses revealed low concentrations of toluene, ethylbenzene, and xylenes in all soil samples. Analysis of the groundwater sample detected TPH-diesel, toluene, and xylenes.

Analytical data for USTs 842A-1 and 842A-2 indicate that a release of petroleum hydrocarbon originating from the USTs probably occurred. This conclusion is further supported by the petroleum odor, stained soil, and floating product observed during the excavation.

Site 842 Soil Investigation

A field screening process (described in Appendix A) was employed to determine the number of soil samples to be collected and analyzed. All samples taken from Geoprobe sampling locations within the vadose zone were observed to be clean (i.e., no odors, PID readings at background, no visible staining, etc.). Geoprobe soil sampling locations are presented on Figure 2-45.

Two soil samples were collected at 5 feet bgs using a Geoprobe. However, the shallow water table (approximately 4 feet bgs) suggests that the analytical results of these two samples may not be indicative of conditions in the vadose zone. Because the soil samples were collected from saturated material below the groundwater level, contaminants detected in the samples are more likely to represent contaminants present in the groundwater. Therefore, the Geoprobe groundwater samples (presented later in this section) would be more representative of groundwater conditions. In addition to the Geoprobe samples, soil samples were collected from the monitoring well bore holes at approximately 4 feet bgs and within the vadose zone.

Geoprobe sampling and monitoring well locations are presented on Figure 2-45. Procedures for the collection of soil samples using a Geoprobe and split spoon sampler are described in Appendix A. Soil samples were analyzed for TPH-gasoline and TPH-diesel using USEPA Method 8015-modified, for BTEX compounds using USEPA Method 8020, and for total lead using USEPA Method 3010M/6010. In addition, a permeability test was conducted on one soil sample collected from monitoring well 842-MW1.

Site 842 Soil Investigation Results

Analytical results for the Geoprobe soil samples and samples collected from the monitoring wells are included in Appendix C, summarized in Tables 2-1 and 2-2, respectively, and presented on Figure 2-45.

TPH-diesel at a concentration of 1,036 mg/kg was detected in Geoprobe soil sample 842-S3-05. This sample was located approximately 20 feet east of the location of the former UST. Varying concentrations (1.7 mg/kg to 80 mg/kg) of unidentified hydrocarbon compounds were detected in the soil samples collected from the three monitoring well boreholes. BTEX compounds were not detected above laboratory detection limits in the soil samples. Lead concentrations of <6.5, 9.4, and 9.7 mg/kg were detected in soil samples from monitoring wells 842-MW1, 842-MW2, and 842-MW3, respectively.

Site 842 Groundwater Investigation

Nine screening-level groundwater samples and one duplicate sample were collected using a Geoprobe. Groundwater sampling locations are presented on Figure 2-46. The samples were analyzed for TPH-gasoline and TPH-diesel using USEPA Method 8015-modified and for BTEX using USEPA Method 602. Sample collection methodologies are included in Appendix A.

Following review of the analytical results for the screening-level groundwater samples, three monitoring wells were installed at the site to assess the potential impact of hydrocarbons on the groundwater. Construction, development, purging, and sampling procedures for the monitoring wells are detailed in Appendix A. Boring logs are included in Appendix D.

Groundwater samples collected from the three monitoring wells were analyzed for TPH-gasoline, TPH-diesel, kerosene, and motor oil using USEPA Method 8015-modified; for BTEX using USEPA Method 602; and for total lead using USEPA Method 3010M/6010. To complete the groundwater quality assessment, one sample from each site was analyzed for general minerals.

Site 842 Geology and Hydrogeology

The lithologic material observed in the tank excavation was described as fine-grained, well-sorted sand with trace amounts of clay. The Bay Mud Formation was encountered in the bottom of the excavation pit below the tanks. The lithologic material encountered during drilling consisted of yellowish-brown, silty sand underlain by dark greenish-gray, silty clay.

Groundwater was encountered between 4.5 and 5 feet bgs during the installation of the monitoring wells. On January 20, 1995, depth to groundwater was measured in all three monitoring wells. Depth to groundwater and groundwater elevation data are presented in Table 2-3. Potentiometric surface contours (Figure 2-46) based on groundwater elevation data indicate that the groundwater flow

direction was toward the northwest at that time. The hydraulic gradient at the site was approximately 0.005 ft/ft. On March 30, 1995, groundwater elevations were measured again at the site. Calculations at that time indicated that the groundwater flow direction had shifted approximately toward the west, and that the hydraulic gradient was 0.008 ft/ft. Because of the site's proximity to the San Francisco Bay, groundwater flow direction and hydraulic gradient can fluctuate considerably. A tidal study conducted for the base by PRC indicated that approximately 8 feet of tidal change was observed at FISC during the study period.

Hydraulic conductivity of the soil was determined to be 6.2×10^{-7} centimeter per second (cm/sec) or 0.013 gpd/ft^2. Data obtained during well development and purging indicates that the monitoring wells are capable of sustaining pumping rates up to 1.5 gpm.

Site 842 Groundwater Investigation Results

Laboratory analytical results for all groundwater samples, including analysis for general minerals, are included in Appendix E. Analytical results for the screening-level groundwater samples collected via the Geoprobe process are summarized in Table 2-4. Analytical results for the groundwater samples collected from the monitoring wells are summarized in Table 2-5. Figure 2-47 shows concentrations of all detected chemical constituents in groundwater samples.

Free floating product was observed in the groundwater samples at Geoprobe locations 842-W1 and 842-W2. However, the thickness of the floating product could not be adequately addressed using the Geoprobe. Dissolved TPH-diesel was detected in two of the nine Geoprobe groundwater samples, 842-W1 and 842-W3, at concentrations of 10,640 and 156,000 µg/L, respectively (Figure 2-48). An unidentified hydrocarbon compound within the diesel range was detected in the groundwater sample from monitoring well 842-MW3 at a concentration of 200 µg/L.

BTEX compounds were detected at only low concentrations and in only two Geoprobe groundwater samples (842-W6 and 842-W7) and one groundwater monitoring well sample (842-MW3). Benzene concentrations ranged from non-detect to 3.0 µg/L. Toluene ranged from non-detect to 16.3 µg/L. Ethylbenzene ranged from non-detect to 5.8 µg/L. Xylene concentrations ranged from non-detect to 27.8 µg/L.

Lead was detected in only one monitoring well (842-MW3), at a concentration of 27 µg/L.

Site 842 Storm Drain and Utility Corridor Investigation

A CAD drawing provided by the Navy PWC was reviewed for the location of storm drains, catch basins, and manholes in the vicinity of Site 842. On January 12, 1996, ERM conducted a survey of the site to verify the presence of catch basins and manholes shown on the CAD drawing and to measure the depth to the bottom of those features. Surface features visually confirmed by ERM and the approximate location of storm drains, as indicated on the CAD drawing, are presented on Figure 2-49.

A 12-inch diameter storm drain crosses the west end of the estimated groundwater plume boundary. The plume does not appear to follow the storm drain, indicating that fill material surrounding the storm drain does not serve as preferential pathway for the migration of contaminants. As presented on Figure 2-49, the 12-inch storm runs north-south and terminates at a manhole near the southwest corner of Building 842-A. The depth to the base of the 12-inch storm sewer measured at this manhole is approximately 3 feet bgs.

To evaluate whether affected groundwater may come in contact with the storm drain, a cross-section showing the monitoring wells 842-MW2 and 842-MW3, groundwater elevations in January 1995, and the estimated location and slope (assumed to be 2%) of the storm drain was prepared by ERM (Figure 2-50). The January 1995 measurements were taken during a period of above-average rainfall and the groundwater elevations most likely represent an unusually high water level. Figure 2-50 shows that, during periods of unusually high water levels, hydrocarbon-affected groundwater at Site 842 does not come in contact with the storm drain. During periods of normal rainfall or dry conditions, groundwater elevations at Site 842 would probably be lower than those observed in January 1995 and unlikely to come in contact with the storm drain.

Water, electrical, and fuel lines are typically buried shallow enough (less than 3 feet bgs) to enable access for repairs and modifications. Depth to groundwater measurements taken at Site 842 in January 1995 ranged from 3.11 to 5.0 feet bgs. During periods of unusually high water levels, groundwater at Site 842 could potentially come in contact with some buried utilities. During years of normal or low rainfall, however, groundwater levels would be consistently greater than 3 feet bgs and unlikely to come into contact with buried utilities.

Site 845 Soil and Groundwater Investigation

Phase I of the investigation, consisting of the collection of soil and groundwater samples using a Geoprobe, was conducted at Site 845 on

November 29, 1994. Phase II, consisting of the installation of three groundwater monitoring wells, was conducted on December 20, 1994, and the wells were sampled on January 20, 1995.

In the Workplan, it was proposed that up to two soil samples and one groundwater sample be collected at each of the 7 proposed Geoprobe locations at Site 845. However, the actual number and placement of Geoprobe sampling locations and the number of soil and groundwater samples collected at each location was based on four field-determined criteria: 1) the presence of underground utilities which may prevent the collection of subsurface samples; 2) the presence of surface features which may prohibit the collection of samples at specific locations; 3) the results of the field screening of soil samples; and 4) the results of the chemical analyses of soil and groundwater samples performed by an on-site mobile laboratory. Although every effort was made to position Geoprobe sampling locations in close proximity to the former UST locations at Site 845, actual sampling locations were dictated by the presence of underground utilities and surface features. A total of six soil samples and eight screening-level groundwater samples were collected at Site 845 using a Geoprobe.

The three groundwater monitoring wells installed during Phase II of the investigation were selected to provide sufficient difference in groundwater gradient to enable determination of groundwater flow direction and assess the lateral extent of dissolved hydrocarbons in the groundwater.

Site 845 Background

Former USTs 845-1 and 845-2 were located near the southwest corner of Building 845, close to the southern edge of FISC (Figure 2-51). The two steel USTs were situated end-to-end and featured extensive piping leading to Building 845. The calculated capacities of USTs 845-1 and 845-2 were 4,500 and 6,000 gallons, respectively. UST 845-1 reportedly contained gasoline, and UST 845-2 reportedly contained diesel fuel. Both USTs were partially filled with gravel and sand as a method of in-place closure. The USTs were removed in a single excavation in September 1992.

Soil on the pit walls of the excavation was visibly contaminated about one foot above the water table, and an oily product, appearing to be fuel oil, was floating on the groundwater surface. Groundwater observed during excavation activities was approximately 5.5 feet bgs and about 2 feet above the bottom of the USTs. The age of the USTs and the dates of their in-place closure are not known.

Site 845 Summary of Previous Investigations

Four soil samples were collected from the pit walls near the soil and groundwater interface. Because UST 845-1 reportedly contained gasoline, the soil and groundwater samples were analyzed for BTEX, TPH-diesel, TPH-gasoline, and total lead.

Pit wall soil samples collected near UST 845-2 contained up to 1,600 mg/kg TPH-diesel but no detectable levels of BTEX or TPH-gasoline. A total lead concentration of 91.7 mg/kg was found in the east wall soil sample, possibly due to leakage of gasoline from UST 845-1. The UST pit groundwater sample contained 0.71 mg/L TPH-gasoline.

Site 845 Soil Investigation

A field screening process (described in Appendix A) was employed to determine the number of soil samples to be collected and analyzed. All samples within the vadose zone from Geoprobe sampling locations were observed to be clean (i.e., no odors, PID readings at background, no visible staining).

A Geoprobe was used to collect three soil samples at depths from 5 to 5.5 feet bgs. However, the shallow water table (approximately 4 feet bgs) suggests that the analytical results of these samples may not be indicative of conditions in the vadose zone. Because the soil samples were collected from saturated material below the groundwater level, contaminants detected in the soil are more likely to represent contaminants present in the groundwater. Therefore, the Geoprobe groundwater samples (presented later in this section) would be more representative of groundwater conditions. In addition to the Geoprobe samples, soil samples were collected from the monitoring well bore holes at approximately 4.5 feet bgs.

Geoprobe sampling and monitoring well locations are presented on Figure 2-52. Procedures for the collection of soil samples using a Geoprobe and split spoon sampler are described in the RI Workplan. Soil samples were analyzed for TPH-gasoline and TPH-diesel using USEPA Method 8015-modified, for BTEX compounds using USEPA Method 8020, and for total lead using USEPA Method 3010M/6010. In addition, a permeability test was conducted on one soil sample from monitoring well 845-MW3.

Site 845 Soil Investigation Results

Analytical results for the Geoprobe soil samples as well as the samples collected from monitoring well locations are included in Appendix C, summarized in Tables 2-1 and 2-2, and presented on Figure 2-52.

TPH-diesel concentrations at 150 and 18 mg/kg were detected in Geoprobe soil samples 845-S3-05 and 845-S4-05, respectively. Both soil samples were collected at a depth of approximately 5 feet bgs. Varying concentrations (1.3 to 150 mg/kg) of unidentified hydrocarbon compounds were detected in soil samples collected from monitoring well bore holes 845-MW1 and 845-MW2. BTEX compounds were not detected above laboratory detection limits in the soil samples. Lead concentrations of 810, 11, and 13 mg/kg were detected in soil samples collected from monitoring wells MW1, MW2, and MW3, respectively.

Site 845 Groundwater Investigation

Eight screening-level groundwater samples were collected using a Geoprobe. These samples were analyzed for TPH-gasoline and TPH-diesel using USEPA Method 8015-modified and for BTEX using USEPA Method 602. Sample collection methodologies are described in the RI Workplan. Geoprobe groundwater sampling locations are presented on Figure 2-53.

Following review of the analytical results for the screening-level groundwater samples, three monitoring wells were installed at the site to assess the potential impact of hydrocarbons on the groundwater. Construction, development, purging, and sampling procedures for the monitoring wells are detailed in the Workplan. Boring logs and well construction details are included in Appendix D.

Groundwater samples collected from the three monitoring wells were analyzed for TPH-gasoline, TPH-diesel, kerosene, and motor oil using USEPA Method 8015-modified, for BTEX using USEPA Method 602, and for total lead using USEPA Method 3010M/6010. To complete the groundwater quality assessment, one sample from each site was analyzed for general minerals.

Site 845 Geology and Hydrogeology

The lithologic material encountered during drilling consisted of brown, silty sand underlain by dark gray, silty clay.

Groundwater was encountered between 4.5 and 5 feet bgs during the installation of the monitoring wells. On January 23, 1995, depth to groundwater was measured in all three monitoring wells. Depth to groundwater and groundwater elevation data are presented in Table 2-3. Potentiometric surface contours (Figure 2-54) based on groundwater elevation data indicated that the groundwater flow direction at that time was due north. The hydraulic gradient at the site was approximately 0.003 ft/ft. On March 30, 1995, groundwater elevations at the site were measured again. Calculations at that time indicated that the groundwater flow direction had shifted

approximately toward the east, and that the hydraulic gradient was 0.001 ft/ft. Due to tidal fluctuations, groundwater flow direction and hydraulic gradient can fluctuate considerably. A tidal study conducted at the base (PRC, 1994) indicated that approximately eight feet of tidal change was observed at FISC during the study period.

Hydraulic conductivity of the soil was determined to be $3.0x10^{-5}$ cm/sec or 0.64 gpd/ft^2. Data obtained during well development and purging indicates that the monitoring wells may be capable of sustaining pumping rates up to 1.5 gpm.

Site 845 Groundwater Investigation Results

Laboratory analytical results for all groundwater samples, including analysis for general minerals, are included in Appendix E. Analytical results for the screening-level groundwater samples collected with the Geoprobe are summarized in Table 2-4. Analytical results for the groundwater samples collected from the monitoring wells are summarized in Table 2-5. Figure 2-53 shows concentrations of all detected chemical constituents in groundwater samples.

TPH-diesel was detected in two of the eight Geoprobe groundwater samples, 845-W3 and 845-W8, at concentrations of 1,454 and 7,563 µg/L, respectively (Figure 2-55). Analysis of the groundwater samples from the monitoring wells detected no TPH or BTEX concentrations above laboratory detection limits.

BTEX compounds were detected at low concentrations in six Geoprobe groundwater samples but were not detected in the three monitoring wells. Benzene was not detected above the laboratory detection limit. Toluene concentrations ranged from non-detect to 13.9 µg/L. Ethylbenzene concentrations ranged from non-detect to 4.4 µg/L. Xylene concentrations ranged from non-detect to 32.7 µg/L.

Lead was detected only in one monitoring well (845-MW3), at a concentration of 68 µg/L.

Site 845 Storm Drain and Utility Corridor Investigation

A CAD drawing provided by the Navy PWC was reviewed by ERM for the location of storm drains, catch basins, and manholes in the vicinity of Site 845. On January 12, 1996, ERM conducted a survey of the site to verify the presence of these catch basins, manholes, and storm drains shown on the CAD drawing, and to measure the depth to the bottom of those features.

The CAD drawing indicated that a six-inch storm drain crosses the former location of the UST excavation at Site 845 (Figure 2-56).

However, there was no mention of encountering a storm drain in the UST removal report and ERM's survey of the site found no catch basins or manholes to indicate that the presence of a storm drain at that location. The approximate location of surface features visually confirmed by ERM and indicated on the CAD drawing are presented on Figure 2-56.

The CAD drawing indicated that a 15-inch and an 18-inch storm drain are located within the estimated boundaries of the groundwater plume. The 15-inch storm drain traverses the site from east to west. A manhole for this storm drain is located within the estimated area of affected groundwater (Figure 2-56). The 18-inch storm drain traverses the area of affected groundwater from the south to north and terminates at the manhole located on the 15-inch storm drain (Figure 2-56). Measurements taken by ERM indicate that the base of both storm drains at the manhole is approximately 3 feet bgs.

The configuration of the plume (Figure 2-55) suggests that the fill material surrounding the 15-inch storm drain may potentially serve as a preferential pathway for the migration of hydrocarbon-affected groundwater. To evaluate the potential for hydrocarbon-affected groundwater to come in contact with the storm drains, the elevations of the storm drains were compared to groundwater elevations in monitoring wells located south and north of the hydrocarbon plume and manhole. In January 1995, depth to groundwater in monitoring wells 845-MW1 and 845-MW2 was measured at 3.90 and 3.94 feet bgs, respectively. The data indicates that the elevations of the storm drains are higher than the elevation of the groundwater. Therefore, it is unlikely that affected groundwater would come in contact with and enter the storm drains. Since the January 1995 measurements were taken during a period of above-average rainfall and most likely represent a higher than normal groundwater level, it is reasonable to assume that depth to groundwater would typically be greater than 3 feet bgs and unlikely to come into contact with the storm drains.

Water, electrical, and fuel lines are typically buried shallow enough (less than 3 feet bgs) to enable access for repairs and modifications. Depth to groundwater measurements taken at Site 845 in January and March 1995 ranged from 3.88 to 4.39 feet bgs; not high enough to come in contact with most buried utilities. The January and March measurements were taken during and after a period of above-average rainfall and represent higher than normal water levels. It is anticipated that during typical periods of normal rainfall or dry conditions, groundwater levels would be lower and unlikely to come in contact with buried utilities.

TABLE 2-1

Concentrations of Chemical Constituents in Monitoring Well Soil Samples
UST Sites 211, 331E, 331S, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		6010	8015	8015	8240	8270	8080	8020	8020	8020	8020
Sample Location and Depth	Date	Lead	TPH-Gasoline	TPH-Diesel	VOCs	BNAs	PCBs	Benzene	Toluene	Ethyl-benzene	Total Xylenes
211-MW1-5'	1/6/95	2.6	<1.0	58 (1)	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
211-MW2-4'	1/6/95	2.0	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
211-MW3-5'	1/6/95	1.4	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331N-MW1	8/16/95	Not sampled. Boring located within excavation backfill.									
331N-MW2-3'	8/16/95	<2.5	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331N-MW3-3.5'	8/17/95	<2.5	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331E-MW1-4'	1/9/95	5.6	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331E-MW2-5'	1/10/95	3.7	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331E-MW3-4'	1/10/95	14.0	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
331S-MW1-4'	1/9/95	1.2	<1.0	<1.0	<0.005	<0.05	<0.1	<0.005	<0.005	<0.005	<0.005
331S-MW2-5'	1/12/95	1.9	<1.0	<1.0	<0.005	<0.05	<0.1	<0.005	<0.005	<0.005	<0.005
331S-MW3-4.5'	1/12/95	5.3	<1.0	<1.0	<0.005	<0.05	<0.1	<0.005	<0.005	<0.005	<0.005
332-MW1-4.5'	1/11/95	8.9	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
332-MW2-5.5'	1/11/95	7.9	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
332-MW3-5.5'	1/11/95	4.2	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
334-MW1	8/17/95	Not sampled. Boring located within excavation backfill.									
334-MW2-3.5'	8/17/95	<2.5	<1.0	1.4(2)	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
334-MW3-3.5'	8/17/95	<2.5	<1.0	3.6(3)	NA	NA	NA	<0.005	<0.005	<0.005	<0.005
511D-MW1-5.5'	1/6/95	0.8	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.0050	<0.0050
511D-MW2-5'	1/6/95	1.1	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.0050	<0.0050
511D-MW3-5'	1/6/95	1.3	<1.0	<1.0	NA	NA	NA	<0.005	<0.005	<0.0050	<0.0050
750-MW1-4.5'	12/19/94	14.0	<1.0	8.2 (4)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
750-MW2-4'	12/19/94	9.4	5.9 (10)	210 (5)	NA	NA	NA	<0.0050	<0.0050	<0.0050	0.0052
750-MW3-3'	8/1/96	NA	<5	0.98/0.78*	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050

TABLE 2-1

Concentrations of Chemical Constituents in Monitoring Well Soil Samples
UST Sites 211, 331E, 331S, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		6010	8015	8015	8240	8270	8080	8020	8020	8020	8020
Sample Location and Depth	**Date**	**Lead**	**TPH-Gasoline**	**TPH-Diesel**	**VOCs**	**BNAs**	**PCBs**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
842-MW1-4	12/20/94	<6.5	<1.0	80 (6)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
842-MW-2-4	12/20/94	9.4	<1.0	1.7 (7)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
842-MW3-4	12/20/94	9.7	<1.0	3.3 (7)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
845-MW1-4.5	12/21/94	810	1.3 (9)	150 (8)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
845-MW2-4.5	12/21/94	11	2.4 (9)	52 (6)	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050
845-MW3-4.5	12/21/94	13	<1.0	<1.0	NA	NA	NA	<0.0050	<0.0050	<0.0050	<0.0050

NOTES:
All concentrations reported in milligrams per kilogram (mg/kg)
Bolded values indicate detected concentrations
* = Motor Oil
(1) = Unidentified compound in diesel range
(2) = Unidentified hydrocarbon C9-C24
(3) = Unidentified hydrocarbon >C17
(4) = Unidentified hydrocarbon >C16
(5) = Unidentified hydrocarbon >C10
(6) = Unidentified hydrocarbon >C13
(7) = Unidentified hydrocarbon C10-C22
(8) = Unidentified hydrocarbon >C15
(9) = Unidentified hydrocarbon >C8
(10)= Unidentified hydrocarbon C8-C12

KEY:
TPH= Total petroleum hydrocarbons
VOCs= Volatile organic compounds
BNAs= Base, Neutrals and Acids
PCBs= Polychlorinated biphenyls
NA = Not analyzed

TABLE 2-2

Groundwater Elevations
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial and Supply Center
Oakland , California

Well ID	Total Depth (btoc)	Screened Interval (btoc)	Well Head Elev (toc-msl)	Date Measured	DTW (btoc)	WL Elev (msl)
UST Site 211						
211-MW1	14.2	4.0-13.0	13.43	1/24/95	4.84	8.59
211-MW2	14.8	4.5-13.5	12.85	1/24/95	4.16	8.69
211-MW3	14.8	3.5-12.5	13.09	1/24/95	4.25	8.84
UST Site 331N						
331N-MW1	14.3	4.0-14.0	112.00	8/17/95	4.59	107.41
				8/30/95	4.00	108.00
331N-MW2	14.5	4.0-14.5	111.47	8/17/95	4.16	107.31
				8/30/95	3.50	107.97
331N-MW3	14,6	4.1-14.1	111.82	8/17/95	4.32	107.50
				8/30/95	3.62	108.20
331N-HMW1	17.9	unknown	111.61	8/30/95	3.71	107.90
UST SITE 331S						
331S-MW1	13.6	3.6-12.6	12.54	1/25/95	4.40	8.14
				8/18/95	4.50	8.04
331S-MW2	13.8	3.5-12.5	12.22	1/25/95	5.22	7.00
				8/18/95	5.65	6.57
331S-MW3	13.6	3.5-12.5	12.39	1/25/95	3.41	8.98
				8/18/95	3.17	9.22
UST SITE 331E						
331E-MW1	14.0	3.5-12.5	12.49	1/26/95	4.48	8.01
				8/18/95	4.48	8.01
331E-MW2	14.6	3.5-12.5	12.60	1/26/95	4.62	7.98
				8/18/95	5.05	7.55
331E-MW3	14.2	3.5-12.5	12.62	1/26/95	5.00	7.62
				8/18/95	5.41	7.21
UST SITE 332						
332-MW1	13.6	3.5-12.5	12.05	1/24/95	6.67	5.38
332-MW2	13.5	3.5-12.5	12.08	1/25/95	5.65	6.43
332-MW3	13.8	3.5-12.5	12.04	1/25/95	6.13	5.91
UST SITE 334						
334-MW1	15.0	4.5-14.5	112.22	8/18/95	7.14	105.08
				8/31/95	7.19	105.03
334-MW2	14.3	3.8-13.8	111.68	8/18/95	7.41	104.27
				8/31/95	6.80	104.88
334-MW3	20.0	4.5-19.5	111.70	8/18/95	7.25	104.45
				8/31/95	6.74	104.96

TABLE 2-2

Groundwater Elevations
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial and Supply Center
Oakland , California

Well ID	Total Depth (btoc)	Screened Interval (btoc)	Well Head Elev (toc-msl)	Date Measured	DTW (btoc)	WL Elev (msl)
UST SITE 511D						
511D-MW1	14.8	3.5-12.5	13.95	1/20/95	4.21	9.74
511D-MW2	15.0	3.5-12.5	12.49	1/20/95	3.11	9.38
511D-MW3	14.5	3.5-12.5	13.17	1/20/95	4.00	9.17
UST SITE 750						
750-MW1	14.5	3.8-13.8	12.28	8/2/96	6.24	6.04
750-MW2	13.3	2.8-12.8	12.28	8/2/96	6.21	6.07
750-MW3	14.5	4.5-14.5	12.43	8/2/96	6.50	5.93
UST SITE 842						
842-MW1	13.2	2.9-12.9	13.09	1/20/95	3.11	9.98
				3/30/95	3.24	9.85
842-MW2	13.1	2.8-12.8	14.15	1/20/95	4.91	9.24
				3/30/95	5.00	9.15
842-MW3	13.6	3.4-13.4	12.69	1/20/95	3.17	9.52
				3/30/95	3.92	8.77
UST SITE 845						
845-MW1	14.0	3.8-13.8	14.14	1/23/95	3.90	10.24
				3/30/95	4.06	10.08
845-MW2	14.2	4.0-14.0	13.93	1/23/95	3.94	9.99
				3/30/95	3.88	10.05
845-MW3	13.5	3.3-13.3	14.31	1/23/95	4.19	10.12
				3/30/95	4.39	9.92

NOTES:
All measurements in feet

KEY:
btoc = Below top of casing
toc= Top of casing
msl = Above mean sea level
DTW = Depth to water
WL= Water level

TABLE 2-3

Concentrations of Chemical Constituents in Geoprobe Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015	8015	8010	8010	8010	8010	8010	8010	8010	8010	602	602	602	602
Location	Date	TPH-Gasoline	TPH-Diesel	Chloroform	TCE	PCE	1,1-DCA	1,4-DCB	1,3-DCB	1,2-DCB	cis-1,2-DCE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
211N-W1	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
211N-W2	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	4.6	<0.5	<1.5
211N-W2 (dup)	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	4.5	<0.5	<1.5
211N-W3	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
211N-W4	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
211N-W5	8/22/95	<50	800	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
211N-W6	8/22/95	190	1,300	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	16.0	6.8	33.0
211N-W7	8/22/95	54	830	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	0.62
211N-W8	8/22/95	52	1,300	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	1.6
211S-W1	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
211S-W2	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
211S-W3	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
331N-W1	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331N-W2	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331N-W3	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331N-W4	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331N-W5	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331N-W6	8/2/95	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331E-W1	12/1/94	4,185	<500	NA	NA	NA	NA	NA	NA	NA	NA	1,463	69.2	144.6	291.5
331E-W2	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	38.1	0.8	<0.5	<1.5
331E-W2 (dup)	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	35.6	0.7	<0.5	<1.5
331E-W3	12/1/94	9,631	<500	NA	NA	NA	NA	NA	NA	NA	NA	7,443	23.6	33.2	45.4
331E-W4	12/1/94	13,650	<500	NA	NA	NA	NA	NA	NA	NA	NA	5,045	37.8	32.6	113.1
331E-W5	12/1/94	14,110	<500	NA	NA	NA	NA	NA	NA	NA	NA	11,690	41.5	86.3	74.1
331E-W6	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	0.7	<0.5	<0.5	<1.5
331E-W7	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
331E-W8	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	3.7	3.7	1.7	4.3
331E-W9	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
331E-W10	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	1.9	0.6	<0.5	<1.5
331E-W11	12/1/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5

TABLE 2-3

Concentrations of Chemical Constituents in Geoprobe Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015	8015	8010	8010	8010	8010	8010	8010	8010	8010	602	602	602	602
Location	Date	TPH-Gasoline	TPH-Diesel	Chloroform	TCE	PCE	1,1-DCA	1,4-DCB	1,3-DCB	1,2-DCB	cis-1,2-DCE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
331S-W1	11/30/94	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
331S-W2	11/30/94	<500	717	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	2.0	<0.5	<0.5	0.7	1.5	12.4
331S-W2 (dup)	11/30/94	<500	736	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	1.9	<0.5	<0.5	0.6	1.4	10.2
331S-W3	11/30/94	<500	92,640	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	31.7	299
331S-W4	11/30/94	<500	<500	<0.5	2.0	16.3	<0.5	1.1	<0.5	13.9	<0.5	<0.5	<0.5	<0.5	<1.5
331S-W5	11/30/94	<500	<500	<0.5	2.4	<0.5	<0.5	0.9	<0.5	6.9	<0.5	<0.5	2.8	1.1	4.5
331S-W6	11/30/94	<500	<500	<0.5	<0.5	7.0	<0.5	0.8	<0.5	0.7	<0.5	<0.5	3.9	1.8	6.0
331S-W7	11/30/94	<500	<500	13.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	33.5	7.1	32.6
331S-W8	11/30/94	<500	<500	<0.5	<0.5	1.2	<0.5	1.8	3.7	6.8	<0.5	<0.5	1.8	5.4	5.7
331S-W9	11/30/94	<500	<500	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	2.8	<0.5	<0.5	0.5	0.9	2.3
331S-W10	8/22/95	1,600	1,100,000	<0.5	<0.5	0.61	0.84	3.0	0.90	7.0	2.7	<0.5	14.0	19.0	86.0
332-W1	12/7/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	2.0	14.4
332-W1 (dup)	12/7/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	2.1	13.5
332-W2	12/7/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
332-W3	12/7/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	2.7
332-W4	12/7/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W1	8/2/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	0.6	0.5	1.4	<1.5
334-W2	8/2/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	0.9	1.1	1.8
334-W2 (dup)	8/2/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	0.6	1.2	<1.5
334-W3	8/2/95	351,600	<500	NA	NA	NA	NA	NA	NA	NA	NA	*<500	841	5,654	23,770
334-W4	8/2/95	1,813	<500	NA	NA	NA	NA	NA	NA	NA	NA	1,238	48.9	775	781
334-W5	8/2/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	0.8	<0.5	2.2
334-W6	8/2/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	0.6	0.5	<1.5
334-W8	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W9	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W9 (dup)	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W10	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	4.4	30
334-W11	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W12	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W13	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
334-W14	8/3/95	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	2.6

TABLE 2-3

Concentrations of Chemical Constituents in Geoprobe Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015	8015	8010	8010	8010	8010	8010	8010	8010	8010	602	602	602	602
Location	Date	TPH-Gasoline	TPH-Diesel	Chloroform	TCE	PCE	1,1-DCA	1,4-DCB	1,3-DCB	1,2-DCB	cis-1,2-DCE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
511D-W1	12/6/04	<500	<500	2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W1 (dup)	12/6/04	<500	<500	2.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W2	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W3	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W4	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W5	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W6	12/6/04	3,120	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	225	28.3	160	179.6
511D-W7	12/6/04	967	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	134	<0.5	<0.5	10.2
511D-W8	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1.9
511D-W9	12/6/04	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.1	0.5	2.5	1.1
511D-W10	12/7/94	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W11	12/7/94	<500	<500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.5
511D-W12	8/22/95	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.0	0.96	<0.5	1.8
511D-W13	8/22/95	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	110	2.4	1.2	4.6
511D-W14	8/22/95	86	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1	2.4	0.88	5.7
511D-W15	8/22/95	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
511D-W16	8/22/95	7,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	35.0	6.3	290	29
511D-W17	8/22/95	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	0.53
750-W1	11/14/94	<50	950	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
750-W2	11/14/94	<50	1,800	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
750-W3	11/14/94	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
750-W4	11/14/94	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5
750-W5	11/14/94	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	0.8
750-W6	11/14/94	550	<50	NA	NA	NA	NA	NA	NA	NA	NA	24	2.1	2.7	6.5
750-W7	11/14/94	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	0.5
750-W8	11/14/94	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	0.5
750-W9	11/14/94	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	1.3

TABLE 2-3

Concentrations of Chemical Constituents in Geoprobe Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015	8015	8010	8010	8010	8010	8010	8010	8010	8010	602	602	602	602
Location	Date	TPH-Gasoline	TPH-Diesel	Chloroform	TCE	PCE	1,1-DCA	1,4-DCB	1,3-DCB	1,2-DCB	cis-1,2-DCE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
842-W1	11/28/94	<500	**10,640**	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
842-W2	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
842-W3	11/28/94	<500	**156,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
842-W4	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
842-W5	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
842-W6	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	**3.0**	**16.3**	**5.8**	**25.2**
842-W6 (dup)	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	**2.7**	**15.7**	**5.2**	**27.8**
842-W7	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	**1.4**	<0.5	**2.6**
842-W8	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
842-W9	11/28/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
845-W1	11/29/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	**2.5**
845-W2	11/29/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<1.5
845-W3	11/29/94	<500	**1,454**	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	**4.4**	**25.2**
845-W4	11/29/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	**2.5**
845-W6	11/29/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	**13.9**	**4.2**	**19.1**
845-W7	11/29/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	**1.3**
845-W8	11/29/94	<500	**7,563**	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	**1.0**	**2.6**	**32.7**
845-W10	12/2/94	<500	<500	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5

NOTES:
All concentrations in micrograms per liter (µg/L)
Bolded values indicate detected concentrations
* = Detection limit is 500 µg/L due to sample dilution

KEY:
TPH= Total petroleum hydrocarbons
TCE= Trichloroethene
PCE= Tetrachloroethene
DCA= Dichloroethane
DCB= Dichlorobenzene
DCE= Dichloroethene
NA = Not analyzed
(dup)= Duplicate sample

Table 2-4

Concentrations of Chemical Constituents in Monitoring Well Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015M	8015M	8015M	5520 C&F	602	602	602	602	8080	8270	CAM 17
Location	**Date**	**TPH-Gasoline**	**TPH-Diesel**	**Motor Oil**	**Oil and Grease**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**	**PCBs**	**Semi-Volatile Organics**	**Lead (mg/L)**
211-MW1	1/24/95	>50	**110 (1)**	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
211-MW2	1/24/95	>50	**370 (1)**	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
211-MW3	1/24/95	>50	>50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331N-MW1	8/30/95	**490**	**2,400 (2)**	<50	**27**	**1.1**	**1.3**	**2.4**	**17**	ND	**b(2-CIP)E =11**	**0.12**
331N-MW2	8/30/95	<50	**89 (3)**	<50	<5.0	<0.5	<0.5	<0.5	<0.5	NA	ND	<0.05
331N-MW3	8/30/95	<50	**67 (4)**	<50	<5.0	<0.5	<0.5	<0.5	<0.5	NA	ND	<0.05
331N-HMW1	8/30/95	<50	<50	<50	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	NA
331S-MW1	1/25/95	100	<50	<500	NA	<0.5	<0.5	<0.5	**1.1**	NA	NA	<10
331S-MW2	1/25/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331S-MW3	1/25/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331E-MW1	1/26/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331E-MW2	1/26/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331E-MW2 (dup)	1/26/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
331E-MW3	1/26/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
332-MW1	1/25/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	**11**
332-MW2	1/25/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
332-MW3	1/25/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
334-MW1	8/30/95	<50	**100 (3)**	NA	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	**0.059**
334-MW2	8/30/95	<50	**160 (4)**	NA	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<0.05
334-MW3	8/30/95	<50	**110 (4)**	NA	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<0.05
511D-MW1	1/20/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
511D-MW2	1/20/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
511D-MW3	1/20/95	**480**	**170 (1)**	<500	NA	**19**	**0.6**	**9.8**	**5.7**	NA	NA	<10

Table 2-4

Concentrations of Chemical Constituents in Monitoring Well Groundwater Samples
UST Sites 211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015M	8015M	8015M	5520 C&F	602	602	602	602	8080	8270	CAM 17
Location	**Date**	**TPH-Gasoline**	**TPH-Diesel**	**Motor Oil**	**Oil and Grease**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**	**PCBs**	**Semi-Volatile Organics**	**Lead (mg/L)**
750-MW1	8/2/96	<50	<50	<50	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	NA
750-MW2	8/2/96	<50	**59/<50 (5)**	<50	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	NA
750-MW3	8/2/96	<50	**77/21 (5)**	<50	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	NA
750-MW3 (dup)	8/2/96	<50	**65/18 (5)**	<50	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	NA
842-MW1	1/20/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
842-MW2	1/20/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
842-MW3	1/20/95	<50	**200 (1)**	<500	NA	<0.5	<0.5	<0.5	**0.6**	NA	NA	**27**
845-MW1	1/23/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
845-MW2	1/23/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	<10
845-MW3	1/23/95	<50	<50	<500	NA	<0.5	<0.5	<0.5	<0.5	NA	NA	**68**

NOTES and KEY:

Concentrations reported in micrograms per liter (µg/L) except where noted
b(2-ClP)E = bis(2-chloroisopropyl)ether
(1) Unidentified hydrocarbon compounds
(2) Unidentified hydrocarbons <C12, >C18
(3) Unidentified hydrocarbons >C9
(4) Unidentified hydrocarbons C9-C24
(5) Detected concentrations before and after silica gel cleanup to remove polar organic compounds
dup = duplicate sample
NA = Not analyzed
ND = Not detected
mg/L = Milligrams per liter

TABLE 2-6

Concentrations of Chemical Constituents in Geoprobe Soil Samples
UST Sites 211, 331N, 331E, 331S, 332, 334, 511D, 750, 842, and 845
Fleet and Industrial Supply Center
Oakland, California

Analytical Method:		8015M	8015M	8020	8020	8020	8020	8010
Sample Location	**Date**	**TPH-Gasoline**	**TPH-Diesel**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**	**Halogenated Volatile Hydrocarbons**
331N-S1-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331N-S2-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331N-S3-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331N-S4-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331N-S5-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331N-S6-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
331E-S1-05'	12/1/94	**4,348**	<10	**5.78**	**5.35**	**31.3**	**126.1**	NA
331E-S2-05'	12/1/94	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
331E-S3-05'	12/1/94	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
331E-S5-05'	12/1/94	<10	<10	**0.008**	<0.005	<0.005	<0.005	NA
331E-S6-05'	12/1/94	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
331E-S7-05'	12/1/94	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
334-S1-04'	8/2/95	<10	<10	<0.005	**0.01**	<0.005	<0.005	NA
334-S2-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
334-S3-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
334-S4-04'	8/2/95	<10	<10	**0.01**	**0.01**	<0.005	**0.05**	NA
334-S5-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
334-S6-04'	8/2/95	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
511D-S5-05'	12/6/94	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
511D-S6-05'	12/6/94	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
511D-S7-05'	12/6/94	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
511D-S8-05'	12/6/94	<10	<10	<0.005	<0.005	<0.005	<0.005	<0.005
511D-S9-05'	12/6/94	<10	<10	**0.012**	<0.005	**0.030**	**0.036**	<0.005
750-S2-05'	11/14/94	<1.0	<200	<0.005	<0.005	<0.005	<0.005	NA
750-S3-05'	11/14/94	<1.0	<1	<0.005	<0.005	<0.005	<0.005	NA
750-S6-05'	11/14/94	<1.0	<1	<0.005	<0.005	<0.005	<0.005	NA
750-S8-05'	11/14/94	<1.0	NA	<0.005	<0.005	<0.005	<0.005	NA
842-S1-05'	11/28/94	<10	<10	NA	NA	NA	NA	NA
842-S3-05'	11/28/94	<10	**1,036**	<0.005	<0.005	<0.005	<0.005	NA
845-S1-05'	11/29/94	<10	<10	<0.005	<0.005	<0.005	<0.005	NA
845-S3-05'	11/29/94	<10	**150**	<0.005	<0.005	<0.005	<0.005	NA
845-S4-05'	11/29/94	<10	**17**	<0.005	<0.005	<0.005	<0.005	NA
845-S4-05(dup)	11/29/94	<10	**18**	<0.005	<0.005	<0.005	<0.005	NA

NOTES:

All concentrations in milligrams per kilogram (mg/kg)

Detected concentrations are in bold

TPH = Total petroleum hydrocarbons

NA = Not analyzed

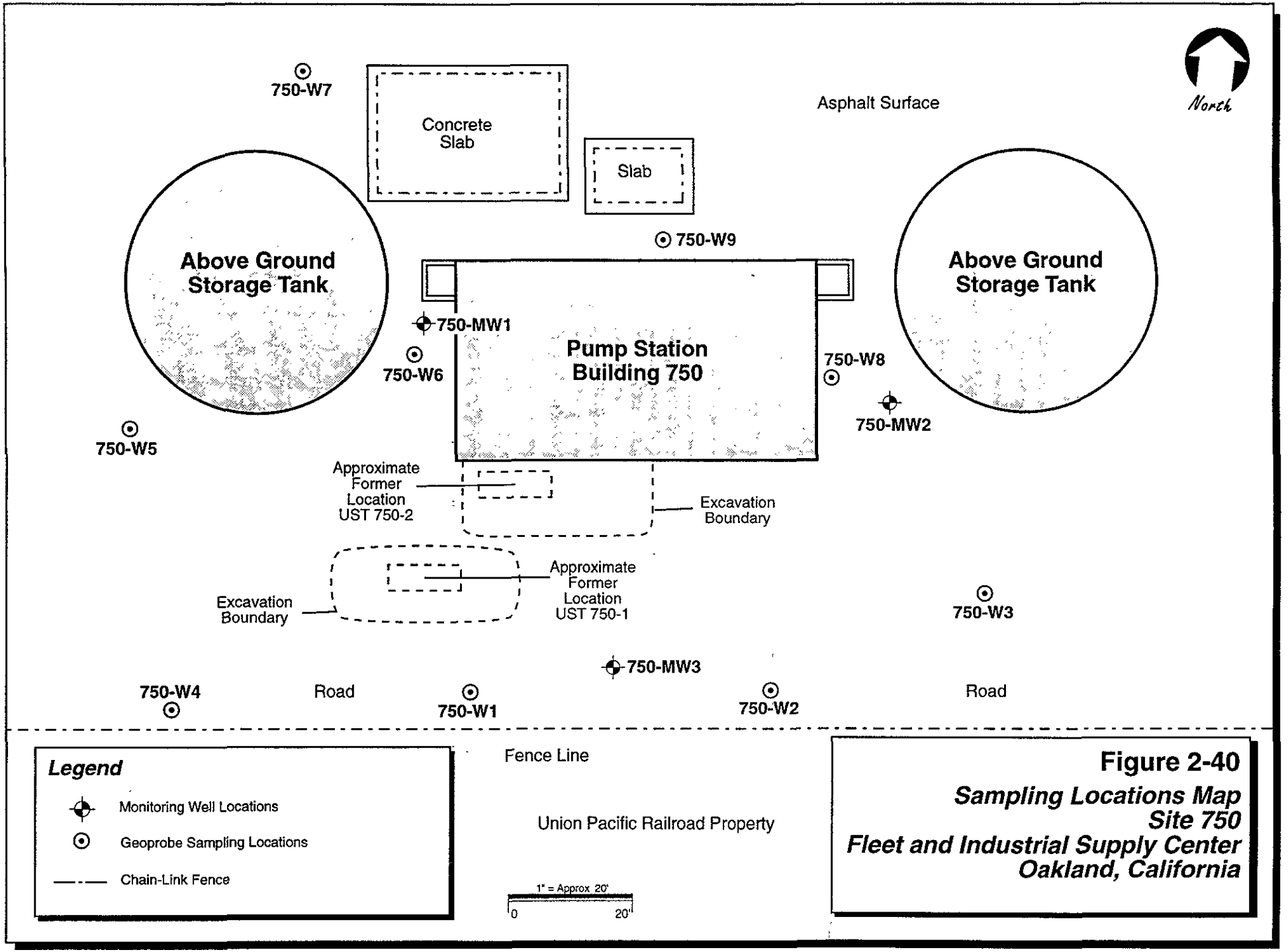


Figure 2-40

Sampling Locations Map
Site 750
Fleet and Industrial Supply Center
Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o49.711

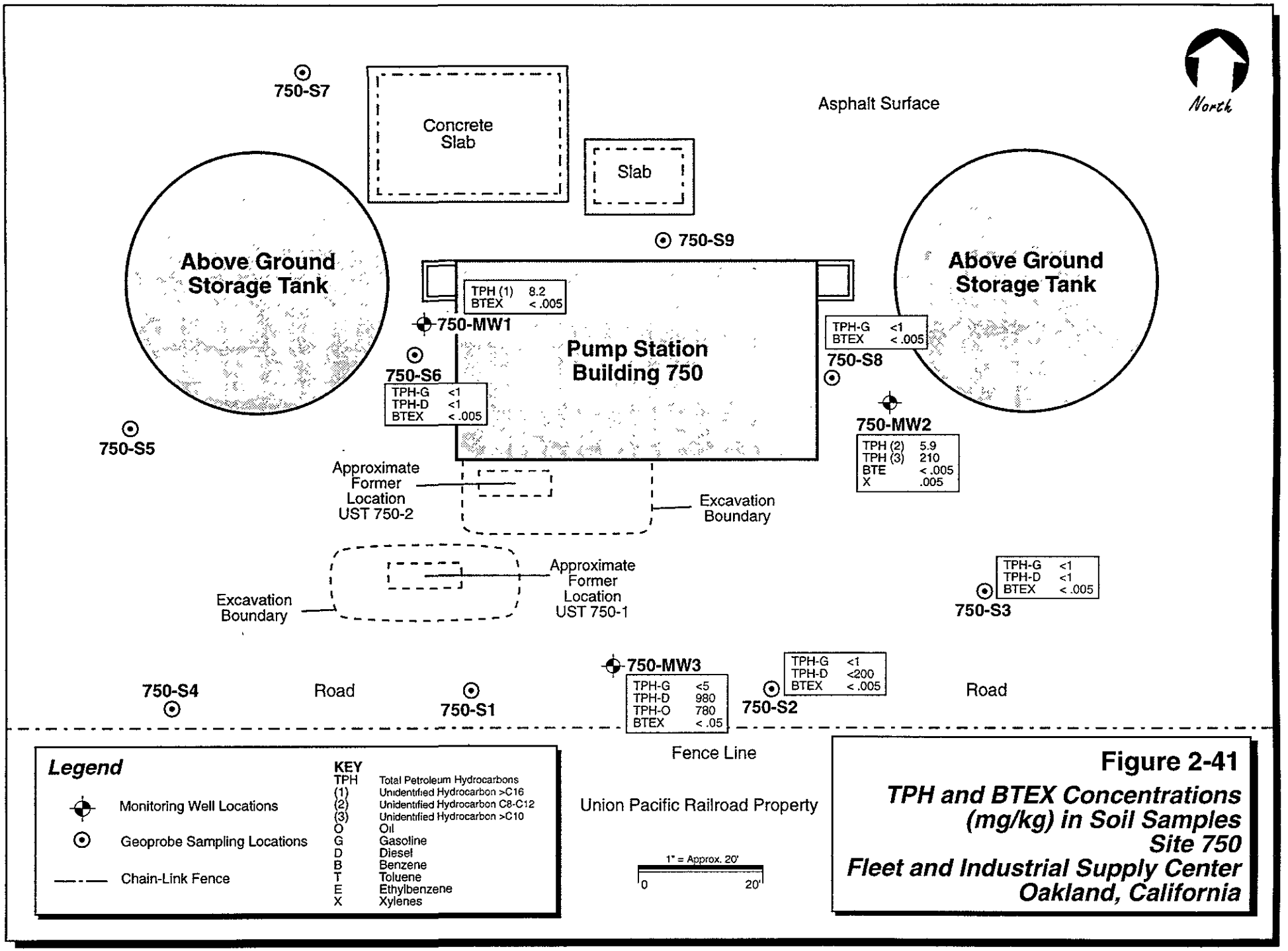


Figure 2-41

TPH and BTEX Concentrations (mg/kg) in Soil Samples Site 750 Fleet and Industrial Supply Center Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o48.711

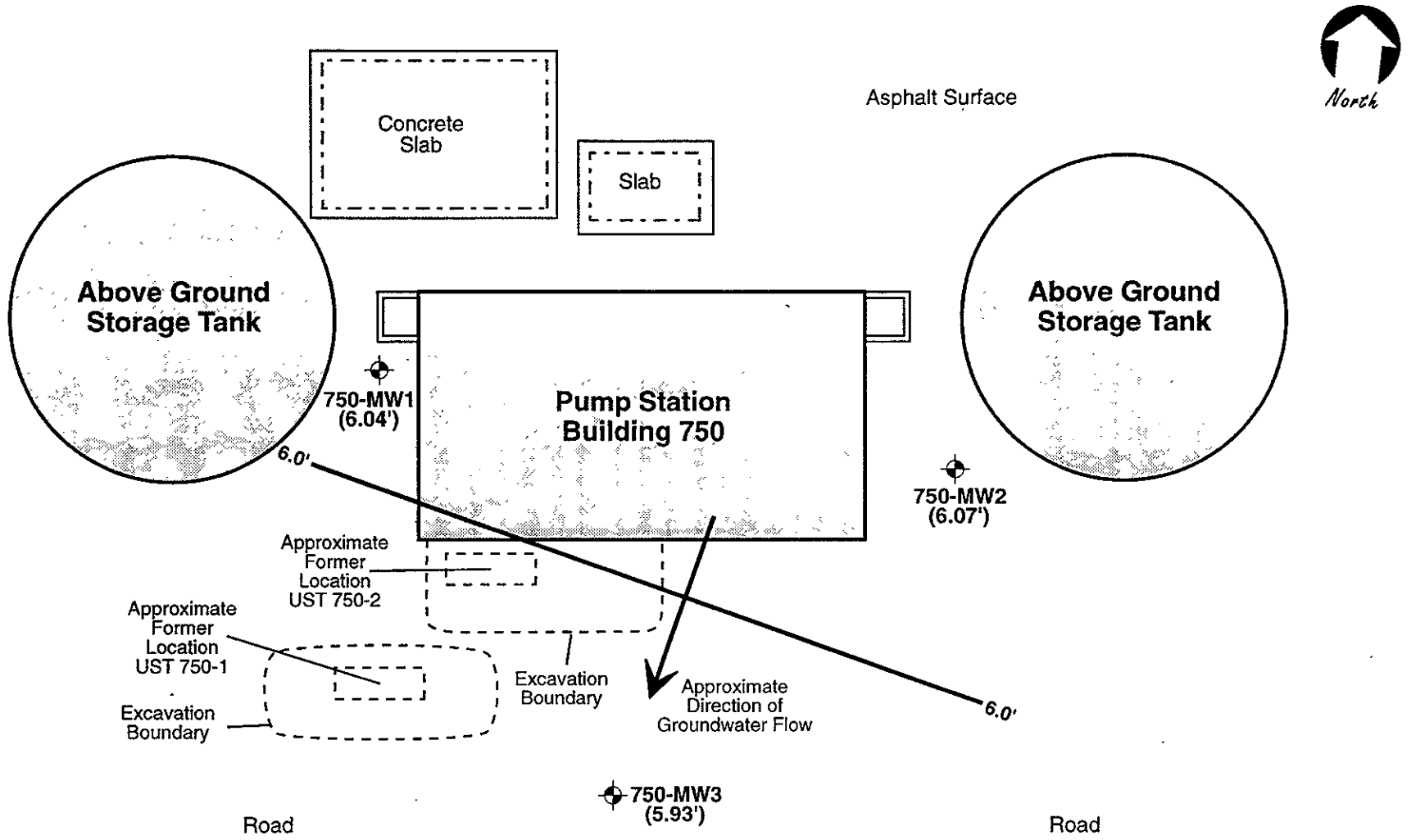


Figure 2-42

Groundwater Elevations Map
Site 750
Fleet and Industrial Supply Center
Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o47.711

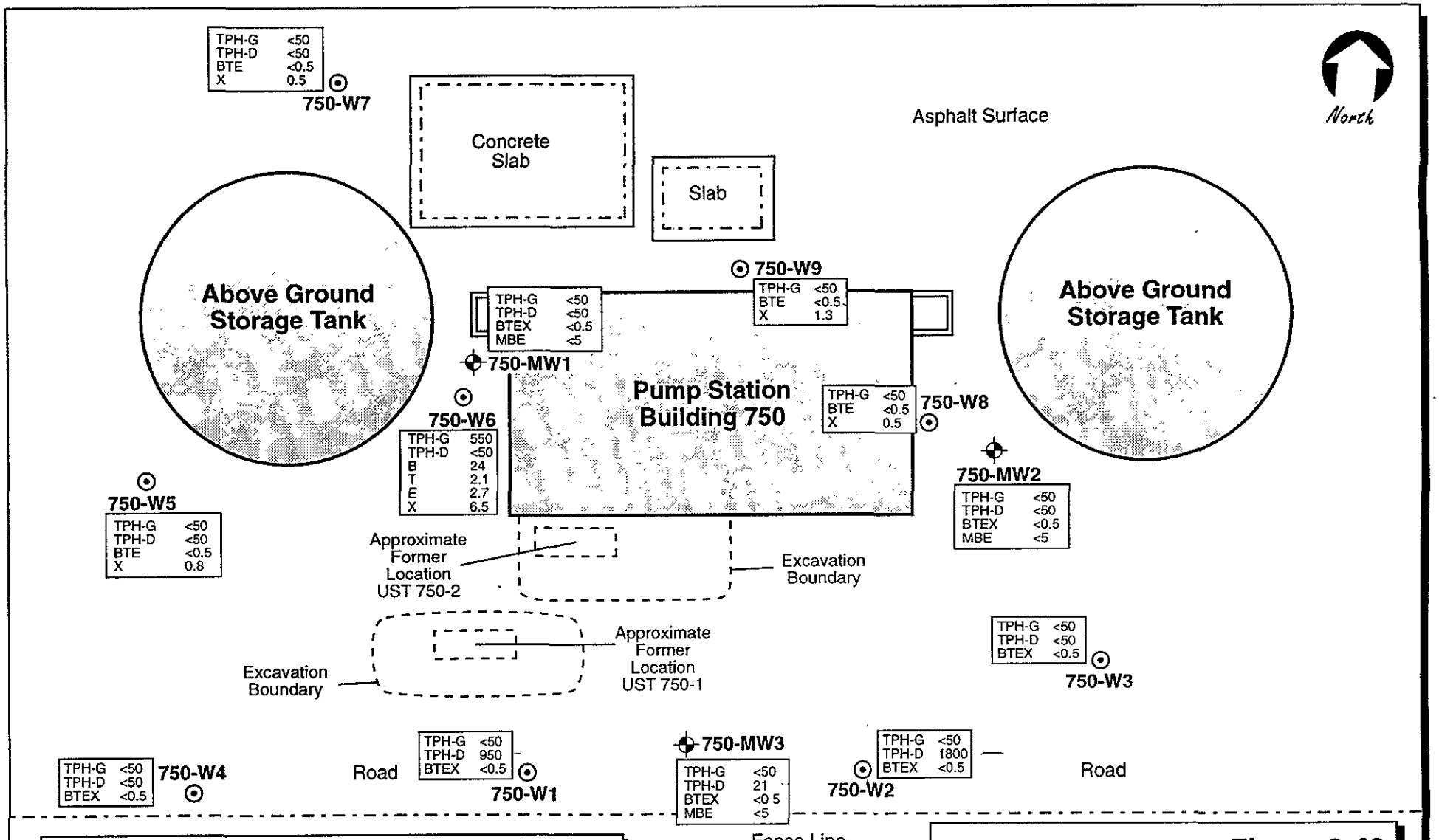


Figure 2-43

TPH and BTEX Concentrations (ug/L) in Groundwater Site 750 Fleet and Industrial Supply Center Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o46.711

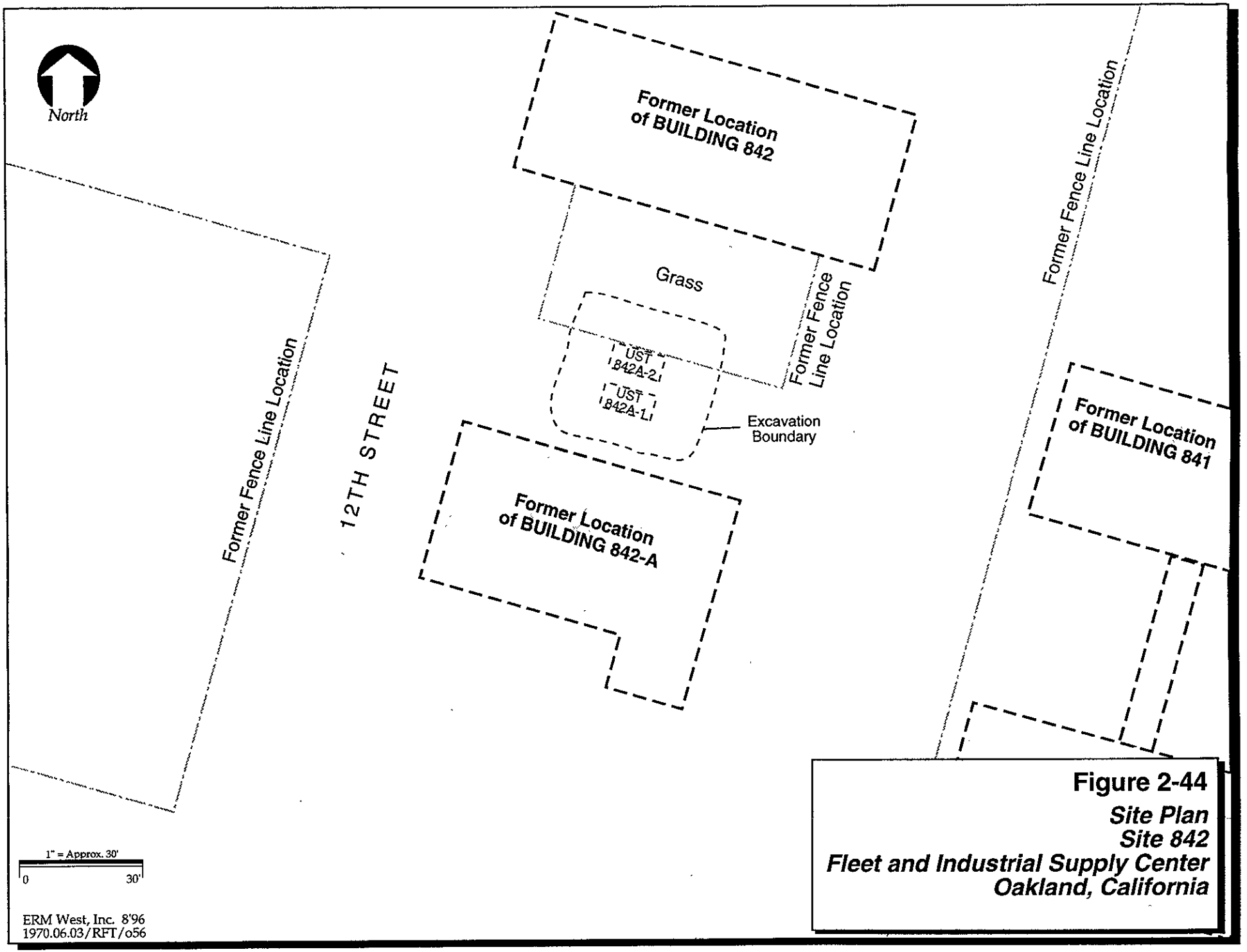


Figure 2-44
Site Plan
Site 842
Fleet and Industrial Supply Center
Oakland, California

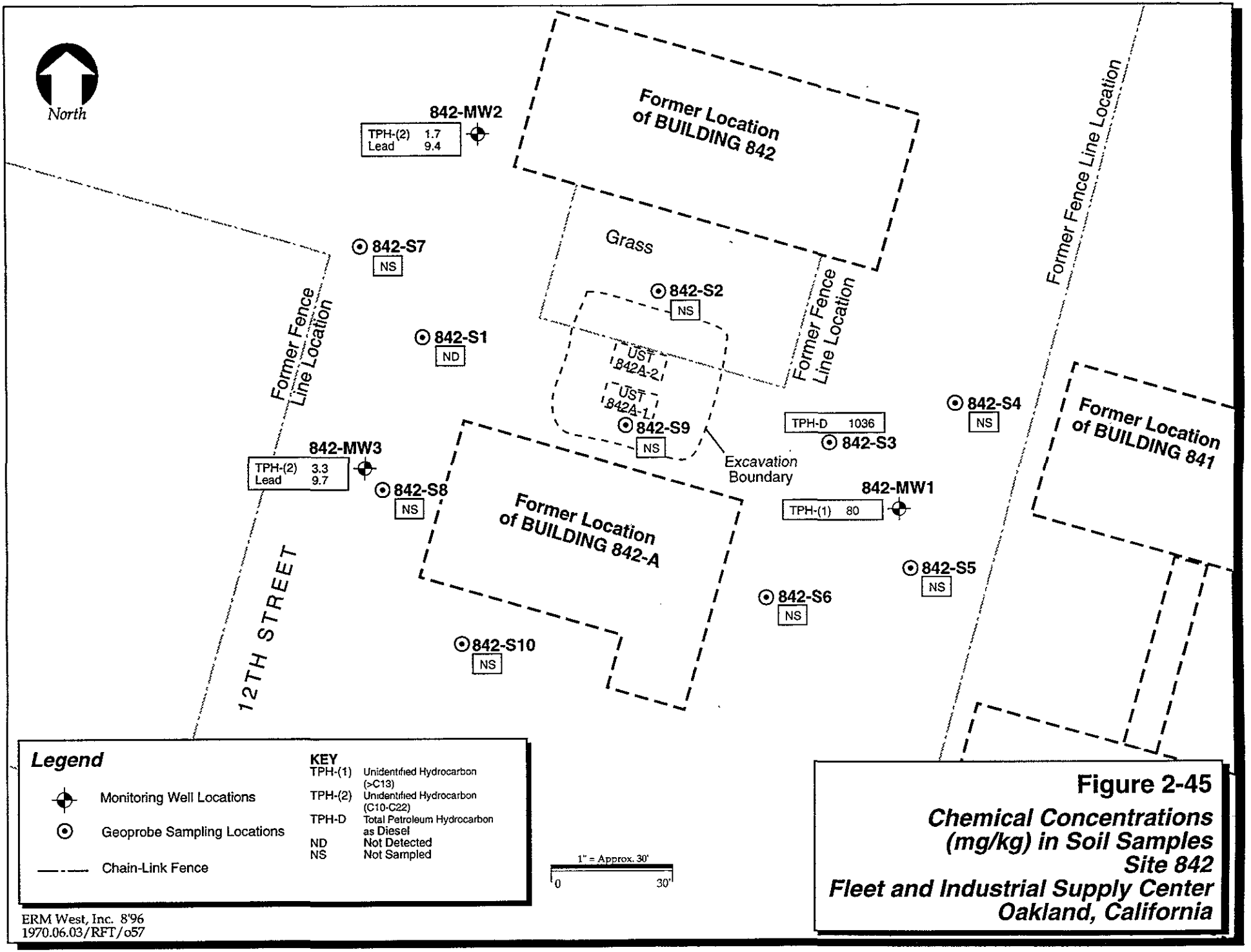


Figure 2-45

Chemical Concentrations (mg/kg) in Soil Samples
Site 842
Fleet and Industrial Supply Center
Oakland, California

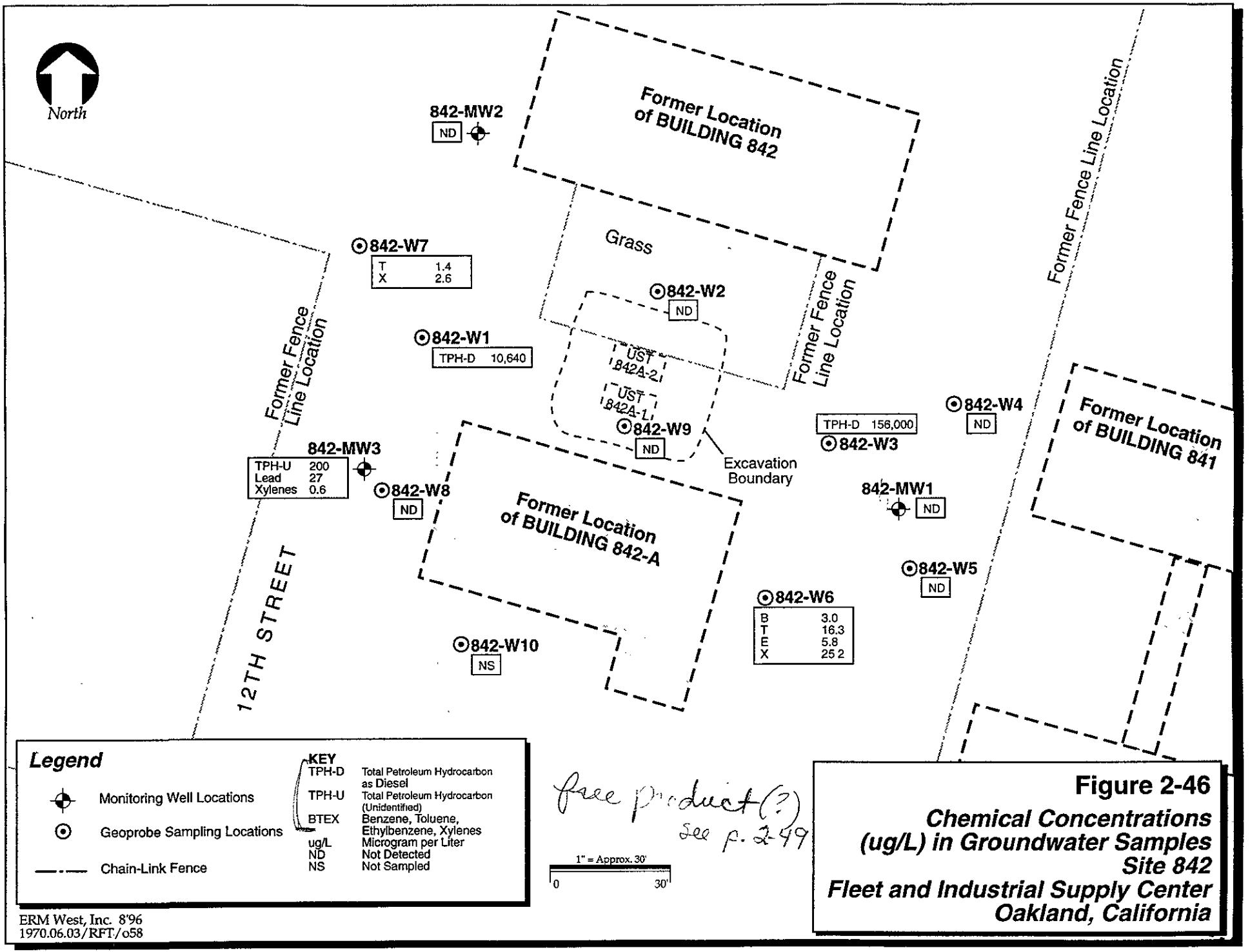


Figure 2-46

Chemical Concentrations (ug/L) in Groundwater Samples Site 842 Fleet and Industrial Supply Center Oakland, California

ERM West, Inc. 8'96
1970.06.03/RFT/o58

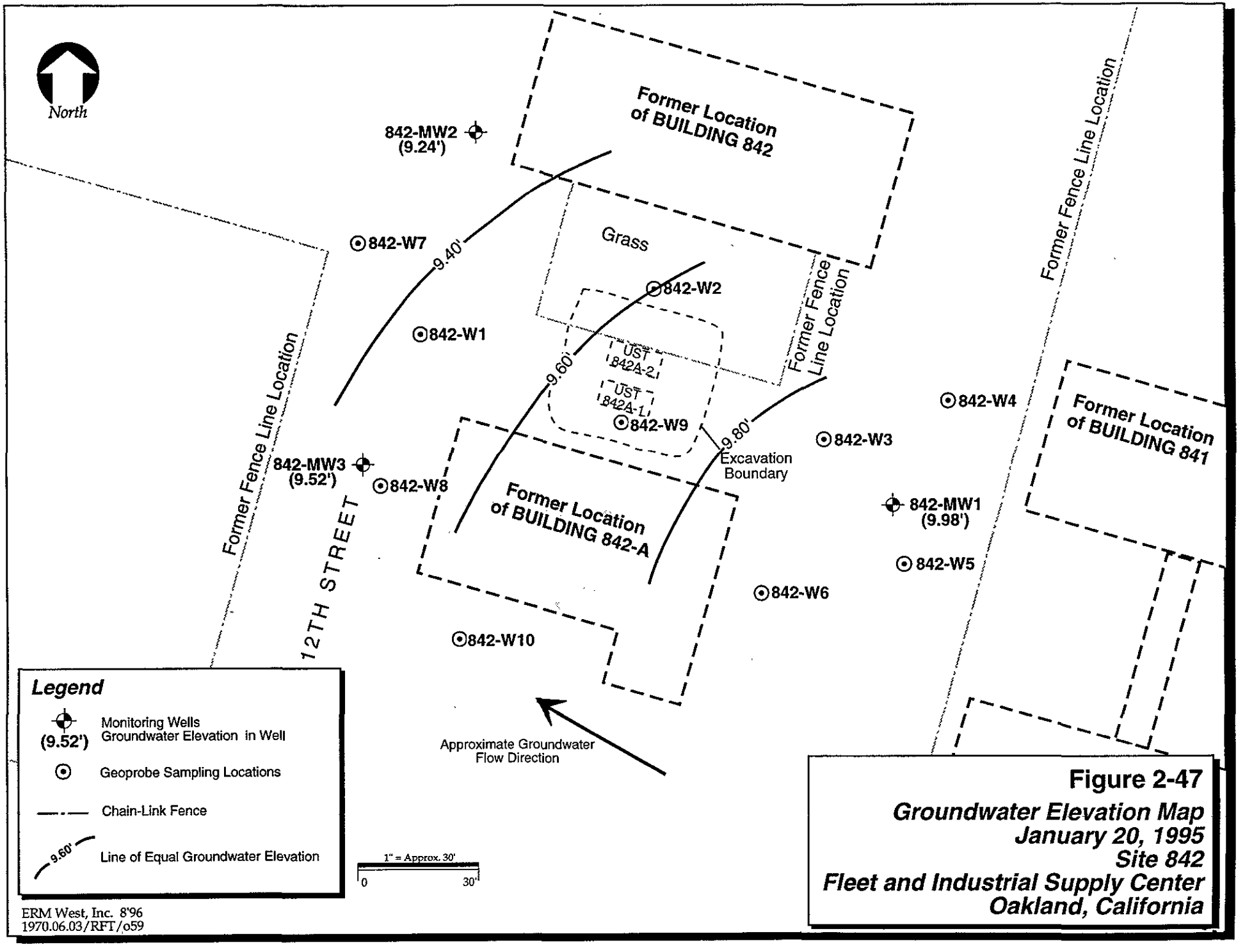


Figure 2-47

Groundwater Elevation Map
January 20, 1995
Site 842
Fleet and Industrial Supply Center
Oakland, California

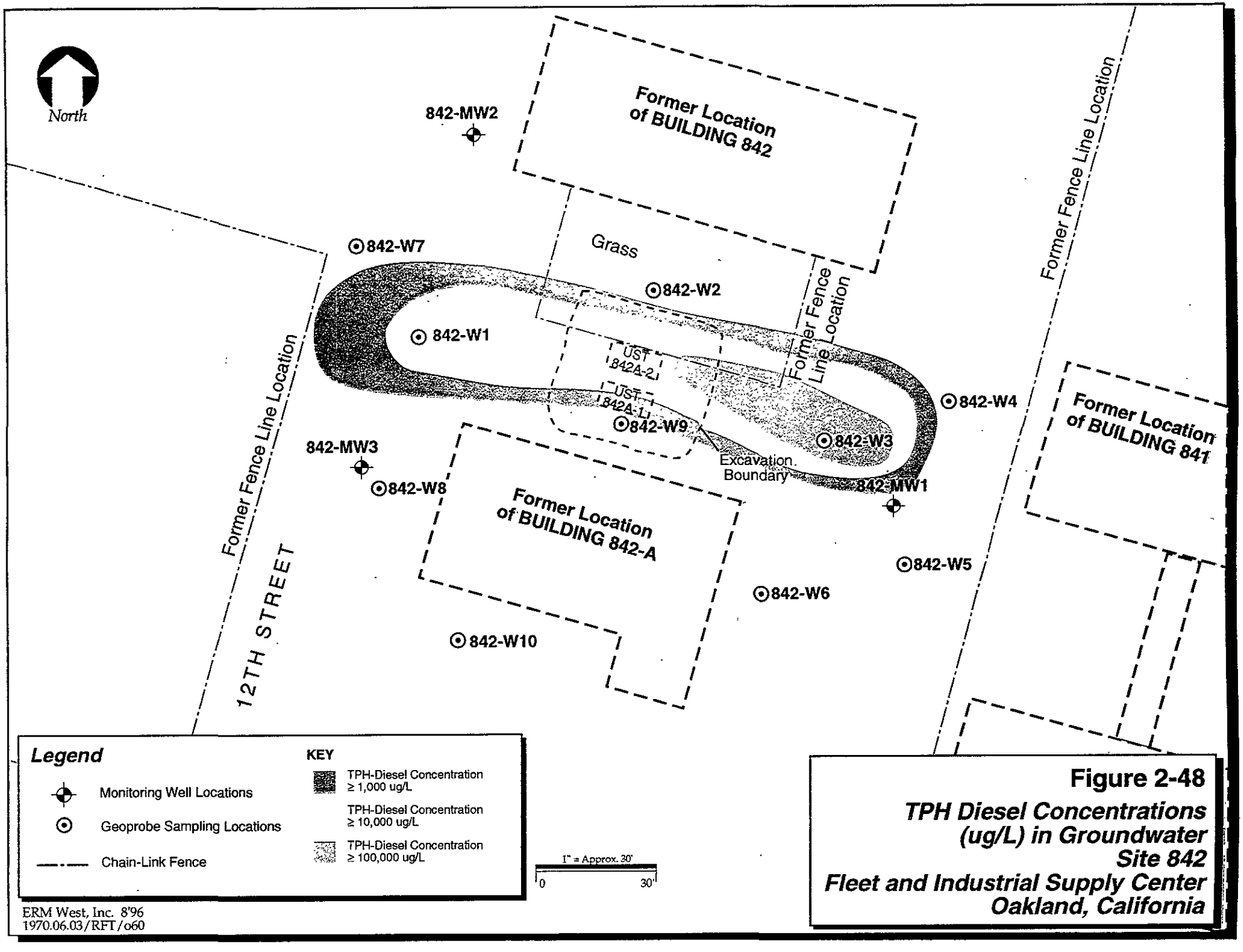


Figure 2-48

TPH Diesel Concentrations (ug/L) in Groundwater
Site 842
Fleet and Industrial Supply Center
Oakland, California

ERM West, Inc. 8'96
1970.06.03/RFT/o60

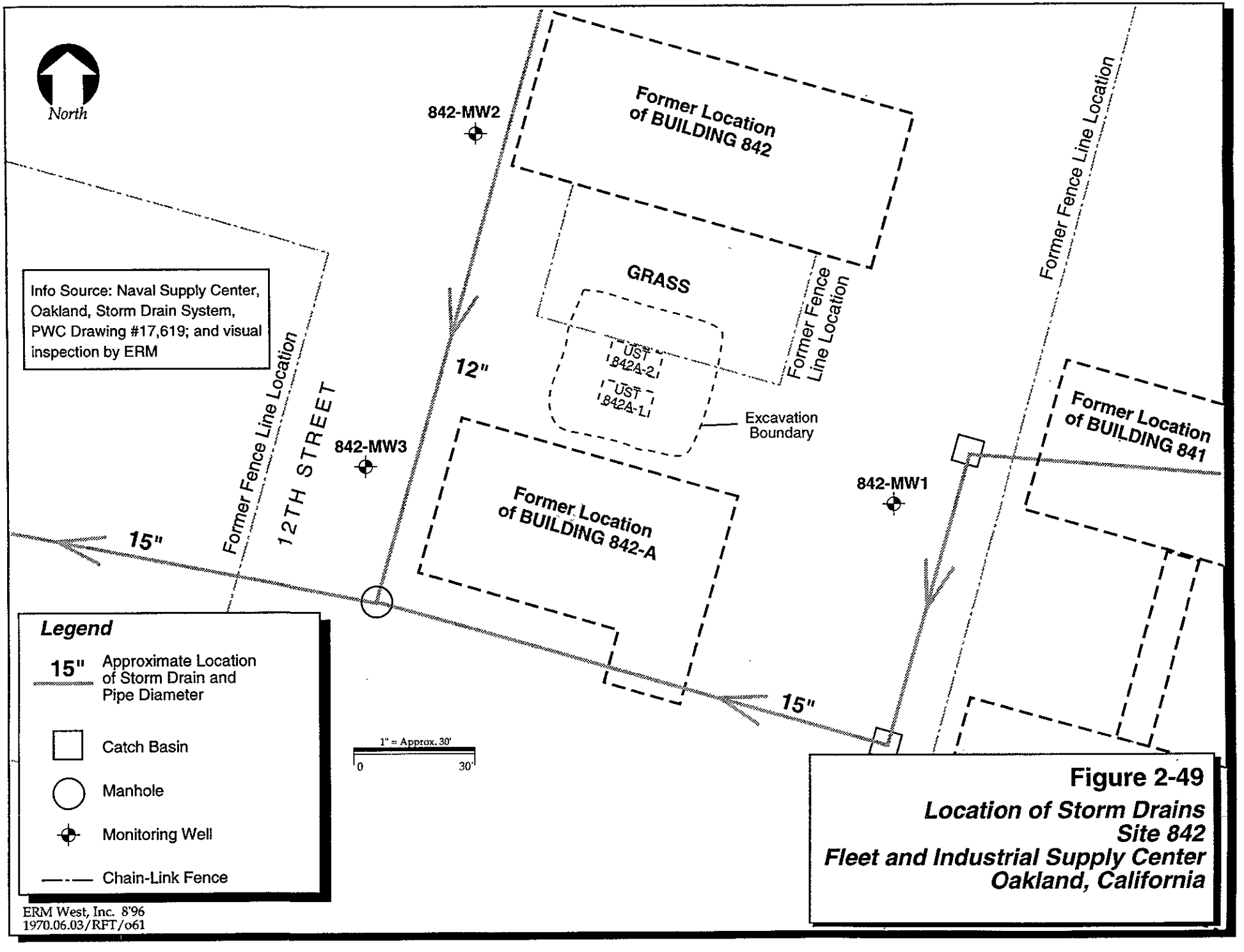
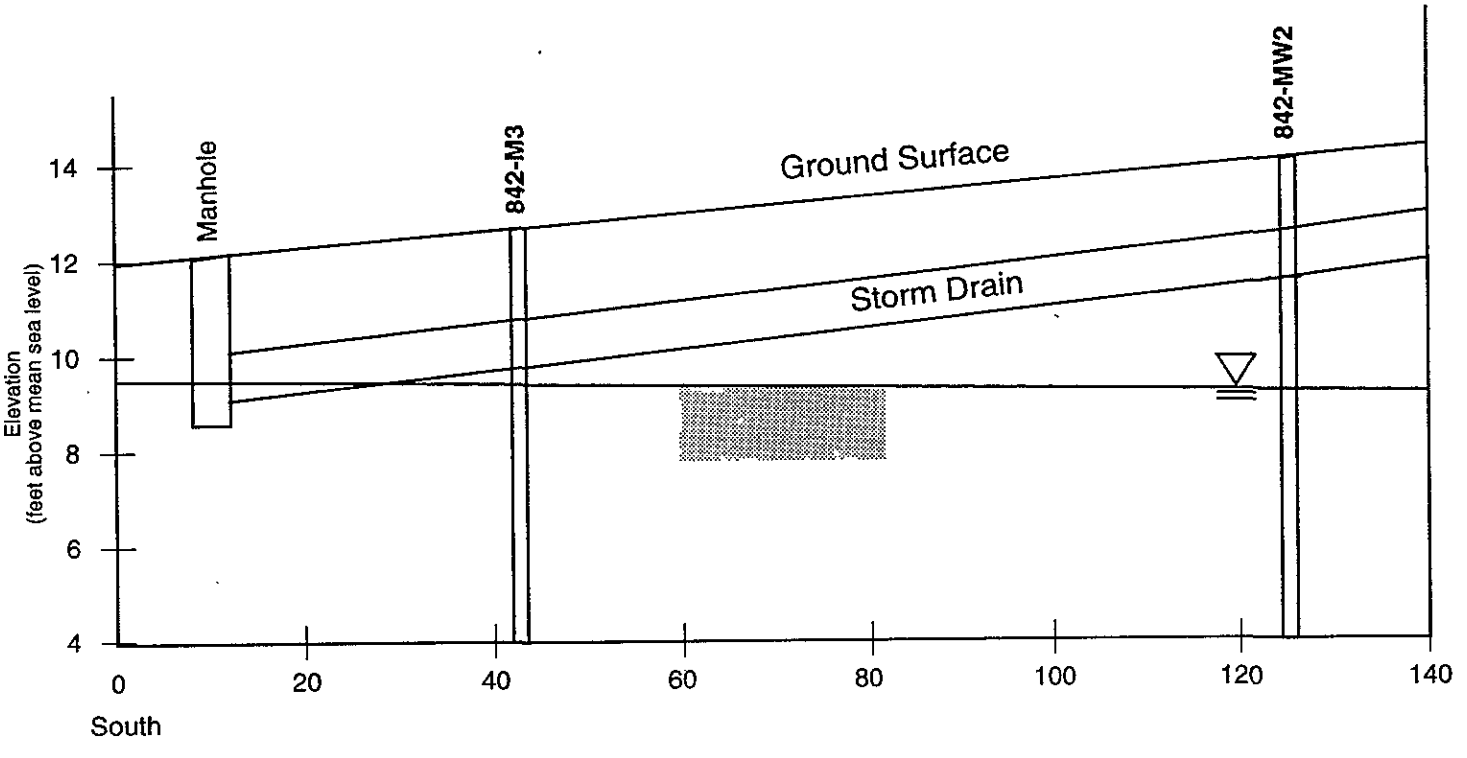


Figure 2-49
Location of Storm Drains
Site 842
Fleet and Industrial Supply Center
Oakland, California

ERM West, Inc. 8'96
1970.06.03/RFT/o61



Legend

Potentiometric Water Level (Jan 20, 1995)

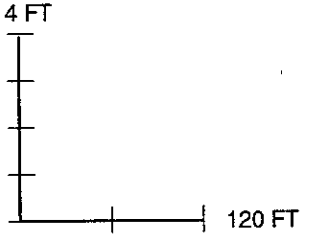
Estimated Lateral Extent of Benzene Plume

NOTES

1) Ground surface elevation and manhole elevation based on top of casing elevations for monitoring well 842-MW2 and 842-MW3

2) Depth of base of storm drain measured at manhole.

3) Assumed a minimum 2% slope to estimate depth of remainder of storm drain.



ERM-West, Inc. 8'96
1970.06.03/RFT/o39.101

Figure 2-50

Cross Section of Storm Sewer Site 842
Fleet Industrial Supply Center
Oakland, California

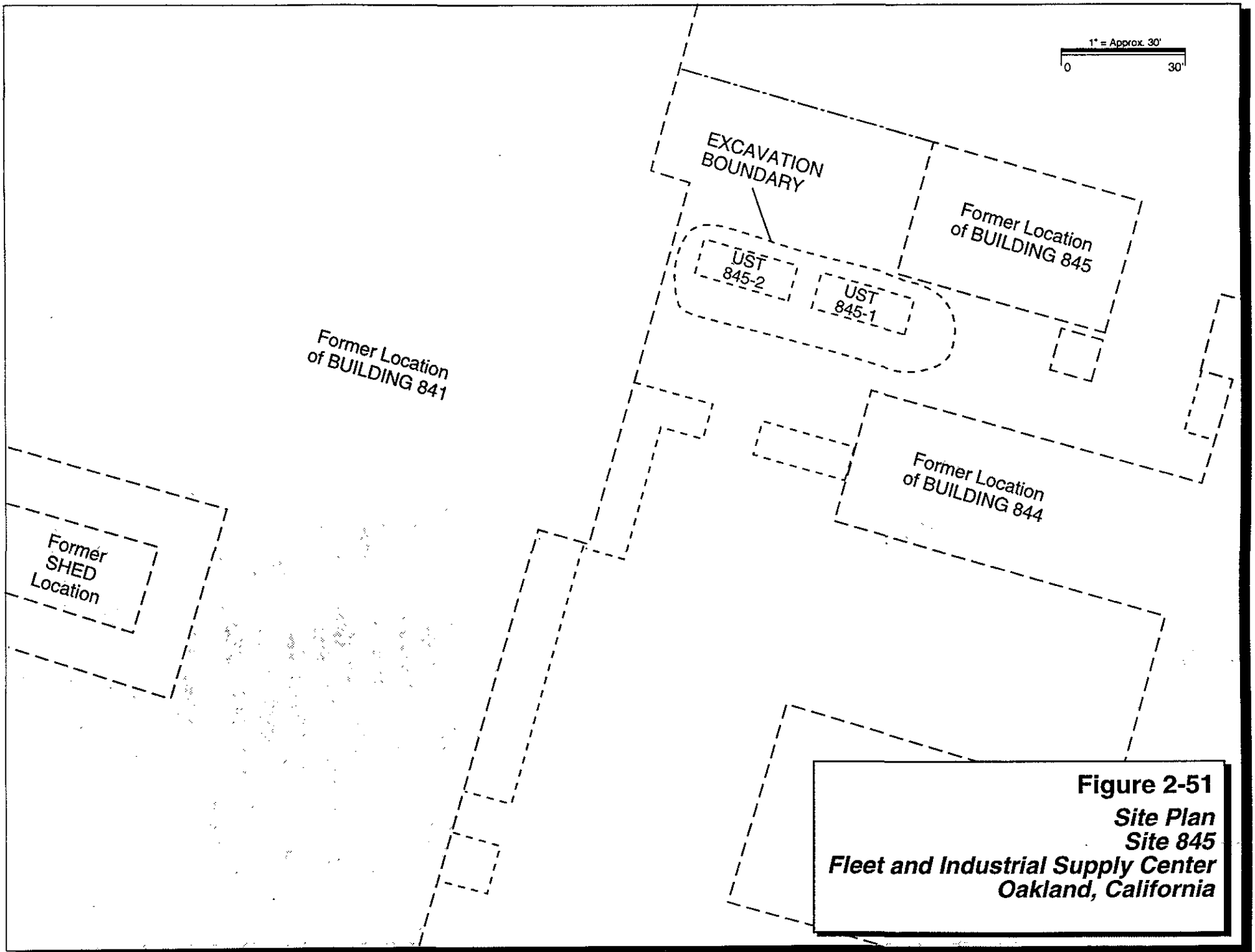


Figure 2-51
Site Plan
Site 845
Fleet and Industrial Supply Center
Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o50

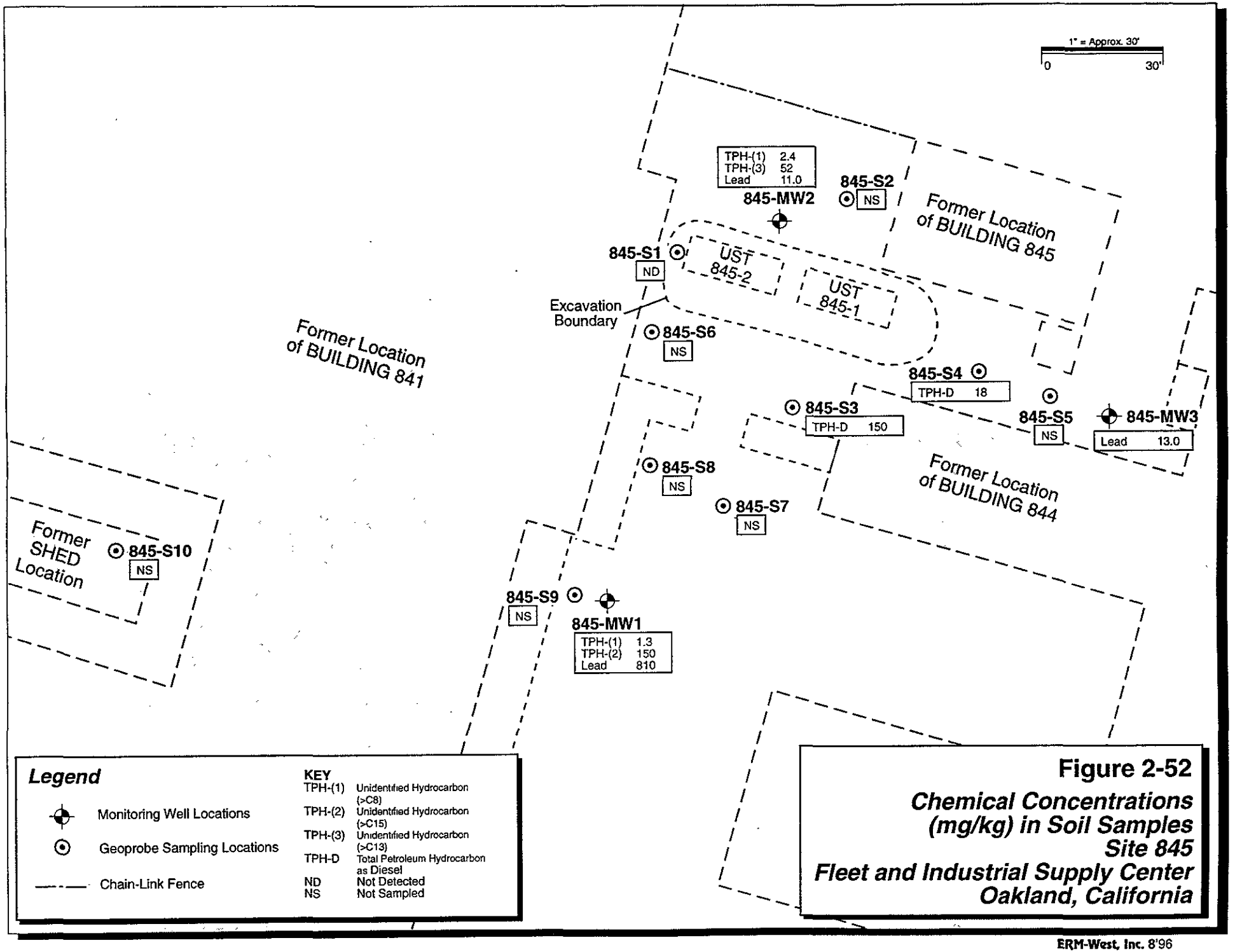


Figure 2-52

Chemical Concentrations (mg/kg) in Soil Samples
Site 845
Fleet and Industrial Supply Center
Oakland, California

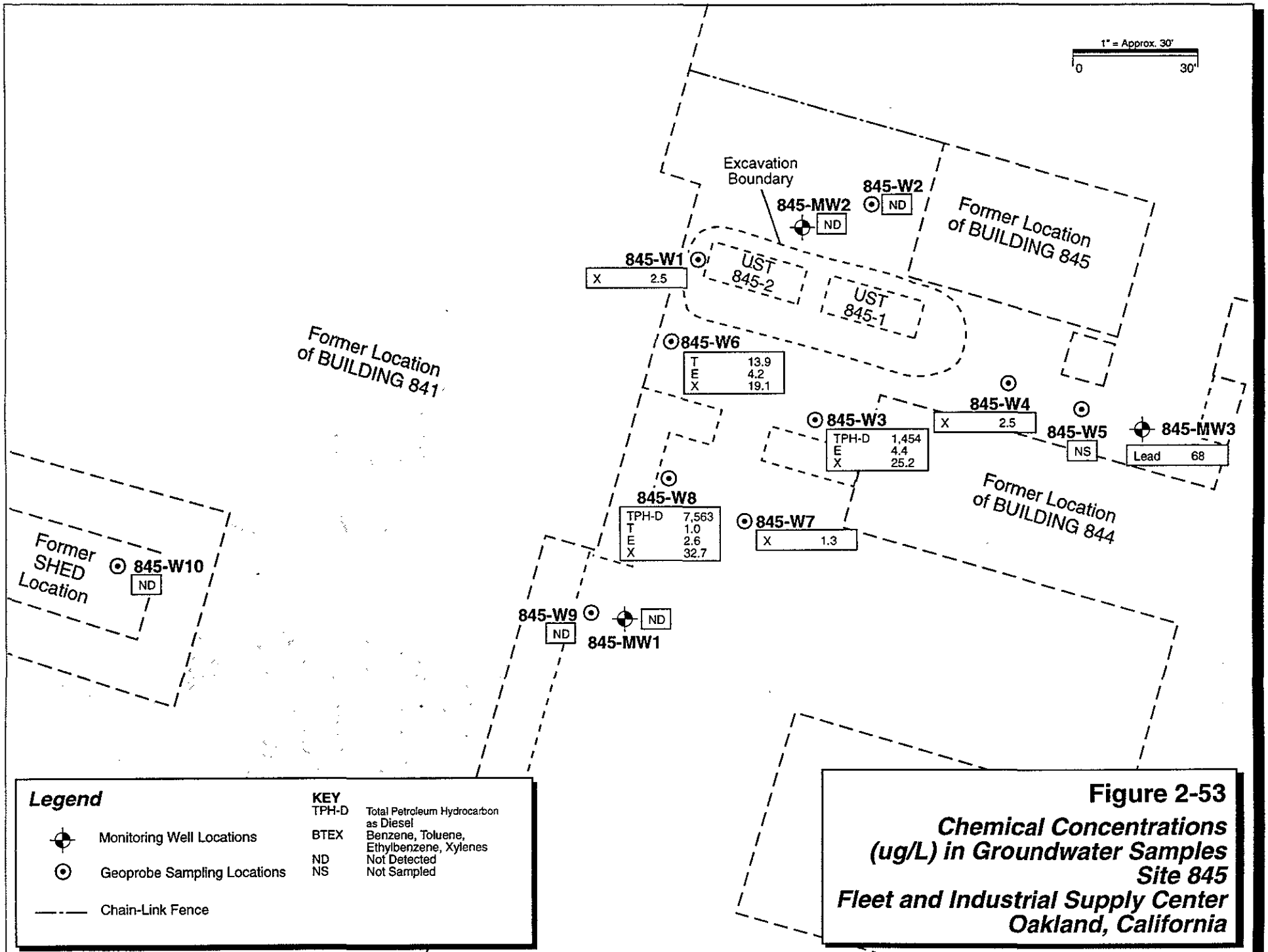


Figure 2-53

Chemical Concentrations (ug/L) in Groundwater Samples Site 845 Fleet and Industrial Supply Center Oakland, California

ERM-West, Inc. 8'96
1970.06.03/RFT/o52

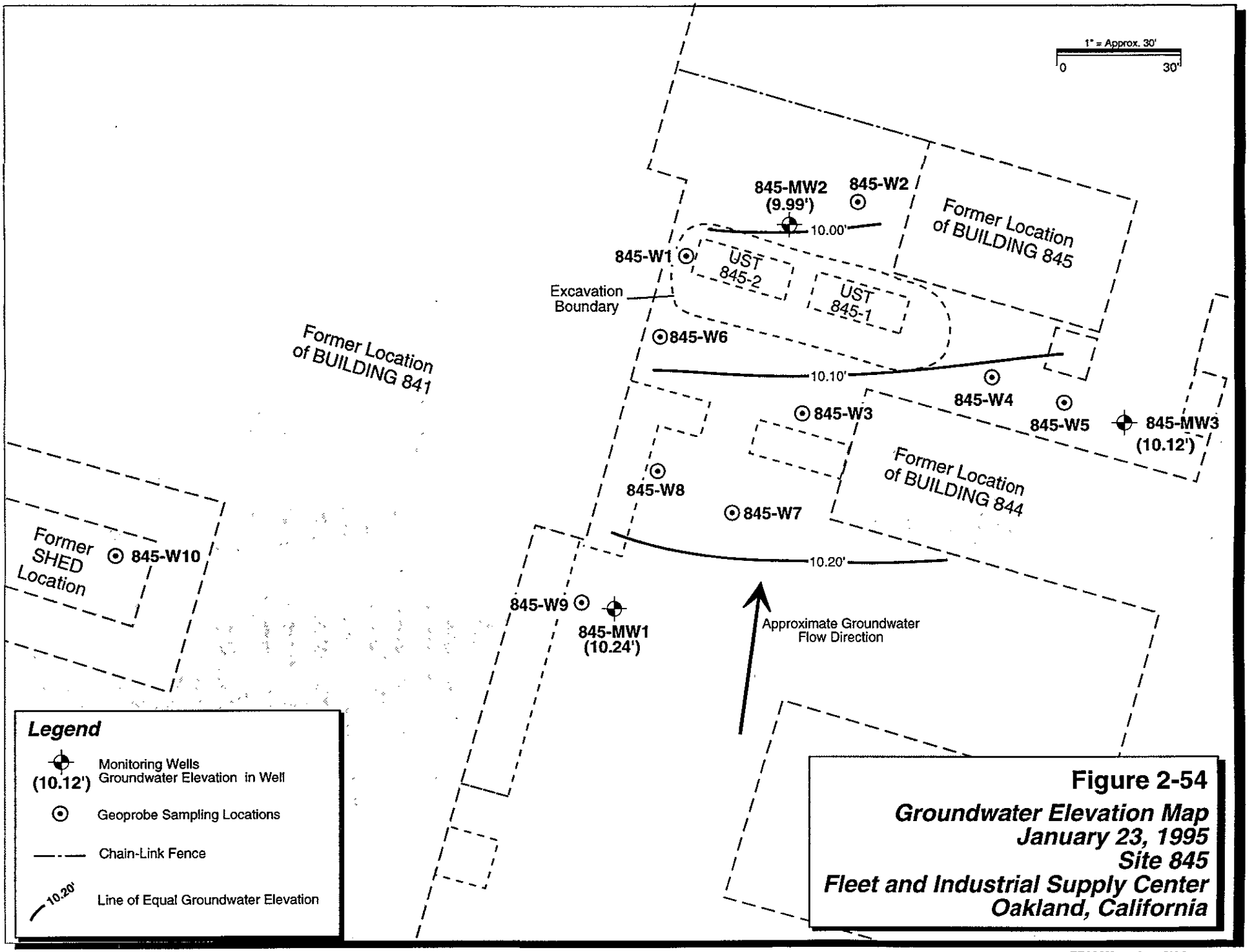


Figure 2-54

Groundwater Elevation Map
January 23, 1995
Site 845
Fleet and Industrial Supply Center
Oakland, California

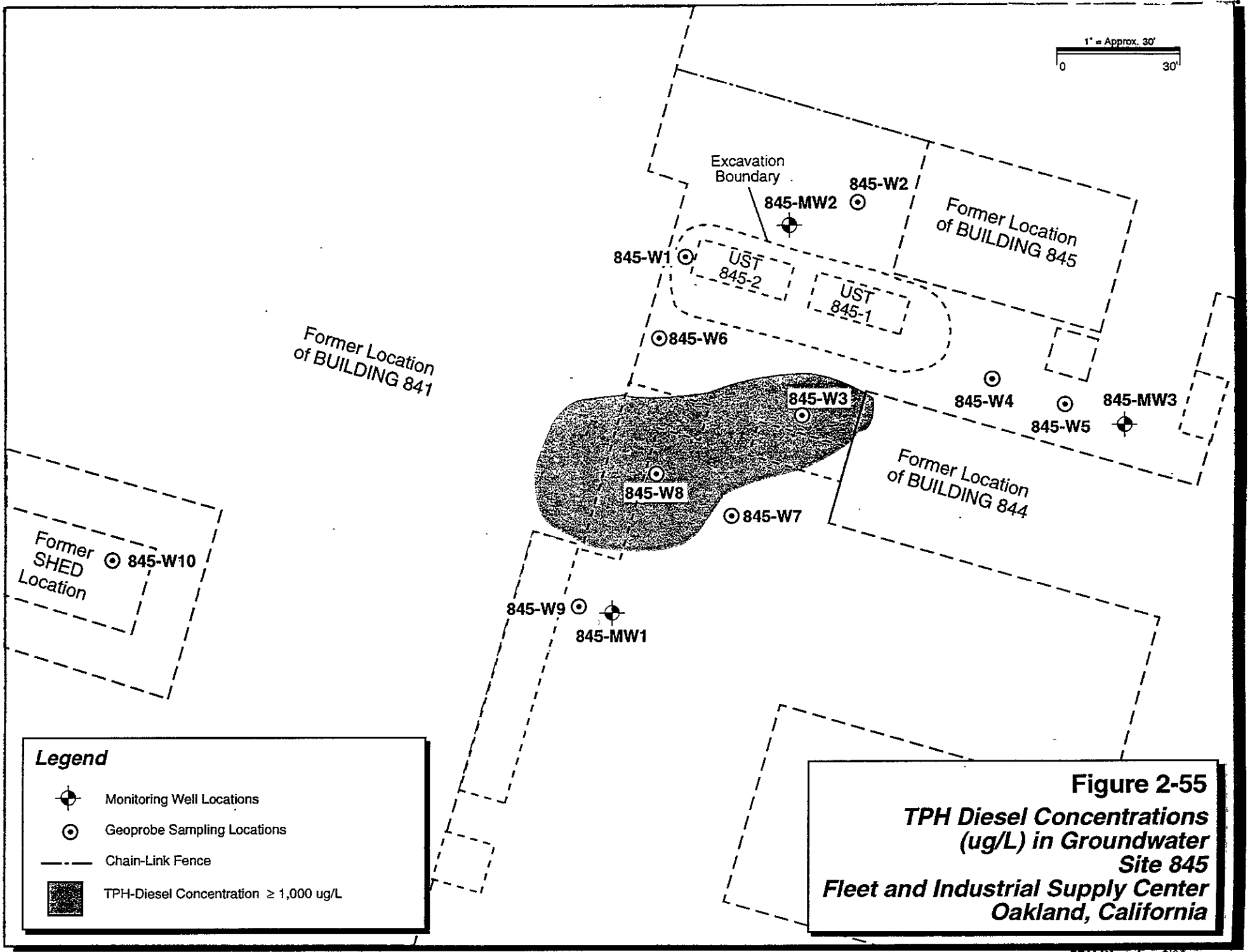


Figure 2-55

TPH Diesel Concentrations (ug/L) in Groundwater
Site 845
Fleet and Industrial Supply Center
Oakland, California

ERM-West, Inc. 8/96
1970.06.03/RFT/o54

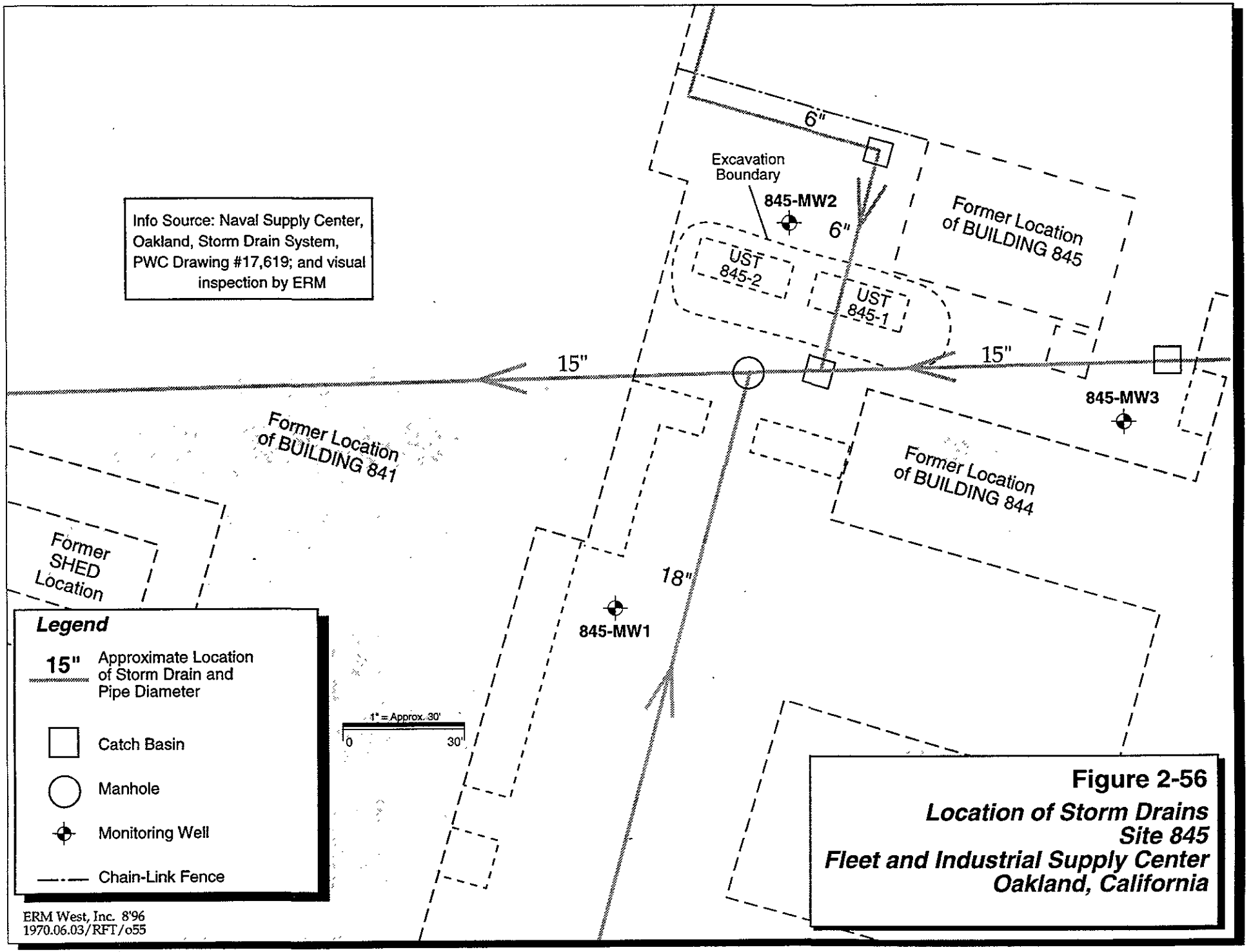


Figure 2-56

Location of Storm Drains
Site 845
Fleet and Industrial Supply Center
Oakland, California

into the harbor via storm drains or utilities is, therefore, not a concern at this site.

- Based on the numeric Tier 1 RBSLs established in RBCA (Table 3-2), the volatilization of hydrocarbons in the groundwater at Site 511D does not appear to present an inhalation risk to human health or the environment.

The site presents no significant risk to human health or the environment.

- The hydrocarbon-affected groundwater at Site 511D is unlikely to impact water wells, deeper drinking water aquifers, surface water, or other sensitive receptors and, therefore, presents no significant risk to human health or the environment.

Recommendations

Based on the conclusions presented above, Site 511D does not fulfill all the criteria for a low-risk groundwater case. To satisfy the criteria and achieve closure of the site, ERM recommends that six additional monitoring wells be installed to assess hydrocarbon concentrations within the plumes and that a groundwater monitoring program be implemented to evaluate migration of the hydrocarbon plumes. Suggested locations for the six groundwater monitoring wells are shown on Figure 4-5. The groundwater monitoring program should, at a minimum, include semi-annual sampling of the wells at the site for two years. If the results for the groundwater monitoring indicate that the plume is not migrating and levels of hydrocarbons are stable or decreasing, closure of the site should be requested.

Site 750

Conclusions

Conclusions based on the results of the soil and groundwater investigations conducted by ERM at UST Site 750, with respect to the criteria for a low-risk groundwater site, are summarized below.

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

- USTs 750-1 and 750-2 and associated piping have been removed.

- No free product was observed in the soil or on the surface of the groundwater after removal of the USTs, and no free product was

observed in the soil or groundwater samples collected during the UST investigation.

- The detection of diesel and gasoline in the soil samples collected from the excavation sidewalls after the removal of UST 750-2 indicates that releases of hydrocarbons resulting from use of the tank have impacted the soil at that location. Because the excavation soil samples were collected at the soil/groundwater interface (the capillary fringe area), it is likely that the hydrocarbons in those samples have already impacted the groundwater. Although the hydrocarbons in the soil could potentially be an ongoing source of contamination to the groundwater, the low hydrocarbon concentrations in the groundwater suggest that the migration of hydrocarbons from the soil into the groundwater is occurring at a slower rate than natural biodegradation.

- Although hydrocarbons were not detected in the Geoprobe soil samples collected at Site 750, unidentified hydrocarbons in the gasoline range at 5.9 mg/kg, diesel up to 0.98 mg/kg, and motor oil at 0.78 mg/kg were detected in the soil samples collected from the three monitoring wells.

- Lead concentrations detected in the soil samples are within the range of naturally occurring levels for this metal and are not a concern for Site 750.

Based on the conclusions presented above, potential sources of hydrocarbons at Site 750 have been removed, and the hydrocarbons detected in the excavation and monitoring well soil samples do not represent an ongoing source of contamination to the groundwater.

The site has been adequately characterized.

- The groundwater measurements taken on August 2, 1996, indicates that the groundwater flow direction on that date was toward the south-southwest. However, groundwater elevation data collected in 1994 by PRC indicates that groundwater flow direction at FISC is highly variable and subject to tidal influence. Additional groundwater monitoring is needed to further assess the groundwater flow direction and hydraulic gradient at the site.

- The low concentrations of TPH and BTEX detected in the groundwater north (upgradient) of the former location of the USTs, and the low concentrations of TPH detected in the groundwater south (downgradient) of the former location of the USTs suggests that hydrocarbons originating from the two USTs have slightly impacted the groundwater. Additional groundwater sampling is necessary, however, to evaluate the potential presence of

hydrocarbons in the groundwater close to the former locations of the USTs.

- The vertical extent of hydrocarbons in the groundwater was not addressed during this investigation. However, it is likely that the vertical migration of hydrocarbons from the former location of the USTs is impeded by the presence of the apparently continuous clay (aquitard) observed beneath the site and that dissolved hydrocarbons may be confined to the sand unit above the clay.

Based on the conclusions presented above, the lateral extent of hydrocarbons in the groundwater at Site 750 has not been completely characterized.

The dissolved hydrocarbon plume is not migrating.

- The results of the groundwater sampling suggests that the groundwater at Site 750 has only been slightly impacted by hydrocarbons. The migration of dissolved hydrocarbons in the groundwater, however, could not be fully evaluated because the potential presence of hydrocarbons in the groundwater close to the former location of the USTs has not been evaluated, and insufficient groundwater monitoring and sampling data exists for the site.

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

- As discussed in Section 3, the shallow and deep groundwater units at FISC are not currently being used as a municipal, domestic, irrigation, or industrial water supply, and it is unlikely that they will be used in the future. The affected groundwater at Site 750 is, therefore, unlikely to impact water wells or deeper drinking water aquifers.

- Site 750 is located approximately 250 feet north of the Oakland Middle Harbor. The detection of only low levels of TPH in the groundwater downgradient of the former location of the USTs suggests that the extent of affected groundwater at the site is probably limited to within 100 feet of the former location of the USTs. It is, therefore, unlikely that the plume will migrate directly into the harbor.

- The storm drain and utility corridor investigation at Site 750 indicates that no storm drains cross the area of hydrocarbon-affected groundwater and no catch basins or manholes exist at the site. The discharge of affected groundwater into the harbor via storm drains or utilities is, therefore, not a concern at this site.

- Based on the numeric Tier 1 RBSLs established in RBCA (Table 3-2), the volatilization of hydrocarbons in the groundwater at Site 750 is unlikely to present an inhalation risk to human health or the environment.

The site presents no significant risk to human health or the environment.

- The hydrocarbon concentrations in soil and groundwater at Site 750 are unlikely to impact water wells, deeper drinking water aquifers, surface water, or other sensitive receptors and therefore does not present a significant risk to human health or the environment.

Recommendations

Based on the conclusions presented above, Site 750 does not fulfill all the criteria for a low-risk groundwater case. To satisfy the criteria and achieve closure of the site, ERM recommends the following actions:

1) Collect up to six additional groundwater samples close to the former locations of the USTs using a Geoprobe to evaluate the potential presence of hydrocarbons in the groundwater in that area. Suggested Geoprobe groundwater sampling locations are shown on Figure 4-6. Should significant TPH concentrations be detected in the Geoprobe groundwater samples, it is suggested that an additional groundwater monitoring wells be installed to evaluate attenuation over time.

2) Implement a groundwater monitoring and sampling program to evaluate the stability of the dissolved hydrocarbon plume. The groundwater monitoring program should, at a minimum, include semi-annual sampling of the wells for a period of two years.

If the results of the groundwater monitoring indicate that the plume is not migrating and levels of hydrocarbons are stable or decreasing, closure of the site should be requested.

Site 842

Conclusions

Conclusions based on the results of the soil and groundwater investigations conducted by ERM at UST Site 842, with respect to the criteria for a low-risk groundwater site, are summarized below.

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

- USTs 842A-1 and 842A-2 and associated piping have been removed.

- Because the soil samples from the tank excavation (October 1992) and from the RI field work were collected at the soil and water interface, it appears that TPH-gasoline, TPH-diesel, and BTEX detected in these samples have already impacted groundwater. Based on the field screening process, the relatively thin, unsaturated zone appears to be clean.

- Free product was observed on the groundwater within the excavation after removal of the USTs in 1992, but the thickness of product was not reported. Free product was observed in two screening level groundwater samples (842-W1 and 842-W3) collected east and west of the former location of the USTs, but the thickness of product could not be evaluated using the Geoprobe.

- Lead concentrations in soil samples are below USEPA PRGs for residential land use levels.

Based on the conclusions presented above, the source of hydrocarbons at Site 842 has been removed, however, the free product may constitute an ongoing source of contamination to the groundwater.

The site has been adequately characterized.

- Free floating product and dissolved TPH-diesel concentrations detected in the groundwater at the site indicate that the hydrocarbons originating from the leaky former USTs have impacted groundwater. Preliminary isoconcentration contours have been prepared based on the Geoprobe sample results and one monitoring well sampling event. TPH-diesel isoconcentration contours (Figure 2-48) indicate that the TPH-diesel plume appears to cover an area approximately 30 feet wide and 150 feet long. The area with the highest TPH-diesel concentrations lies adjacent to the location of the former USTs and is estimated to cover an area approximately 12 feet wide by 50 feet long. Figure 2-48 shows that, based on a Geoprobe groundwater sampling, TPH-diesel concentrations above 100,000 µg/L may exist in the plume.

- Benzene was detected at concentrations above the California State MCL in only one groundwater sample (842-W6). Toluene, ethylbenzene, and total xylenes were not detected at concentrations above the state MCLs. Currently, the California State MCLs for benzene, toluene, ethylbenzene, and total xylenes are 1, 150, 700, and 1,750 µg/L, respectively.

- Lead was detected in monitoring well 842-MW3 at a concentration higher than the Federal Action Level of 15 µg/L requiring public notification. However, the Action Level was established for dissolved concentrations in groundwater. Because the groundwater sample was not filtered prior to analysis, the lead concentration reported includes both the dissolved and suspended lead concentrations. The actual dissolved lead concentration is most likely less than the Federal Action Level.

Based on the conclusions presented above, the extent of hydrocarbon concentrations in the groundwater at Site 842 has not been completely characterized.

The dissolved hydrocarbon plume is not migrating.

- Migration of the hydrocarbon plume in groundwater at Site 842 could not be fully evaluated because the plume has not been completely characterized and insufficient groundwater monitoring and sampling exists for the site.

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

- As discussed in Section 3, the shallow and deep groundwater units at FISC are not currently being used as a municipal, domestic, irrigation, or industrial water supply, and it is unlikely that they will be used in the future. Therefore, the affected groundwater at Site 842 will not impact water wells or deeper drinking water aquifers.

- Site 842 is located approximately 400 feet north of the Oakland Middle Harbor. The results of the groundwater investigation indicate that the extent of affected groundwater at the site is probably limited to within 80 feet of the former location of the USTs. It is, therefore, unlikely that the plume will migrate directly into the harbor.

- The storm drain and utility corridor investigation at Site 842 found that a 12-inch storm drain runs north-south through the site and crosses the west end of the estimated boundary of the groundwater plume. The configuration of the plume, however, does not suggest that the storm drain acts as a preferential pathway for migration of the plume (Figure 2-48). A cross-section of the site showing the storm drain, groundwater elevations, and the area of affected groundwater indicates that, even during periods of unusually high water levels, the affected groundwater at Site 842 does not come in contact with the storm drain. The migration of affected groundwater into the storm drain and the harbor is, therefore, not a concern at this site.

- Based on the numeric Tier 1 RBSLs established in RBCA (Table 3-2), the volatilization of hydrocarbons in the groundwater at Site 842 does not present a significant inhalation risk to human health or the environment.

The site presents non significant risk to human health or the environment.

- The hydrocarbon concentrations in the groundwater at Site 842 are unlikely to impact water wells, deeper drinking water aquifers, surface water, or other sensitive receptors and therefore present no significant risk to human health or the environment.

Recommendations

Based on the conclusions presented above, Site 842 does not fulfill all the criteria for a low-risk groundwater case. To satisfy the criteria and achieve closure of the site ERM recommends the following action:

1) Install one additional monitoring well (Figure 4-7) to evaluate the thickness of free product and, if necessary, remove the free product;

2) Collect up to five additional Geoprobe groundwater samples (Figure 4-7) to complete the characterization of hydrocarbon concentrations in the groundwater; and

3) Implement a groundwater monitoring and sampling program to evaluate hydrocarbon concentrations over time and assess migration of the hydrocarbon plume. The groundwater monitoring program should, at a minimum, include semi-annual sampling of the monitoring wells[2] for two years.

If the results of the groundwater monitoring program indicate that the plume is not migrating and hydrocarbon concentrations are stable or decreasing, closure of the site should be requested.

Site 845

Conclusions

Conclusions based on the results of the soil and groundwater investigations conducted by ERM at UST Site 845, with respect to the criteria for a low-risk groundwater site, are summarized below.

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2 The area surrounding Sites 842 and 845 have been leased to the Port-of-Oakland and/or its tenant(s). The Port-of-Oakland and/or its tenant(s) will except full responsibility for any damages to the monitoring wells at these two sites.

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

- USTs 845-1 and 845-2 and associated piping have been removed.

- Because the soil samples from the tank excavation (October 1992) and from the RI field work were collected at the soil and groundwater interface, it appears that TPH-gasoline, TPH-diesel, and BTEX detected in these samples have already impacted groundwater. Based on the field screening process, the relatively thin, unsaturated zone appears to be clean.

- Lead concentrations in soil samples collected from 845-MW2 and 845-MW3 are below the residential land use PRG of 400 mg/kg. However, the lead detected in the soil sample from monitoring well 845-MW1 is above the residential PRG, but is lower than the industrial PRG of 1,000 mg/kg.

- An unspecified thickness of free product was observed on the surface of the groundwater within the excavation after removal of the USTs in 1992. Free product was not observed in the screening level or monitoring well groundwater samples collected during the UST investigation in 1994. The results of the UST investigation suggests that the free product observed in the excavations have dissolved in the groundwater.

Based on the conclusions presented above, the source of hydrocarbons at Site 845 has been removed and no potential ongoing sources of hydrocarbons to the groundwater exist at the site.

The site has been adequately characterized.

- Preliminary isoconcentration contours have been prepared based on the Geoprobe sample results and one monitoring well sampling event. TPH-diesel isoconcentration contours (Figure 2-55) indicate that a plume of dissolved diesel, approximately 25 feet wide by 80 feet long, is located 15 to 20 feet south of the former location of the USTs. Diesel concentrations greater than 1,000 µg/L may present in the plume. With respect to the calculated groundwater flow direction on January 23, 1995, the dissolved diesel plume is located upgradient of the former location of the USTs. Although the diesel concentrations in the groundwater may have originated from the leaky former USTs, a comparison of the diesel isoconcentration contours (Figure 2-55) and the location of the storm drains, manhole, and catch basin (Figure 2-56) indicates a possible correlation between the diesel plume and storm drain system. The correlation suggests that the diesel concentrations in the groundwater could potentially have resulted from diesel entering the storm drain. Additional groundwater sampling is needed south

of the former location of the USTs to further evaluate the origin of the dissolved diesel in the groundwater at Site 750.

- Lead was detected in monitoring well 845-MW3 at a concentration higher than the Federal Action Level of 15 µg/L, requiring public notification. However, the Federal Action Level was established for dissolved lead concentrations. Because the groundwater sample was not filtered prior to analysis, the reported lead concentration includes both the dissolved and suspended lead concentrations. The actual dissolved lead concentration is most likely less than the Federal Action Level.

Based on the conclusions presented above, the extent of hydrocarbons in the groundwater at Site 845 has not been completely characterized.

The dissolved hydrocarbon plume is not migrating.

- Migration of the dissolved hydrocarbon plume at Site 845 could not be evaluated because insufficient groundwater monitoring and sampling data exists for the site.

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

- As discussed in Section 3, the shallow and deep groundwater units at FISC are not currently being used as a municipal, domestic, irrigation, or industrial water supply, and it is unlikely that they will be used in the future. It is, therefore, unlikely that affected groundwater at Site 845 will impact water wells or deeper drinking water aquifers.

- Site 845 is located approximately 400 feet north of the Oakland Middle Harbor. The results of the groundwater sampling indicates that the dissolved diesel plume at Site 845 is limited to within 80 feet of the former location of the USTs. It is therefore unlikely that affected groundwater at the site will migrate directly into the harbor.

- The storm drain and utility corridor investigation at Site 845 identified the presence of a 15-inch storm drain, a 18-inch storm drain, a manhole, and a catch basin within the area of impacted groundwater. A comparison of the elevations for the storm drains and the high groundwater elevations in January 1995 indicated that groundwater is unlikely to come in contact with and enter the storm drains. The results of the investigation indicate that the potential migration of affected groundwater into the storm drain and harbor is not a concern at Site 845. The correlation between the dissolved diesel plume in the groundwater and the storm drain system, however, suggests that surface releases of hydrocarbons may

have potentially impacted the catch basin and storm drain system in the past.

- Based on the numeric Tier 1 RBSLs established in RBCA (Table 3-2), the volatilization of hydrocarbons in groundwater at Site 845 does not present a significant inhalation risk to human health and the environment.

The site presents no significant risk to human health or the environment.

- The hydrocarbon concentrations in soil and groundwater at Site 845 are unlikely to impact water wells, deeper drinking water aquifers, surface water, or other sensitive receptors and, therefore, present no significant risk to human health or the environment.

Recommendations

Based on the conclusions presented above, Site 845 does not fulfill all the criteria for a low-risk groundwater case. To satisfy the criteria and achieve closure of the site, ERM recommends the following action:

1) Collect two additional Geoprobe groundwater samples between the current defined boundary of the plume and the former location of the USTs (Figure 4-8) to evaluate the origin of the plume;

2) Install one additional groundwater monitoring well in the central portion of the plume (Figure 4-8) to evaluate hydrocarbon concentrations over time; and

3) Implement a groundwater monitoring and sampling program to evaluate hydrocarbon concentrations within the plume and monitor migration of the plume. The groundwater monitoring program should, at a minimum, include semi-annual sampling of all monitoring wells[3] at the site for a period of two years.

If the results of the groundwater monitoring indicate that the plume is not migrating and that hydrocarbon concentrations are stable or decreasing, closure of the site should be requested.

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3 Ibid.

SECTION 3

CRITERIA FOR LOW-RISK FUEL SITES

In October 1995, Lawrence Livermore National Laboratory (LLNL) issued its "Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks". The report concluded that for sites which pose a low-risk to human health and the environment, source removal and natural attenuation may adequately remediate the contamination. Based on the LLNL's recommendation report, the San Francisco Bay RWQCB issued an Interim Guidance Technical Memorandum on January 6, 1996 which outlines the criteria for determining if a UST site may be classified as a low risk soil or groundwater case. The Technical Memorandum and its impact on the UST sites at naval facilities was discussed at a meeting attended by ERM, EFA-West, the Department of Toxic Substances Control (DTSC), and the RWQCB on March 22, 1996.

The Interim Guidance Technical Memorandum issued by the San Francisco Bay RWQCB states that a UST site may be considered a low risk soil case only if "little or no groundwater impact currently exists and no contaminants are found at levels above established Maximum Contaminant Levels (MCLs) or other applicable water quality objectives". With the exception of UST Site 332, the extent and/or concentrations of hydrocarbons in the groundwater at the FISC UST sites preclude them from being classified as low risk soil cases. For that reason, and because the vadose zone soil at FISC is relatively thin and rarely impacted by the contents of the former USTs, this report will only address the criteria pertaining to low risk groundwater cases. If the groundwater at a particular site fails to satisfy the criteria for a low risk groundwater case, and remedial actions are required, these actions would most likely address any concerns associated with affected soil.

The Interim Guidance Technical Memorandum established six criteria for determining if a site can be classified as a low-risk groundwater case. The six criteria are listed below, followed by a discussion of the factors and conditions to be considered in determining whether the site satisfies the criteria.

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

The underground storage tanks and associated piping at the ten FISC UST sites have been removed. Free product in the soil or floating on the groundwater, and hydrocarbons in the vadose zone may constitute an ongoing source of contamination to the groundwater. The presence

of free product and the potential for hydrocarbons in the soil to degrade groundwater quality is different at each site and must be evaluated on a site-by-site basis and are discussed in the conclusions for each individual site presented in Section 4.

The site has been adequately characterized.

Because subsurface conditions, the extent, type, and concentrations of hydrocarbons in the soil and groundwater, and the presence or absence of potential exposure pathways and receptors are different at each site, a determination as to whether a UST site has been adequately characterized must be made on a site-by-site basis. The completeness of the characterization at each site is discussed in the conclusions presented in Section 4.

The dissolved hydrocarbon plume is not migrating.

To determine whether a hydrocarbon plume in the groundwater is stable or continues to migrate, the plume should be characterized to the extent possible and sufficient groundwater monitoring and sampling conducted to assess chemical concentrations over time. Since these factors are different for each site, the stability of the plume must be evaluated on a site-by-site basis and will discussed in the conclusions presented for each site in Section 4.

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

Other sensitive receptors include humans, aquatic plants and animals, wildlife, and sensitive habitats such as wetlands, marshes, and mudflats. Since FISC is currently an industrial site, and will likely remain one in the future, the potential impact to wildlife is negligible and no wetlands, marshes, or mudflats are located at FISC. Pathways by which affected groundwater at the FISC UST sites could potentially impact humans and the environment are outlined below.

1) Direct contact with hydrocarbon-affected soil and/or groundwater by humans or burrowing creatures resulting in dermal absorption or ingestion.

   Since the contaminants are confined to the subsurface and the sites are currently covered with asphalt or concrete, and will likely remain covered in the future, direct contact with hydrocarbon impacted soil and groundwater by burrowing creatures is not of concern. Although contaminated soil and groundwater may be encountered by humans during excavation work, the preparation of and compliance with a health and safety plan for all excavation work at the facility would significantly reduce the risk of exposure.

2) Migration of contaminants into groundwater supply wells.

Mr. Richard Hegarty, Facilities and Environmental Engineering Division Head at FISC, indicated that there is no current use of groundwater at the facility and there are no water supply wells on the property. Potable water and water for fire protection is supplied to FISC by the East Bay Municipal Utility District (EBMUD). Future installation of groundwater supply wells on leased portions of the FISC facility have been prohibited as part of an agreement between the Navy and the Port of Oakland. It is very likely that such restrictions will be placed on other areas at FISC, if and when they are leased.

State Water Board Resolution 88-33 defines potential sources of potable water as those having a TDS concentration of 3,000 mg/L or less and a sustainable yield of 200 gallons per day. Groundwater samples collected from each of the ten UST sites were analyzed for TDS. Laboratory analysis of the samples showed TDS concentrations ranging from 230 to 700 mg/L. Shallow groundwater pumping tests performed by PRC on wells at FISC indicated that flow rates of one gallon per minute (1,440 gallons per day) or less were sustained for up to four hours (PRC, 1994). Although these factors would indicate that the shallow groundwater at FISC may be considered a potential source of potable water, there is a high likelihood that sustained pumping would rapidly deplete the limited supply of fresh water and induce the flow of saltwater into the wells. Therefore, it is unlikely that the shallow groundwater at FISC will be utilized in the future as a source of fresh water for municipal, industrial, or irrigation purposes.

Groundwater that may be present in deeper aquifers is not currently being utilized at FISC. Two deep water supply wells were installed at Alameda Naval Air Station, located south of FISC, in 1931 and 1942 by the Army and Pan American Airways. Groundwater extraction from the two wells was permanently halted sometime before 1983 due to elevated concentrations of naturally occurring mercury. Because of the elevated concentrations of mercury associated with the deeper regional aquifer, it is unlikely that the deeper groundwater beneath FISC would provide a safe and reliable source of potable water.

3) Migration of contaminants to surface water.

The closest body of surface water to any of the FISC UST sites is the Oakland Middle Harbor. The Harbor is an extension of San Francisco Bay and is saltwater body. Aquatic plants and animals could potentially be impacted if affected groundwater migrates into or is discharged into the harbor. Potential routes by which affected

groundwater from the FISC UST sites could impact the harbor include: 1) affected groundwater could migrate directly into the harbor; 2) affected groundwater could enter storm drains and be discharged to the harbor; and 3) affected groundwater could migrate along the aggregate bedding material surrounding storm drains and utilities and be discharged to the harbor. Factors to be considered in evaluating the potential for hydrocarbon-affected groundwater to impact the harbor via those routes include: 1) the extent and migration rate of the groundwater plume; 2) the distance of the site from the harbor; and 3) the location and depth of storm drains and utilities with respect to affected groundwater at each site. Since these factors are different for each, the potential for affected groundwater at each site to impact the harbor must be evaluated on a site-by-site basis and will be discussed as part of the conclusions in Section 4.

4) Uptake of contaminants into the food chain.

   Because the compounds of concern do not bioaccumulate, this potential exposure pathway does not present a significant risk to human health or the environment.

5) Migration of VOCs from the groundwater into the vadose zone and subsequent release into the atmosphere and inhalation.

   The inhalation pathway is a concern when volatile hydrocarbon constituents migrate from the soil into enclosed structures or the atmosphere at concentrations considered potentially hazardous to human health. Site conditions which affect the potential migration of volatile hydrocarbon constituents from the groundwater to the atmosphere include the type of petroleum product (i.e., gasoline, diesel), the distribution and concentrations of hydrocarbons in the groundwater, the volatilization of the hydrocarbon compounds, the depth to groundwater, and the lithology and permeability of the soil in the vadose zone. The *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM Standard E 1739-95), referred to as the Risk-Based Corrective Action (RBCA) approach, provides a methodology for performing a tiered risk-based analysis to evaluate the potential risk to human health posed by the inhalation of VOC emissions from hydrocarbon-affected soil and/or groundwater. The RBCA approach provides numeric Tier 1 risk-based screening levels (RBSLs) which were developed using conservative default assumptions for the conditions listed above. A summary of Tier 1 RBSLs for various exposure pathways is included in Table 3-1.

   The principle type of hydrocarbon detected in the groundwater at the FISC UST sites is diesel. Diesel contains polynuclear aromatic hydrocarbons (PAHs), which are considered SVOCs, and contain

relatively low concentrations of VOCs such as BTEX. The EPA method used to analyze for diesel (EPA method 8015-Modified) detects PAHs but does not differentiate them. The RBCA approach provides Tier 1 RBSLs for two PAHs commonly found in diesel, naphthalene and benzo(a)pyrene (Table 3-1). These compounds are two of 12 of the commonly selected chemicals of concern for diesel.[1] Since there are currently no analytical data on specific PAH concentrations at either site, a conservative approach would be to assume that the TPH-diesel is comprised entirely of naphthalene and benzo(a)pyrene, then compare TPH-diesel concentrations to the Tier 1 RBSLs for these compounds. For benzo(a)pyrene, the inhalation pathway is not a concern because, as indicated by the ">S" on Table 3-1, the risk level is not exceeded for all possible dissolved concentrations. Therefore, for this analysis, we will assume that the TPH-diesel is comprised entirely of naphthalene.

The potential risk to human health posed by the inhalation of volatile hydrocarbon emissions from the groundwater at each of the FISC UST sites will be discussed in Section 4.

The site presents no significant risk to human health; and
The site presents no significant risk to the environment

The RBCA approach provides a framework and methodology for performing a tiered risk analysis of petroleum hydrocarbon sites to determine cleanup levels that are protective of human health and environmental resources. The risk to human health and the environment presented by a particular site depends on the type and concentrations of the hydrocarbon constituents and the potential for them to impact water wells, deeper drinking water aquifers, surface water, or other sensitive receptors. Because the type and concentration of hydrocarbon constituents is different at each site, the potential risks must be evaluated on a site by site basis using the RBSLs presented in Table 3-1.

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1 *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM Standard E 1739-95.

TABLE 3-1

Tier 1 Risk-Based Screening Levels*

Exposure Pathway	Units	Benzene†	Toluene	Ethyl-Benzene	Xylenes	Naph-thalene	Benzo(a) pyrene†
Soil vapor intrusion - from soil to buildings							
Residential	mg/kg	0.0016	20.6	427	RES	40.7	RES
Commercial/Industrial	mg/kg	0.0032	54.5	1,100	RES	107	RES
Soil leachate to protect groundwater							
Residential	mg/kg	0.0050	129	575	RES	22.9	0.171
Commercial/Industrial	mg/kg	0.0168	361	1,610	RES	64.2	0.537
Volatilization to outdoor air - Industrial							
From Soil	mg/kg	0.133	RES	RES	RES	RES	RES
From Groundwater	µg/L	5,336	>S	>S	>S	>S	>S
Groundwater vapor intrusion into buildings							
Residential	µg/L	6.9	32,800	77,500	>S	4,740	>S
Commercial/Industrial	µg/L	21.4	85,000	>S	>S	12,300	>S
Groundwater Ingestion							
California State MCLs	µg/L	1	150	700	1,750	N/A	0.2

* Derived from Table X2.1 of ASTM Standard E1739-95

† $1*10^{-6}$ cancer risk assumed; values corrected to reflect California's slope factor.

RES - Risk level not exceeded for pure compound present at any concentration.

>S - Risk level not exceeded for all possible dissolved concentrations.

N/A - Not available

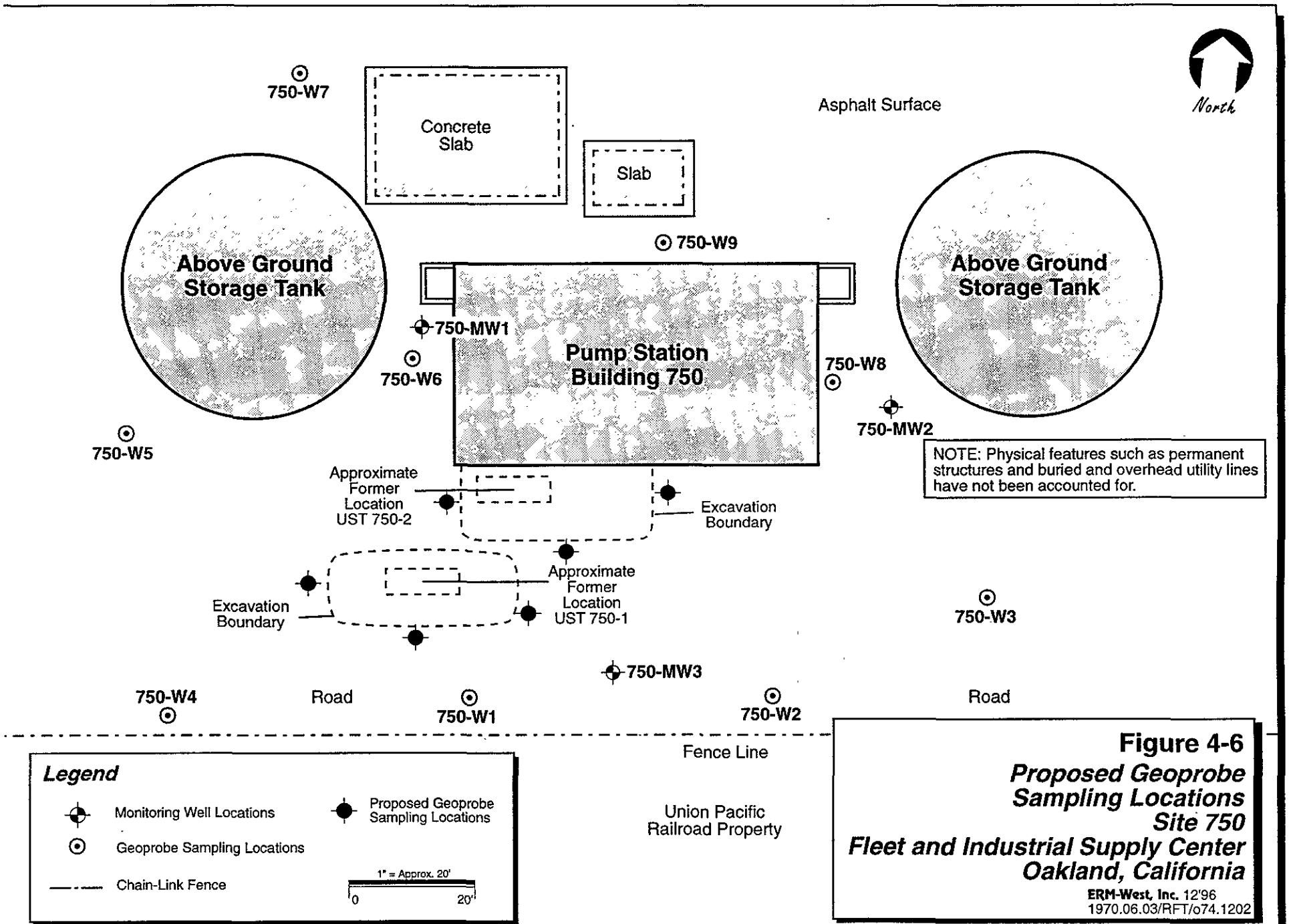
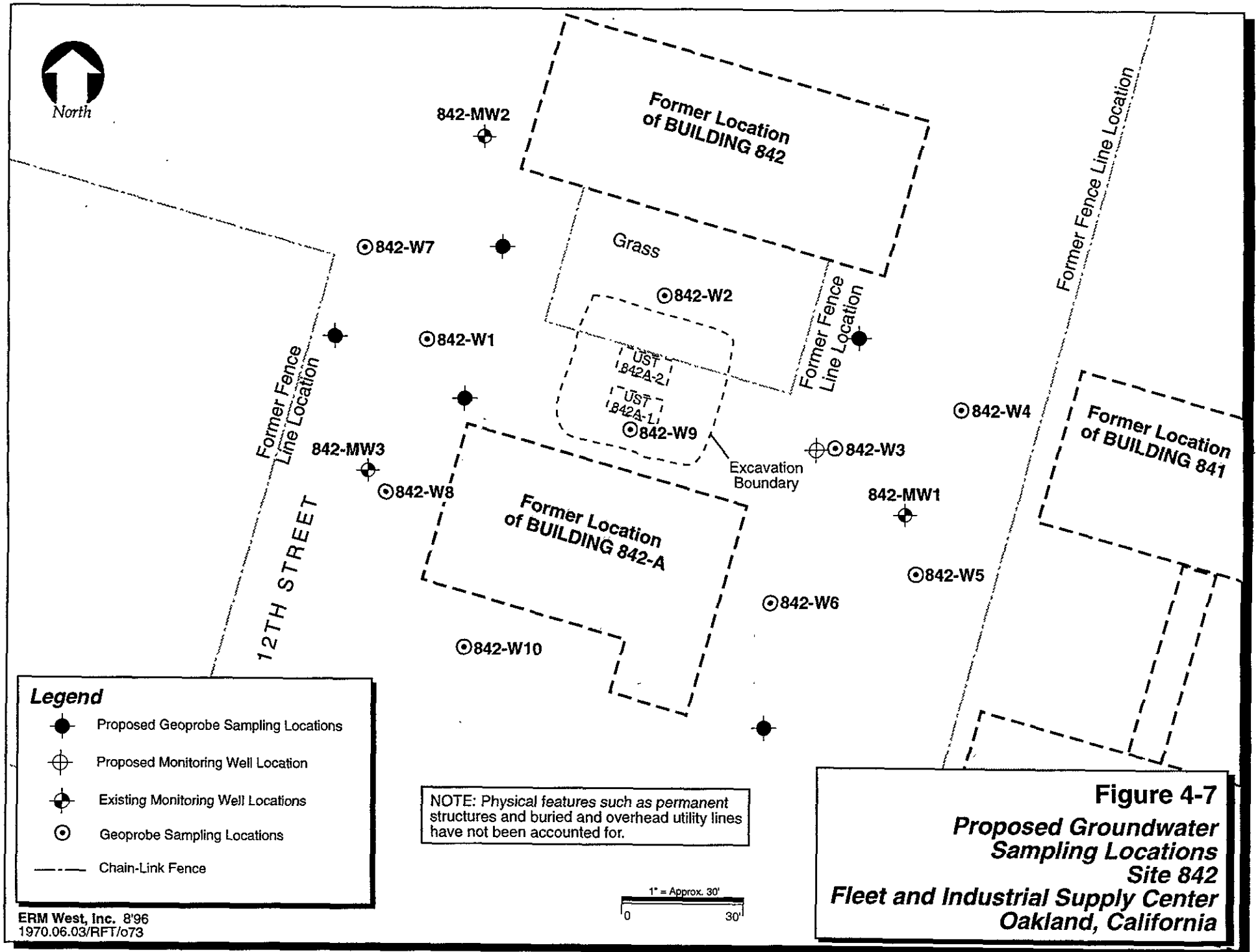


Figure 4-6

Proposed Geoprobe Sampling Locations
Site 750
Fleet and Industrial Supply Center
Oakland, California

ERM-West, Inc. 12'96
1970.06.03/RFT/o74.1202


North
842-MW2
Former Location of BUILDING 842
Grass
842-W7
842-W2
842-W1
UST 842A-2
UST 842A-1
842-W9
Former Fence Line Location
Former Fence Line Location
Former Fence Line Location
842-MW3
842-W8
Excavation Boundary
842-W3
842-W4
Former Location of BUILDING 841
842-MW1
Former Location of BUILDING 842-A
842-W5
842-W6
842-W10
12TH STREET
Legend
Proposed Geoprobe Sampling Locations
Proposed Monitoring Well Location
Existing Monitoring Well Locations
Geoprobe Sampling Locations
Chain-Link Fence
NOTE: Physical features such as permanent structures and buried and overhead utility lines have not been accounted for.
1" = Approx. 30'
0
30'
ERM West, Inc. 8'96
1970.06.03/RFT/o73
Figure 4-7
Proposed Groundwater Sampling Locations
Site 842
Fleet and Industrial Supply Center
Oakland, California

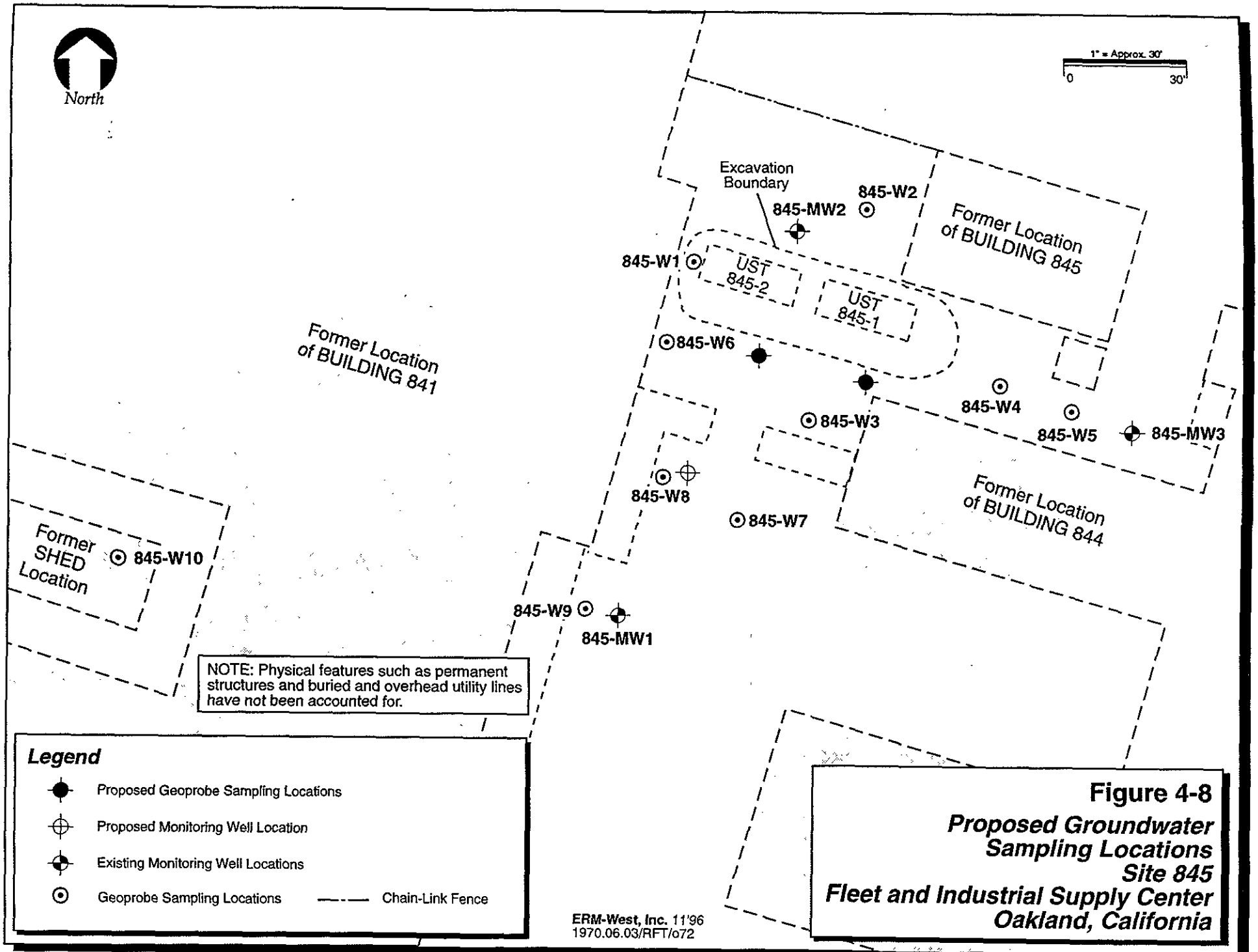


Figure 4-8

Proposed Groundwater Sampling Locations
Site 845
Fleet and Industrial Supply Center
Oakland, California

J. Ebesle

Draft

REVISED
UST INVESTIGATION REPORT

Volume 2 - Appendices

Former Underground Storage Tank Sites
211, 331N, 331S, 331E, 332, 334, 511D, 750, 842, and 845

at

Fleet and Industrial Supply Center,
Oakland, California

Submitted to:
Department of the Navy
Engineering Field Activities
Naval Facilities Engineering Command
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Prepared by:

ERM-West, Inc.
455 Capitol Mall, Suite 800
Sacramento, California 95814

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TABLE 1-1
TANK CLOSURE TABLE
NAVAL SUPPLY CENTER, OAKLAND

Tank No.	Closure Method	Capacity (Gallons)	Tank Contents	Diameter (Feet)	Length (Feet)	Depth (Feet)	Tank Type	Cover Material	Pipe Length (Feet)[1]
211-3	Removal[1]	3,000	Gasoline	6	13	4	Steel	Asphalt	n/a
331-S	Removal	1,400	Waste Oil	5	7	4	Steel	Asphalt	<20
332	Removal	6,800	Fuel Oil	8	18.5	3	Steel	Asphalt	n/a
411-1	Removal	1,100	Waste Oil	5.5	6	3	Steel	Concrete	<20
411-2	Removal	2,000	Waste Oil	6.25	8.75	3	Steel	Concrete	<20
511-1	Removal	1,500	Waste Oil	4	6	2	Steel	Concrete	n/a
511F-1	Removal	12,300	Diesel	5	16	2	Steel	Concrete	n/a
511F-2	Removal	12,300	Diesel	6	42	2	Steel	Concrete	n/a
511F-3	Removal	2,300	Gasoline	6	17	3	Steel	Concrete	n/a
740	Removal	3,600	Fuel Oil	6	15	3.5	Steel	Soil	<20
750-2	Removal	560	Diesel	4	11.5	2	Steel	Asphalt	n/a
842A-1	Removal	12,900	Fuel Oil	7	24	4	Steel	Asphalt	n/a
842A-2	Removal	12,500	Fuel Oil	7	24	4	Steel	Asphalt	n/a
845-1	Removal	4,500	Gasoline	6	19	4	Steel	Asphalt	n/a
845-2	Removal	6,000	Diesel	6	24	4	Steel	Asphalt	n/a

Notes:
1 Estimated
n/a Piping not present

TABLE 6-1
SUMMARY OF FIELD OBSERVATIONS, ANALYTICAL DATA, AND PROPOSED ACTION
NAVAL SUPPLY CENTER OAKLAND

UST SITE	TANK HOLES OBSERVED	OBSERVED SOIL OR GROUND WATER CONTAMINATION	PETROLEUM ODOR OBSERVED	TPH CONCENTRATION GREATER THAN 100 ppm	GROUND-WATER CONTAMINATION DETECTED IN ANALYSES	PERMEABLE PATHWAY	CASE NO.1 REQUIRED* (Soil/ground-water investigation required)	CASE NO.2 REQUIRED* (No further action required)	CASE NO. 3 REQUIRED* (Site specific analysis required)	FUTURE INVESTIGATION AND REMEDIAL WORK TO BE HANDLED UNDER THE IR PROGRAM FOR NSC OAKLAND	FUTURE INVESTIGATIVE AND REMEDIAL WORK TO BE HANDLED UNDER THE UST PROGRAM FOR NSC OAKLAND	COMMENTS
211-3 (gasoline)	No	No	No	No	Yes†	Yes	X	Possible Option			X	A limited scope investigation should be sufficient to define potential leak problems at UST 211-3.
331-S (waste oil)	No	Yes	Yes	Yes	Yes	Yes			X		X	Solvents were detected in soil and ground water.
332 (fuel oil)	Yes	No	Yes	No	Yes	No	X				X	TPH in soil ranged as high as 93 ppm.
411-1 (waste oil)	No	Yes	No	Yes	DNA	Yes			X	X		A remedial investigation is planned for this site under t and involves investigation of USTs.
411-2 (waste oil)	No**	Yes	Yes	No	Yes	Yes			X	X		A remedial investigation is planned for this site under th and involves investigation of USTs.
511-1 (waste oil)	No	Yes	Yes	Yes	DNA	Yes			X	X		A remedial investigation is planned for this site under th and involves investigation of USTs.
511F-1 511F-2 511-F3 (gasoline and diesel)	No	No	No	Yes	Yes	Yes	X			X		A remedial investigation is planned for this site under the and involves investigation of USTs.
740 (fuel oil)	No	Yes	Yes	Yes	Yes	No	X			X		A remedial investigation is planned for this site under the IR program and involves investigation of USTs.
750-2 (diesel)	Yes	Yes	Yes	Yes	DNA	Yes	X				X	Stained soil observed in the excavation.
842A-1 842A-2 (fuel oil)	Yes	Yes	Yes	Yes	Yes	No	X				X	Oil layer observed on ground water.
845-1 845-2 (diesel and gasoline)	Yes	Yes	Yes	Yes	Yes	No	X				X	Oil layer observed on ground water.

Notes:
DNA Data Not Available
* Tri Regional Board Staff recommendations, August 10, 1990 (Appendix F)
** Alameda County stated that holes may have been present in tank.
† Low ppb Concentrations Toluene and Xylenes

GATE 1

IR 08

UST 01

IR 01

IR 03

IR 04

UST 08

IR 10

IR 06

IR 09

IR 02

UST 07

UST 03

UST 02

IR 05

IR 12

IR 11

IR 07

UST 04

UST 05

UST 06

GATE 2

NSC CHANNEL

PARK

NORTH MARGINAL WHARF

SOUTH MARGINAL WHARF

MIDDLE HARBOR ROAD

PIER NO. 2

PIER NO. 3

PIER NO. 4

PIER NO. 5

BERTH "A"

BERTH "B-1"

BERTH "B-2"

BERTH "C"

BERTH "D"

BERTH "E"

BERTH "F"

BERTH "G"

BERTH "H"

BERTH "I"

BERTH "J"

BERTH "K"

BERTH "L"

BERTH "M"

1ST ST.

2ND ST.

3RD ST.

4TH ST.

5TH ST.

6TH ST.

7TH ST.

8TH ST.

9TH ST.

10TH ST.

11TH ST.

12TH ST.

13TH ST.

14TH ST.

C ST.

D ST.

E ST.

E. E ST.

F ST.

G ST.

H ST.

E. H ST.

I ST.

J ST.

K ST.

L ST.

M ST.

N ST.

SCALE: 1" = 600'

NAVAL SUPPLY CENTER OAKLAND

FIGURE 1
INSTALLATION RESTORATION AND UNDERGROUND STORAGE TANK LOCATIONS

PRC ENVIRONMENTAL MANAGEMENT, INC.

SOURCE: MODIFIED FROM WESTDIV, 1988a

OAKLAND DWG - 08/04/93 - CTR - 044-024ZRKMP

TABLE 1-1
TANK CLOSURE TABLE
NAVAL SUPPLY CENTER, OAKLAND

Tank No.	Closure Method	Capacity (Gallons)	Tank Contents	Diameter (Feet)	Length (Feet)	Depth (Feet)	Tank Type	Cover Material	Pipe Length (Feet)[1]
211-3	Removal[1]	3,000	Gasoline	6	13	4	Steel	Asphalt	n/a
331-S	Removal	1,400	Waste Oil	5	7	4	Steel	Asphalt	<20
332	Removal	6,800	Fuel Oil	8	18.5	3	Steel	Asphalt	n/a
411-1	Removal	1,100	Waste Oil	5.5	6	3	Steel	Concrete	<20
411-2	Removal	2,000	Waste Oil	6.25	8.75	3	Steel	Concrete	<20
511-1	Removal	1,500	Waste Oil	4	6	2	Steel	Concrete	n/a
511F-1	Removal	12,300	Diesel	5	16	2	Steel	Concrete	n/a
511F-2	Removal	12,300	Diesel	6	42	2	Steel	Concrete	n/a
511F-3	Removal	2,300	Gasoline	6	17	3	Steel	Concrete	n/a
740	Removal	3,600	Fuel Oil	6	15	3.5	Steel	Soil	<20
750-2	Removal	560	Diesel	4	11.5	2	Steel	Asphalt	n/a
842A-1	Removal	12,900	Fuel Oil	7	24	4	Steel	Asphalt	n/a
842A-2	Removal	12,500	Fuel Oil	7	24	4	Steel	Asphalt	n/a
845-1	Removal	4,500	Gasoline	6	19	4	Steel	Asphalt	n/a
845-2	Removal	6,000	Diesel	6	24	4	Steel	Asphalt	n/a

Notes:
1 Estimated
n/a Piping not present

APPENDIX B

HISTORICAL ANALYTICAL RESULTS

TABLE 6-1
SUMMARY OF FIELD OBSERVATIONS, ANALYTICAL DATA, AND PROPOSED ACTION
NAVAL SUPPLY CENTER OAKLAND

UST SITE	TANK HOLES OBSERVED	OBSERVED SOIL OR GROUND WATER CONTAMINATION	PETROLEUM ODOR OBSERVED	TPH CONCENTRATION GREATER THAN 100 ppm	GROUND-WATER CONTAMINATION DETECTED IN ANALYSES	PERMEABLE PATHWAY	CASE NO.1 REQUIRED* (Soil/ground-water investigation required)	CASE NO.2 REQUIRED* (No further action required)	CASE NO. 3 REQUIRED* (Site specific analysis required)	FUTURE INVESTIGATION AND REMEDIAL WORK TO BE HANDLED UNDER THE IR PROGRAM FOR NSC OAKLAND	FUTURE INVESTIGATIVE AND REMEDIAL WORK TO BE HANDLED UNDER THE UST PROGRAM FOR NSC OAKLAND	COMMENTS
211-3 (gasoline)	No	No	No	No	Yes†	Yes	X	Possible Option			X	A limited scope investigation should be sufficient to define potential leak problems at UST 211-3.
331-S (waste oil)	No	Yes	Yes	Yes	Yes	Yes			X		X	Solvents were detected in soil and ground water.
332 (fuel oil)	Yes	No	Yes	No	Yes	No	X				X	TPH in soil ranged as high as 93 ppm.
411-1 (waste oil)	No	Yes	No	Yes	DNA	Yes			X	X		A remedial investigation is planned for this site under t and involves investigation of USTs.
411-2 (waste oil)	No**	Yes	Yes	No	Yes	Yes			X	X		A remedial investigation is planned for this site under th and involves investigation of USTs.
511-1 (waste oil)	No	Yes	Yes	Yes	DNA	Yes			X	X		A remedial investigation is planned for this site under th and involves investigation of USTs.
511F-1 511F-2 511-F3 (gasoline and diesel)	No	No	No	Yes	Yes	Yes	X			X		A remedial investigation is planned for this site under th and involves investigation of USTs.
740 (fuel oil)	No	Yes	Yes	Yes	Yes	No	X			X		A remedial investigation is planned for this site under the IR program and involves investigation of USTs.
750-2 (diesel)	Yes	Yes	Yes	Yes	DNA	Yes	X				X	Stained soil observed in the excavation.
842A-1 842A-2 (fuel oil)	Yes	Yes	Yes	Yes	Yes	No	X				X	Oil layer observed on ground water.
845-1 845-2 (diesel and gasoline)	Yes	Yes	Yes	Yes	Yes	No	X				X	Oil layer observed on ground water.

Notes:

DNA Data Not Available

* Tri Regional Board Staff recommendations, August 10, 1990 (Appendix F)

** Alameda County stated that holes may have been present in tank.

† Low ppb Concentrations Toluene and Xylenes

APPENDIX C

SOIL ANALYTICAL DATA AND CHAIN-OF-CUSTODY RECORDS

12-24
P. Bliss

teg

ERM - WEST Project # 1970.06.02
Naval Supply Center
FISC / Oakland, California

TEG PROJECT #941128E

BTEX (EPA 8020) & TPH (EPA mod8015) ANALYSES OF SOILS

SAMPLE NUMBER	DATE SAMPLED	DATE ANALYZED	DIESEL mg/kg	GASOLINE mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBNZ mg/kg	XYLENES mg/kg
BLANK	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
BLANK	11/29/94	11/29/94	nd	nd	nd	nd	nd	nd
BLANK	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
BLANK	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
331-E-S1-05	12/01/94	12/01/94	nd	4348	5.779	5.350	31.300	126.100
331-E-S2-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S3-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S5-05	12/01/94	12/01/94	nd	nd	0.008	nd	nd	nd
331-E-S6-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S6-05 dup	12/01/94	12/02/94	nd	nd	nd	nd	nd	nd
331-E-S7-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
511-S5-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S6-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S7-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S8-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S9-05	12/06/94	12/06/94	nd	nd	0.012	nd	0.030	0.036
842-S1-05	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
842-S3-05	11/28/94	11/28/94	1036	nd	nd	nd	nd	nd
845-S1-05	11/29/94	11/29/94	nd	nd	nd	nd	nd	nd
845-S3-05	11/29/94	11/29/94	150	nd	nd	nd	nd	nd
845-S4-05	11/29/94	11/29/94	17	nd	nd	nd	nd	nd
845-S4-05 dup	11/29/94	11/29/94	18	nd	nd	nd	nd	nd
REPORTING LIMITS			10	10	0.005	0.005	0.005	0.015

'nd' INDICATES NOT DETECTED AT LISTED REPORTING LIMITS.

ANALYSES PERFORMED IN TEG's DHS CERTIFIED MOBILE LAB (#1671)

ANALYSES PERFORMED BY: Mr. Leif Jonsson

DATA REVIEWED BY: Mr. Mark Jerpbak

12-20-94

Transglobal Environmental Geochemistry

PO Box 162580, Sacramento, CA 95816 Phone: (916) 736-3233 Fax: (916) 452-5806

teg

ERM - WEST Project # 1970.06.02
Naval Supply Center
FISC / Oakland, California

TEG PROJECT #941128E

BTEX (EPA 8020) & TPH (EPA mod8015) ANALYSES OF SOILS

SAMPLE NUMBER	DATE SAMPLED	DATE ANALYZED	DIESEL mg/kg	GASOLINE mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBNZ mg/kg	XYLENES mg/kg
BLANK	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
BLANK	11/29/94	11/29/94	nd	nd	nd	nd	nd	nd
BLANK	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
BLANK	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
331-E-S1-05	12/01/94	12/01/94	nd	4348	5.779	5.350	31.300	126.100
331-E-S2-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S3-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S5-05	12/01/94	12/01/94	nd	nd	0.008	nd	nd	nd
331-E-S6-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
331-E-S6-05 dup	12/01/94	12/02/94	nd	nd	nd	nd	nd	nd
331-E-S7-05	12/01/94	12/01/94	nd	nd	nd	nd	nd	nd
511-S5-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S6-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S7-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S8-05	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-S9-05	12/06/94	12/06/94	nd	nd	0.012	nd	0.030	0.036
842-S1-05	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
842-S3-05	11/28/94	11/28/94	1036	nd	nd	nd	nd	nd
845-S1-05	11/29/94	11/29/94	nd	nd	nd	nd	nd	nd
845-S3-05	11/29/94	11/29/94	150	nd	nd	nd	nd	nd
845-S4-05	11/29/94	11/29/94	17	nd	nd	nd	nd	nd
845-S4-05 dup	11/29/94	11/29/94	18	nd	nd	nd	nd	nd
REPORTING LIMITS			10	10	0.005	0.005	0.005	0.015

'nd' INDICATES NOT DETECTED AT LISTED REPORTING LIMITS.

ANALYSES PERFORMED IN TEG's DHS CERTIFIED MOBILE LAB (#1671)

ANALYSES PERFORMED BY: Mr. Leif Jonsson

DATA REVIEWED BY: Mr. Mark Jerpbak

12-20-94

Transglobal Environmental Geochemistry

PO Box 162580, Sacramento, CA 95816 Phone: (916) 736-3233 Fax: (916) 452-5806

ERM - WEST Project # 1970.06.02
Naval Supply Center
FISC / Oakland, California

TEG PROJECT #941128E

QA/QC DATA - MATRIX SPIKE ANALYSES - SOIL

SAMPLE NUMBER	DATE ANALYZED	DIESEL mg/kg	GASOLINE mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBNZ mg/kg	XYLENES mg/kg
842-S1-05							
Spiked Conc.	11/28/94	50.0	20.0	0.0100	0.0100	0.0100	0.0300
Measured Conc.		51.4	17.1	0.0087	0.0096	0.0088	0.0267
% Recovery		102.8%	85.5%	87.0%	96.0%	88.0%	89.1%
Spiked Conc.	11/28/94	50.0	20.0	0.0100	0.0100	0.0100	0.0300
Measured Conc.		54.7	18.4	0.0087	0.0097	0.0087	0.0266
% Recovery		109.4%	92.0%	87.0%	97.0%	87.0%	88.7%
RPD		6.2%	7.3%	0.0%	1.0%	1.1%	0.5%
845-S1-05							
Spiked Conc.	11/29/94	50.0	20.0	0.0100	0.0100	0.0100	0.0300
Measured Conc.		43.9	20.3	0.0086	0.0090	0.0091	0.0298
% Recovery		87.8%	101.5%	86.0%	90.0%	91.0%	99.3%
Spiked Conc.	11/29/94	50.0	20.0	0.0100	0.0100	0.0100	0.0300
Measured Conc.		42.6	19.5	0.0087	0.0091	0.0097	0.0287
% Recovery		85.2%	97.5%	87.0%	91.0%	97.0%	95.7%
RPD		3.0%	4.0%	1.2%	1.1%	6.4%	3.8%

ACCEPTABLE RPD LIMIT = 15%

ANALYSES PERFORMED IN TEG's DHS CERTIFIED MOBILE LAB (#1671)

ANALYSES PERFORMED BY: Mr. Leif Jonsson

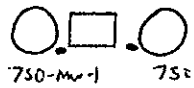
DATA REVIEWED BY: Mr. Mark Jerpbak 12-20-94

Transglobal Environmental Geochemistry
PO Box 162580, Sacramento, CA 95816 Phone: (916) 736-3233 Fax: (916) 452-5806

APPENDIX D

BORING LOGS AND WELL COMPLETION DIAGRAMS

LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ► 1970.06.02

WELL NO 750-MW-1

DATE ► 12-19-94

LOCATION ► FISC Oakland, Ste 750

LOGGED BY ► Greg Mahr

WEATHER ► Sunny 46°

DRILLING METHOD ► HSA

DRILLED BY ► Wayne Drlg Co.

SAMPLING METHOD ► Split-Spoon

OVA ► PID

MEASURING POINT ELEVATION ►

LAND SURFACE ELEVATION ►

FILTER PACK ► #3 Silica, TOP DEPTH 2.5', BOTTOM DEPTH 14.5'

SEAL ► Bentonite, TOP DEPTH 1.5', BOTTOM DEPTH 2.5'

CASING ► TYPE Sched 40 PVC, DIAMETER 4", LENGTH 3.79'

WATER LEVEL INITIAL 5' ☑ B.G.S. ☐ B.M.P.

BOREHOLE DIAMETER 10"

SCREEN ► TYPE Sched 40 PVC, SLOT 0.020, DIAMETER 4", LENGTH 10.0'

WATER LEVEL AT COMPLETION 4.5' ☑ B.G.S. ☐ B.M.P.

BOREHOLE DEPTH 14.5'

DEVELOPMENT ► METHOD

GALLONS PUMPED

PUMPING RATE

COMMENTS ►

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0		
						1		
M						2		
						3		
						4	2	
▼						5	3	
W						6	1	
						7		
						8		
						9		
						10		
						11		
						12		
						13		
						14		
						15		

LITHOLOGY/REMARKS

Asphalt

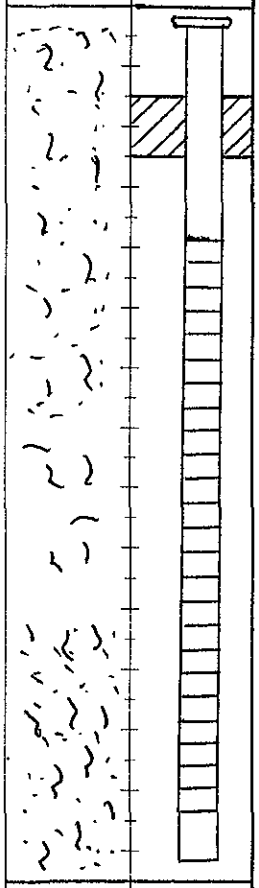
(Fill Material) Silty Sand, Dark Yellowish Brown, 10 YR 4/2, Silt- fine Grained, Minor Rock Fragments

Silty Clay, Medium Dark Gray, N4, Organic Rich (OH)

Clayey Sand, Olive Gray, 5Y 4/1, Silt- Medium Grained, Minor Shell Fragments (SC)

GRAPHIC LOG

WELL COMPLETION



10011 01/WELLLOG/121991-3

The ERM Group®

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 750 Job #: 1970.06.02

Logged By: Greg Mohr Reviewed By: _____ Project Manager: William Spang

Well Number: 750-MW-1 Driller: Wayne Drilling Co.

Date of Installation: 12-19-94 Hours Drilled: 3

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To	Date:
Yield: _____ GPM	Time: From: _____ To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

50 Pounds of Bentonite Pellets

3.79 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

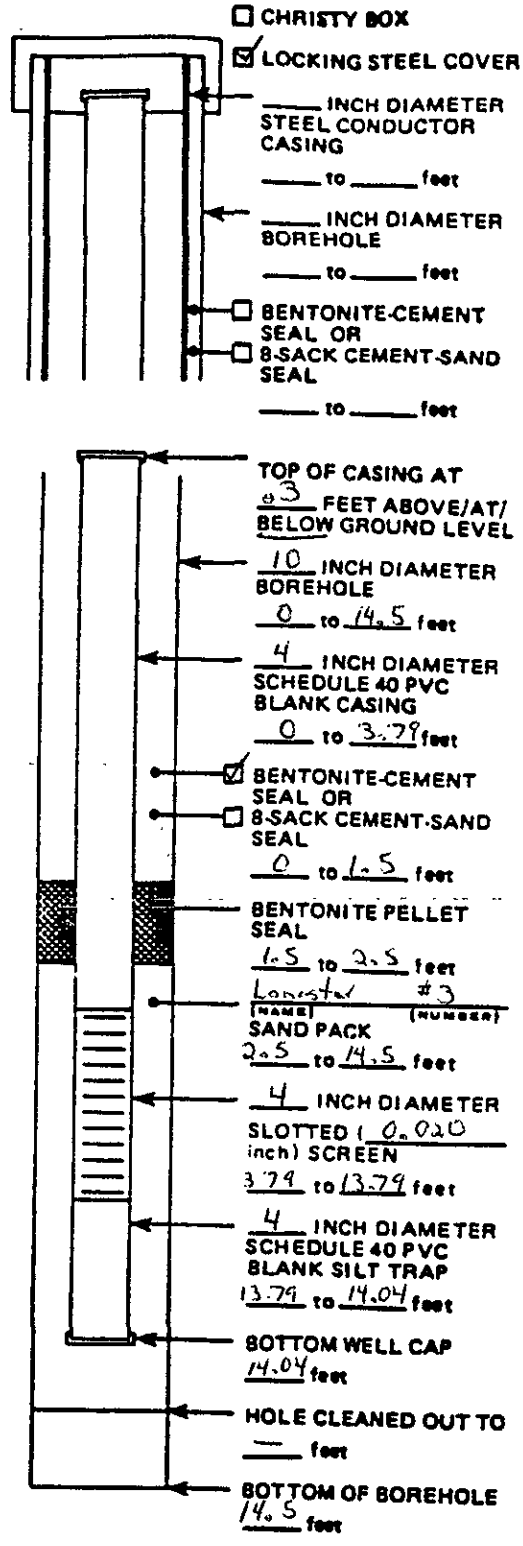
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

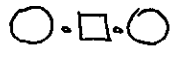
Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ➤ 1970.06.02

WELL NO. 750-MW-2

DATE ➤ 12-19-94

LOCATION ➤ FISC Oakland, Site 750

LOGGED BY ➤ Greg Mohr

WEATHER ➤ Sunny 47°

DRILLING METHOD ➤ H.S.A.

DRILLED BY ➤ Wayne Drlg Co.

SAMPLING METHOD ➤ Split Spoon

OVA ➤ PID

MEASURING POINT ELEVATION ➤

LAND SURFACE ELEVATION ➤

FILTER PACK ➤ #3 silica — TOP DEPTH 2.83' — BOTTOM DEPTH 14'

SEAL ➤ Bentonite — TOP DEPTH 0.83' — BOTTOM DEPTH 1.83'

CASING ➤ TYPE Sched 40 PVC — DIAMETER 4" — LENGTH

SCREEN ➤ TYPE Sched 40 PVC — SLOT 0.020 — DIAMETER 4" — LENGTH 10.0'

WATER LEVEL INITIAL 5' ☑ B.G.S ☐ B.M.P.

WATER LEVEL AT COMPLETION 4.5 ☑ B.G.S. ☐ B.M.P.

BOREHOLE DIAMETER 10"

BOREHOLE DEPTH 13.25'

DEVELOPMENT ➤ METHOD — GALLONS PUMPED — PUMPING RATE

COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0–14	4: 3, 3, 2	
M								
▼								
W								

LITHOLOGY/REMARKS

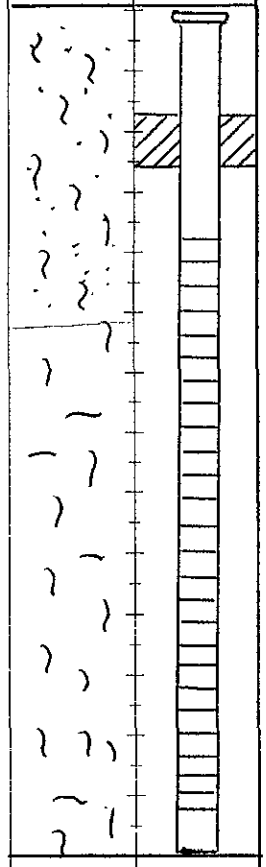
Asphalt

(Fill Material) Silt & Sands, Moderate Yellowish Brown, 10YR 5/4, Abundant Rock Clast

Silty Clay, Dark Greenish Gray, 5 GY 4/1, Organic Rich Semi Plastic, (OH)

GRAPHIC LOG

WELL COMPLETION



10011 01/WELLLOG/121991-3

The ERM Group®

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC Oakland Owner: US Navy

Location: Site 750 Job #: 1970.06.02

Logged By: Greg Mahr Reviewed By: _____ Project Manager: William Spring

Well Number: 750-MW-2 Driller: Wayne Drilling Co

Date of Installation: 12-19-94 Hours Drilled: 3

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To _____	Date:
Yield: _____ GPM	Time: From: _____ To _____	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Mod. Turbid ☐ Slightly cloudy ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 Silica (100 lbs Ea.) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

50 Pounds of Bentonite Pellets

2.83 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

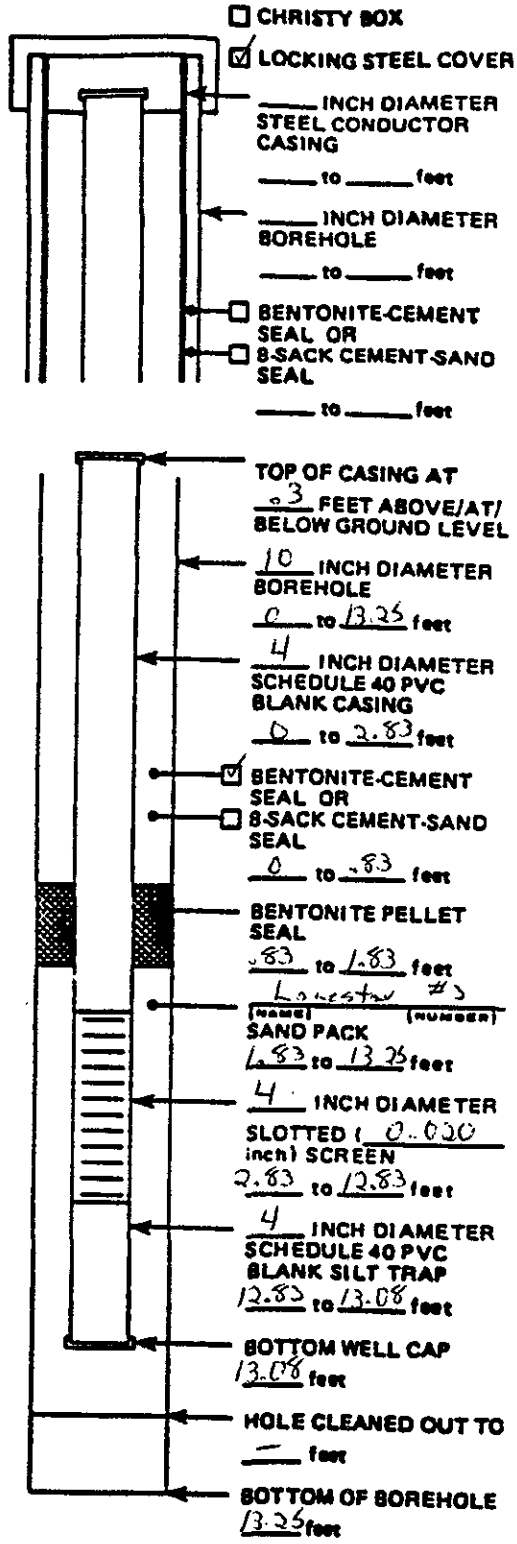
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

Environmental Resources Management

Drilling Log

Project PISC Owner NAVY

Location OAKLAND, CA Project Number 1970.06.03

Boring Number 750-MW3 Total Depth of Auger 15' Auger Diameter 10"

Surface Elevation — Water Level: Initial ~7' BGS 24-hrs. —

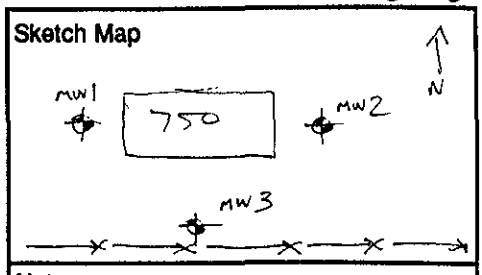
Total Depth of Soil Sampler — Total Depth of Ground Water Sampler —

Ground Water Sample Interval(s) —

Drilling Company WAYNE Drilling Method HOLLOW STEM

Driller PATTISON, JOHN Log By TTM Date Drilled 7/29/96

Sketch Map



Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0					ASPHALT — 6" THICK.
1					FILL MATERIAL (GRAVELLY SAND, BROWN AND
2					GREY, SMALL ROCKS & CONCRETE CHUNKS.
3					NO STAINING OR ODOR.
4					
5					SILTY CLAY, DARK GREENISH GREY,
6					HIGH PLASTICITY, SLIGHT HYDROCARBON ODOR.
7					SAME AS ABOVE, WET
8					
9					
10					SAME AS ABOVE
11					SANDY SILT, DARK GREY, SLIGHT ODOR.
12					
13					
14					
15					TD = 15' BGS.
16					
17					

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC Owner: NAVY

Location: OAKLAND, CA Job #: 1970.06.03

Logged By: TDM Reviewed By: — Project Manager: WAS.

Well Number: 750-MW3 Driller: WAYNE

Date of Installation: 7/29/96 Hours Drilled: _____

Equipment: X Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: 10 GALS. Gallons: _____

Method of Decontamination Prior to Drilling: STEAM CLEAN.

Well Permit #: 96531 Issuing Agency: ZONE 7 WATER AGENCY

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: To	Date:
Yield: _____ GPM	Time: From: To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Mod. Turbid ☐ Slightly cloudy ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 LONESTAR Sand

1 Sacks of PORTLAND Cement

_____ Gallons of Grout Used

_____ Sacks of Powdered Bentonite

_____ Pounds of Bentonite Pellets

_____ Feet of _____ Inch PVC Blank Casing

_____ Feet of _____ Inch PVC Slotted Screen

_____ Feet of _____ Inch Steel Conductor Casing

_____ Yard³ Cement-Sand (Redi-Mix) Ordered

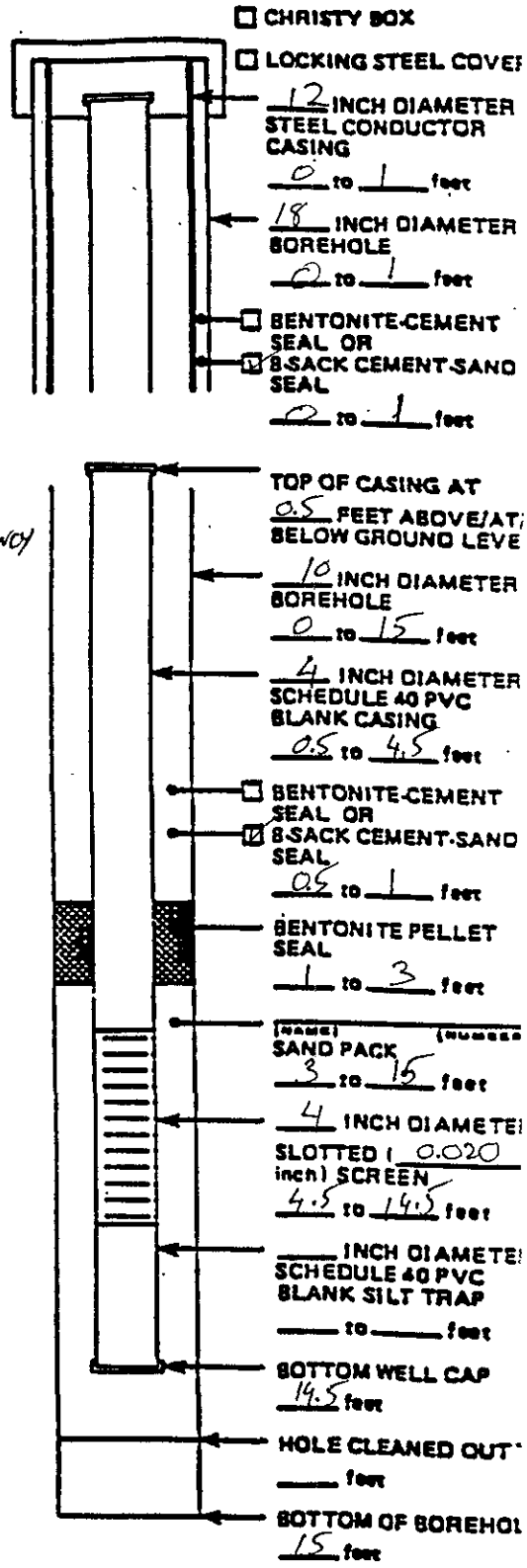
_____ Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? _____ No _____ Yes

Name _____

Well Cover Used: _____ Locking Steel Cover; _____ Diversified Well Products Box; X Christy Box; _____ Other _____

Silt Trap Used? _____ No



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP

842-MW-3 • • 842-MW-2

• 842-MW-1

ERM-SOUTH WELL LOG

PROJECT ► 1970.06.02

WELL NO. 842-MW-1

DATE ► 12-21-94

LOCATION ► FISC Oakland, Site 842

LOGGED BY ► Greg Mahl

WEATHER ► Sunny 46°

DRILLING METHOD ► H.S.A.

DRILLED BY ► Wayne Drilling Co.

SAMPLING METHOD ► Split Spoon

OVA ► PID

MEASURING POINT ELEVATION ►

LAND SURFACE ELEVATION ►

FILTER PACK ► # 3 Silica — TOP DEPTH 1.92' — BOTTOM DEPTH 13.25'

SEAL ► Bentonite — TOP DEPTH .92' — BOTTOM DEPTH 1.92'

CASING ► TYPE Sched 40 PVC — DIAMETER 4" — LENGTH 2.92'

WATER LEVEL INITIAL 5' ☑ B.G.S. ☐ B.M.P. — BOREHOLE DIAMETER 10"

SCREEN ► TYPE Sched 40 PVC — SLOT 0.020 — DIAMETER 4" — LENGTH 10.0'

WATER LEVEL AT COMPLETION 4 1/2 ☑ B.G.S. ☐ B.M.P. — BOREHOLE DEPTH 13.25'

DEVELOPMENT ► METHOD — GALLONS PUMPED — PUMPING RATE — COMMENTS ►

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0		
						1		
M						2		
						3		
▼						4		3
								3
W						5		3
						6		
						7		
						8		
						9		
						10		
						11		
						12		
						13		
						14		

LITHOLOGY/REMARKS

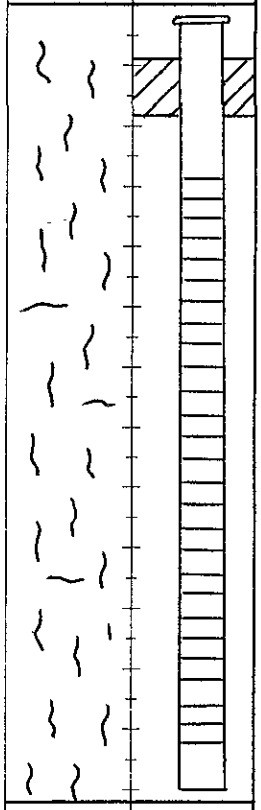
Asphalt

(Fill Material) Sand, Silt + Rocks, Moderate Yellowish Brown. 10YR 5/4.

Silty clay, Dark Greenish Gray, 5 G 4/1, Very Plastic, Organic Rich, (OH)

GRAPHIC LOG

WELL COMPLETION



The ERM Group

10011 01/WELLLOG/121991-3

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 842 Job #: 1970.06.03

Logged By: Greg Mahr Reviewed By: _____ Project Manager: William Spong

Well Number: 842-MW-1 Driller: Wayne Drilling Co

Date of Installation: 12-21-94 Hours Drilled: 3

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: GPM	Time: From: To	Date:
Yield: GPM	Time: From: To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

3½ Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

35 Pounds of Bentonite Pellets

2.92 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of _____ Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

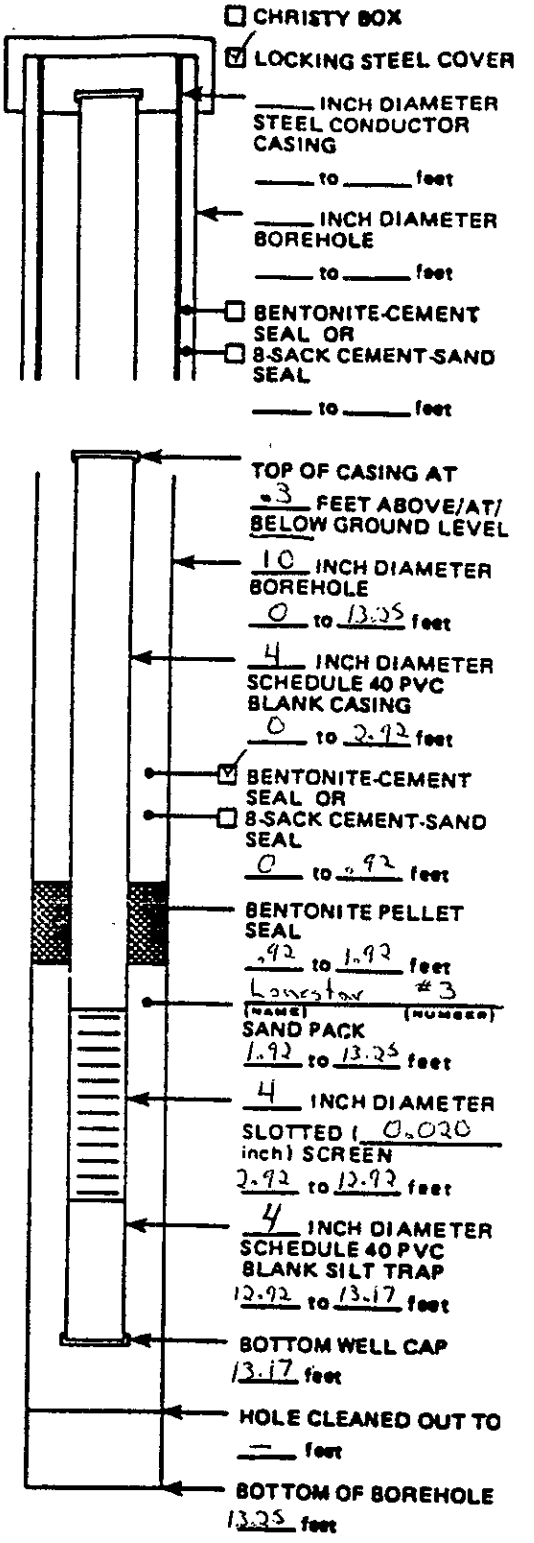
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover; _____ Diversified Well Products Box; _____ Christy Box; _____ Other _____

Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP

842-MW-3 • • 842-MW-2

• 842-MW-1

ERM-SOUTH WELL LOG

PROJECT ► 1970.06.02

WELL NO. 842-MW-2

DATE ► 12-21-94

LOCATION ► FISC Oakland, Site 842

LOGGED BY ► Greg Mohr

WEATHER ► Sunny 45°

DRILLING METHOD ► H.S.A

DRILLED BY ► Wayne Drilling Co.

SAMPLING METHOD ► Split Spoon

OVA ► PID

MEASURING POINT ELEVATION ►

LAND SURFACE ELEVATION ►

FILTER PACK ► #3 silica — TOP DEPTH 1.85 — BOTTOM DEPTH 13.25

SEAL ► Bentonite — TOP DEPTH .85 — BOTTOM DEPTH 1.85

CASING ► TYPE Sched 40 PVC — DIAMETER 4" — LENGTH 2.85'

WATER LEVEL INITIAL 5' — ☑ B.G.S ☐ B.M.P. — BOREHOLE DIAMETER 10"

SCREEN ► TYPE Sched 40 PVC — SLOT 0.020 — DIAMETER 4" — LENGTH 10.0'

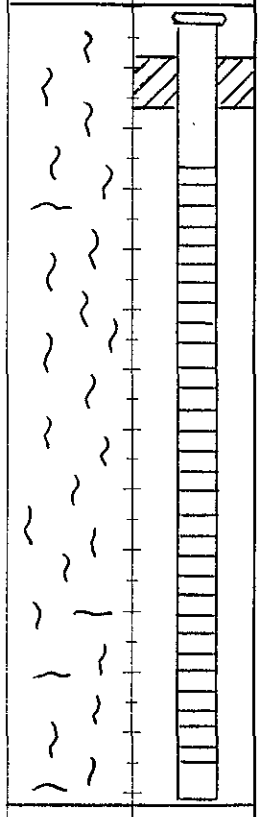
WATER LEVEL AT COMPLETION 4½' — ☑ B.G.S. ☐ B.M.P — BOREHOLE DEPTH 13.25'

DEVELOPMENT ► METHOD — GALLONS PUMPED — PUMPING RATE — COMMENTS ►

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY/REMARKS
M						0			Asphalt
						1			
M						2			(Fill Material) Silts, Sands + Rock Chats, Yellowish Brown 10 YR 5/4
						3			
▼						4		4	
								7	
W						5		6	
						6			
						7			
						8			Silty clay, Dark Greenish Gray, 5G 4/1, Plastic, Organic Rich (OH)
						9			
						10			
						11			
						12			
						13			
						14			

GRAPHIC LOG

WELL COMPLETION



10011 01/WELLLOG/121991-3

The ERM Group®

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 842 Job #: 1970.06.02

Logged By: Greg Mahr Reviewed By: _____ Project Manager: William Spang

Well Number: 842-MW-2 Driller: Wayne Drilling Co

Date of Installation: 12-21-94 Hours Drilled: 2.5

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To	Date:
Yield: _____ GPM	Time: From: _____ To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

3 1/2 Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

35 Pounds of Bentonite Pellets

2.85 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

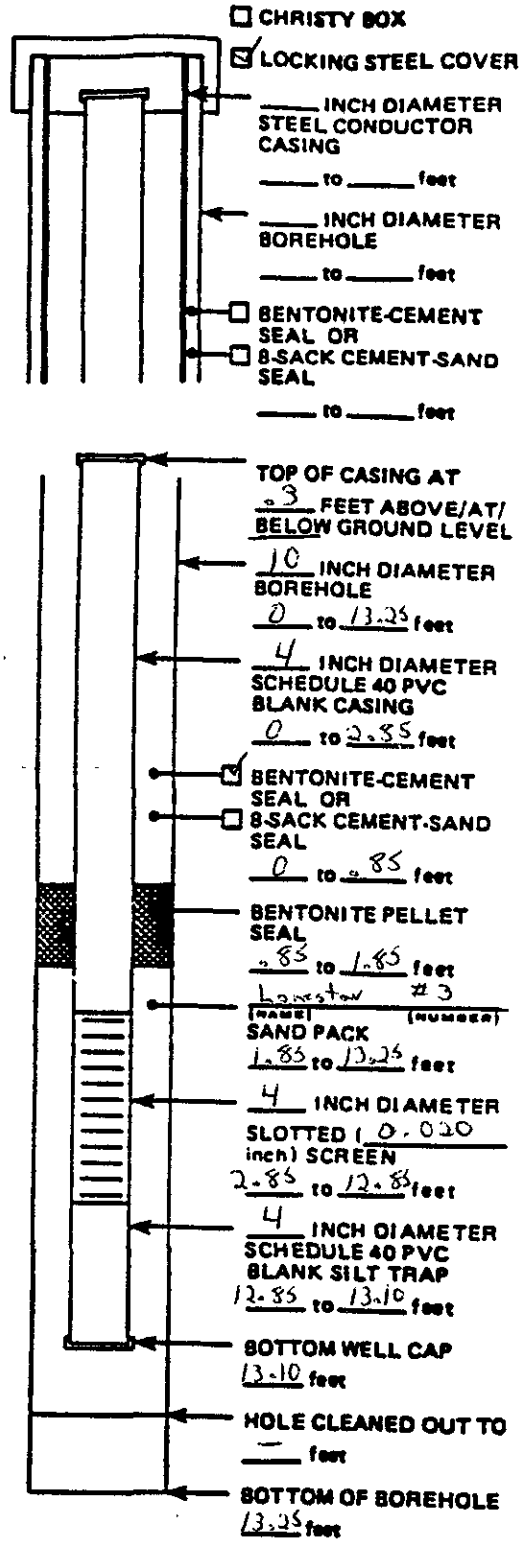
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover _____ Diversified Well Products Box _____ Christy Box _____ Other _____

Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC Oakland Owner: US Navy

Location: Site 842 Job #: 1970-06-02

Logged By: Greg Mishe Reviewed By: _____ Project Manager: William Spong

Well Number: 842-MW-3 Driller: Wayne Drilling Co.

Date of Installation: 12-21-94 Hours Drilled: 2.5

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: steam cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To	Date:
Yield: _____ GPM	Time: From: _____ To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

3 1/2 Sacks of #3 Silica (100 lbs Ea.) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

35 Pounds of Bentonite Pellets

3.35 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

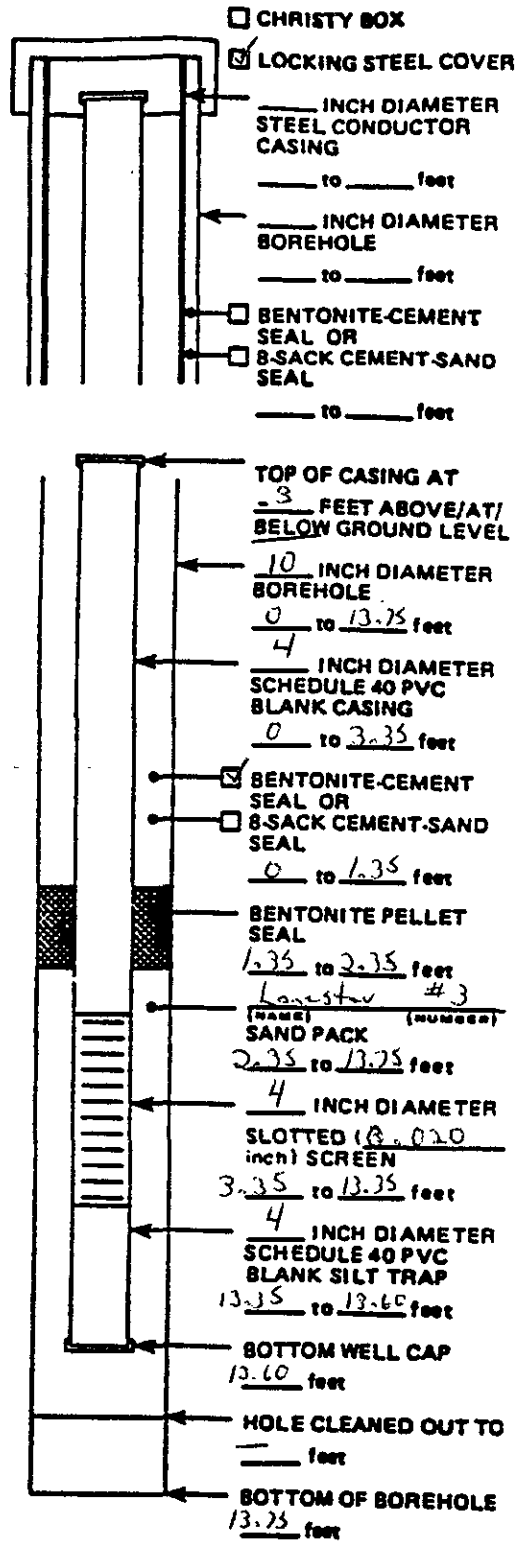
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP

842-MW-3 ○ ○ 842-MW-2

○ 842-MW-1

ERM-SOUTH WELL LOG

PROJECT ➤ 1970.06.02 | WELL NO. 842-MW-3

DATE ➤ 12-21-94	LOCATION ➤ FISC Oakland, Site 842
LOGGED ➤ BY Greg Mohr	WEATHER ➤ Sunny 45°
DRILLING ➤ METHOD H.S.A.	DRILLED ➤ BY Wayne Drilling Co.
SAMPLING ➤ METHOD Split-Spoon	OVA ➤ PID

MEASURING POINT ELEVATION ➤
LAND SURFACE ELEVATION ➤

FILTER ➤ PACK #3 Silica | TOP DEPTH 2.35' | BOTTOM DEPTH 13.75' | SEAL ➤ Bentonite | TOP DEPTH 1.35 | BOTTOM DEPTH 2.35

CASING ➤ TYPE Sched 40 PVC | DIAMETER 4" | LENGTH 3.35' | WATER LEVEL INITIAL 5' | ☐ B.G.S. ☐ B.M.P | BOREHOLE DIAMETER 10"

SCREEN ➤ TYPE Sched 40 PVC | SLOT 0.020 | DIAMETER 4" | LENGTH 10.0' | WATER LEVEL AT COMPLETION 4½ | ☑ B.G.S. ☐ B.M.P. | BOREHOLE DEPTH 13.75

DEVELOPMENT ➤ METHOD | GALLONS PUMPED | PUMPING RATE | COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0–14	3	3, 4, 4
M								
▼ W								

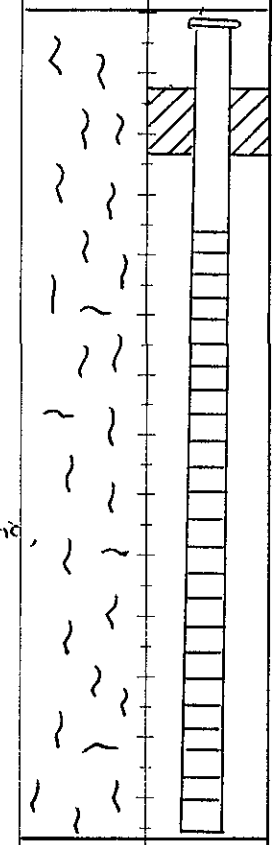
LITHOLOGY/REMARKS

Asphalt

(Fill Material) Silts, Sands & Rock Clasts. Yellowish Brown, 10YR, 5/4.

Silty Clay, Dark Greenish Gray, 5G 4/1, Very Plastic, Organic Rich, (OH)

GRAPHIC LOG / WELL COMPLETION



10011 01/WELLLOG/121991-3

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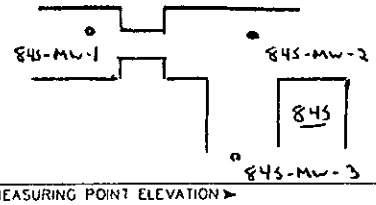
LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ➤ 1970.06-02

WELL NO 845-MW-1

DATE ➤ 12-20-94

LOCATION ➤ Fisc Oakland, Site 845

LOGGED BY ➤ Greg Mahr

WEATHER ➤ Sunny 47°

DRILLING METHOD ➤ H.S.A.

DRILLED BY ➤ Wayne D.I.g Co.

SAMPLING METHOD ➤ Split Spoon

OVA ➤ PID

MEASURING POINT ELEVATION ➤

LAND SURFACE ELEVATION ➤

FILTER PACK ➤ # 3 Silica — TOP DEPTH 2.79' — BOTTOM DEPTH 14.25'

SEAL ➤ Bentonite — TOP DEPTH 1.79' — BOTTOM DEPTH 2.79'

CASING ➤ TYPE: sched 40 PVC — DIAMETER 4" — LENGTH 3.79'

WATER LEVEL INITIAL 5 ☑ B.G.S ☐ B.M.P.

BOREHOLE DIAMETER 10"

SCREEN ➤ TYPE: Sched 40 PVC — SLOT 0.020 — DIAMETER 4" — LENGTH 10.0'

WATER LEVEL AT COMPLETION 4 1/2 ☑ B.G.S ☐ B.M.P.

BOREHOLE DEPTH 14.25'

DEVELOPMENT ➤ METHOD — GALLONS PUMPED — PUMPING RATE — COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0–15	3, 4, 4	
M								
▼								
W								

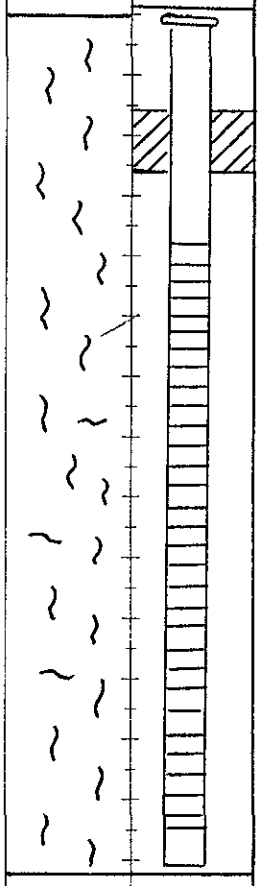
LITHOLOGY/REMARKS

Asphalt

(Fill Material) Silt & Sands, 60% Rock Clast, Moderate Brown, 5YR 3/4, minor metal fragments

Silty Clay, Dark Gray, N3, Minor Fine Sand Inclusions, Organic Rich, Semi Plastic, (OH)

GRAPHIC LOG / WELL COMPLETION



ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 845 Job #: 1970.06.02

Logged By: Greg Mahr Reviewed By: _____ Project Manager: William Spang

Well Number: 845-MW-1 Driller: Wayne Drilling Co

Date of Installation: 12-20-94 Hours Drilled: 2.5

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To	Date:
Yield: _____ GPM	Time: From: _____ To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

50 Pounds of Bentonite Pellets

3.79 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of _____ Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

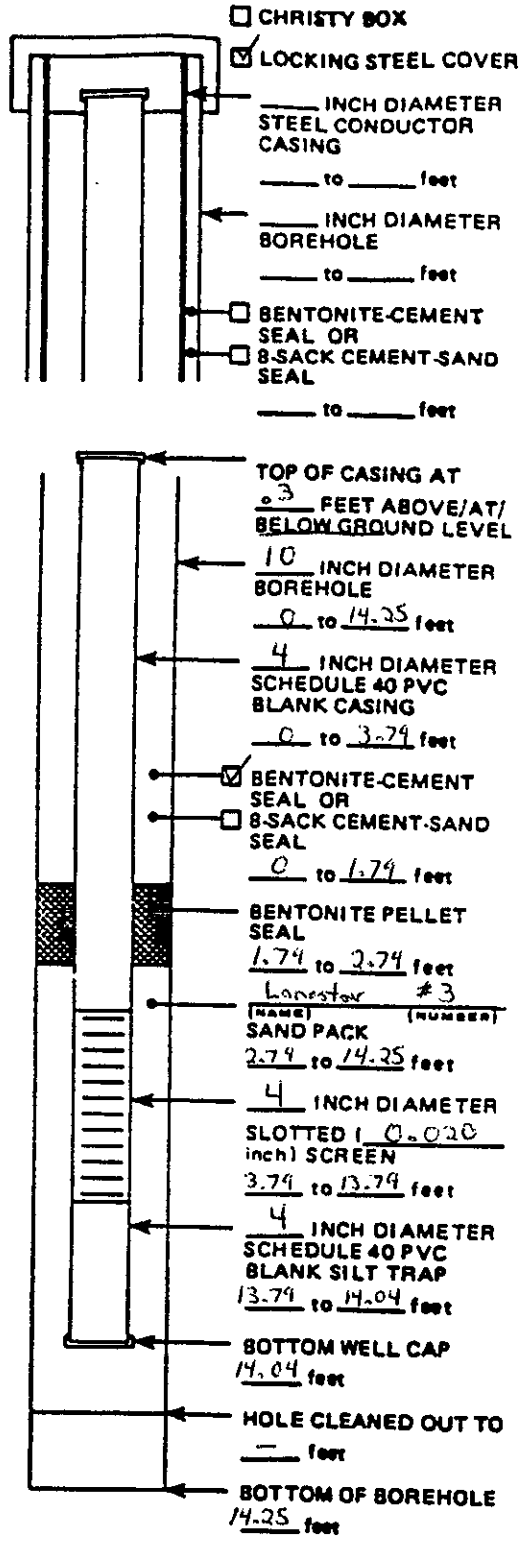
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

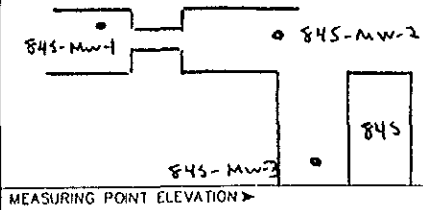
Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ➤ 1970.06.02

WELL NO. 845-MW-2

DATE ➤ 12-20-94

LOCATION ➤ FISC. Oakland, Site 845

LOGGED BY ➤ Greg Mahr

WEATHER ➤ Sunny

DRILLING METHOD ➤ H.S.A

DRILLED BY ➤ Wayne Drlg Co.

SAMPLING METHOD ➤ Split Spoon

OVA ➤ PID

MEASURING POINT ELEVATION ➤

LAND SURFACE ELEVATION ➤

FILTER PACK ➤ # 3 silica — TOP DEPTH 2.98' — BOTTOM DEPTH 14.5'

SEAL ➤ Bentonite — TOP DEPTH 1.96 — BOTTOM DEPTH 2.96

CASING ➤ TYPE: sched 40 PVC — DIAMETER: 4" — LENGTH: 3.96'

WATER LEVEL INITIAL: 5 — ☑ B.G.S ☐ B.M.P

BOREHOLE DIAMETER: 10"

SCREEN ➤ TYPE: sched 40 PVC — SLOT: 0.020 — DIAMETER: 4" — LENGTH: 10.0'

WATER LEVEL AT COMPLETION: 4.5 — ☑ B.G.S. ☐ B.M.P.

BOREHOLE DEPTH: 14.5'

DEVELOPMENT ➤ METHOD

GALLONS PUMPED

PUMPING RATE

COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE
M						0		
						1		
M						2		
						3		
▼						4		3
								4
W						5		7
						6		
						7		
						8		
						9		
						10		
						11		
						12		
						13		
						14		
						15		

LITHOLOGY/REMARKS

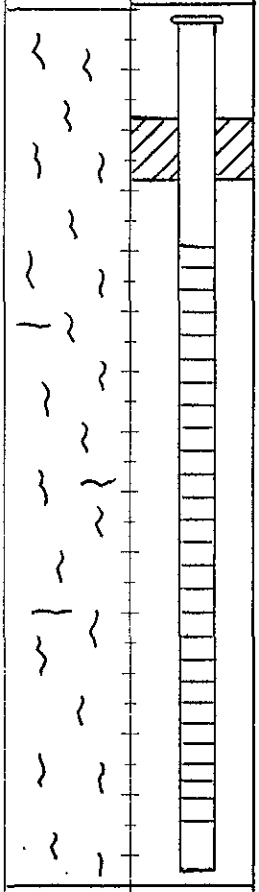
Asphalt

(Fill Material) Silty Clay, Moderate Brown, 5YR 4/4, Minor Pebble & Rock Clast

Silty Clay, Dark Gray, N3, Minor Fine Sand Inclusions, Organic Rich, Plastic (OH)

GRAPHIC LOG

WELL COMPLETION



ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 845 Job #: 1970.06.02

Logged By: Greg Mahr Reviewed By: _____ Project Manager: William Spong

Well Number: 845-MW-2 Driller: Wayne Drilling Co.

Date of Installation: 12-20-94 Hours Drilled: 2.5

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: _____ GPM	Time: From: _____ To	Date:
Yield: _____ GPM	Time: From: _____ To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

4 Gallons of Grout Used

— Sacks of Powdered Bentonite

50 Pounds of Bentonite Pellets

3.96 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

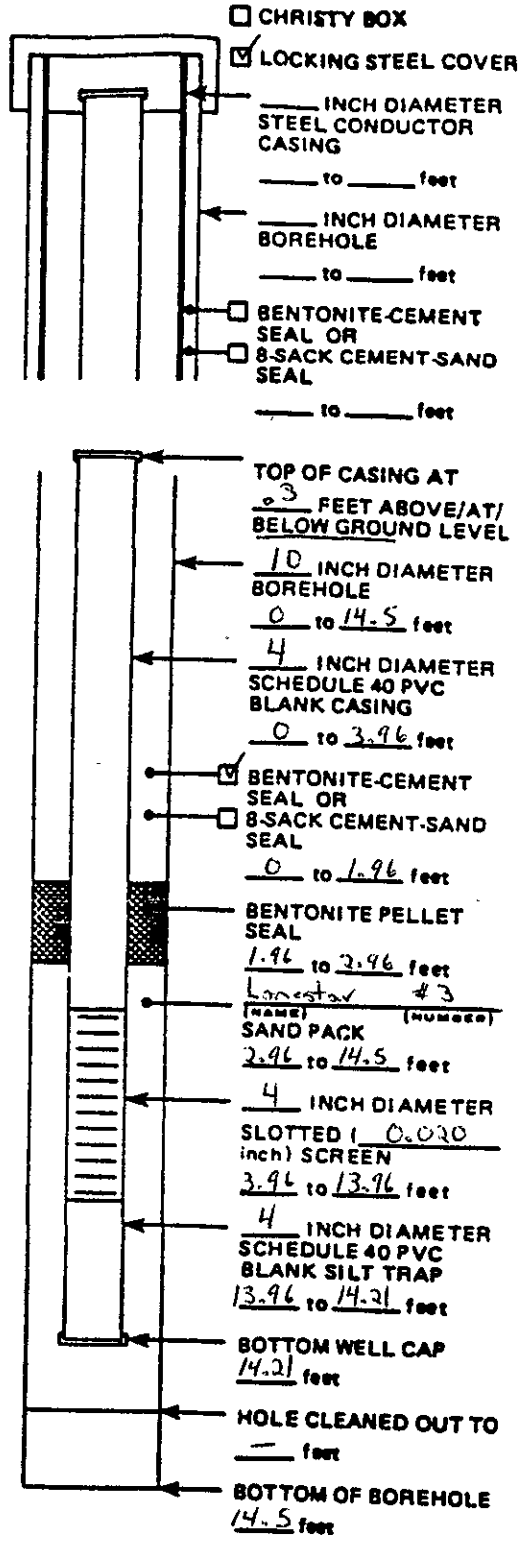
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

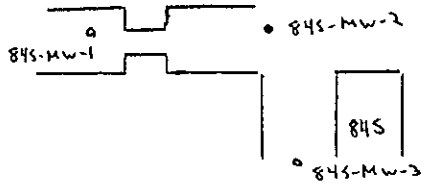
Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ➤ 1970.06.02

WELL NO. 845-MW-3

DATE ➤ 12-20-94

LOCATION ➤ FISC Oakland, Site 845

LOGGED BY ➤ Greg Mahr

WEATHER ➤ Sunny 45°

DRILLING METHOD ➤ H.S.A.

DRILLED BY ➤ Wayne Drilling Co.

SAMPLING METHOD ➤ Split Spoon

OVA ➤ PID

MEASURING POINT ELEVATION ➤

LAND SURFACE ELEVATION ➤

FILTER PACK ➤ #3 Silica — TOP DEPTH 2.26' — BOTTOM DEPTH 14'

SEAL ➤ Bentonite — TOP DEPTH 1.26' — BOTTOM DEPTH 2.26'

CASING ➤ TYPE Sched 40 PVC — DIAMETER 4" — LENGTH 3.26'

WATER LEVEL INITIAL 5' ☑ B.G.S. ☐ B.M.P.

BOREHOLE DIAMETER 10"

SCREEN ➤ TYPE Sched 40 PVC — SLOT 0.020 — DIAMETER 4" — LENGTH 10.0'

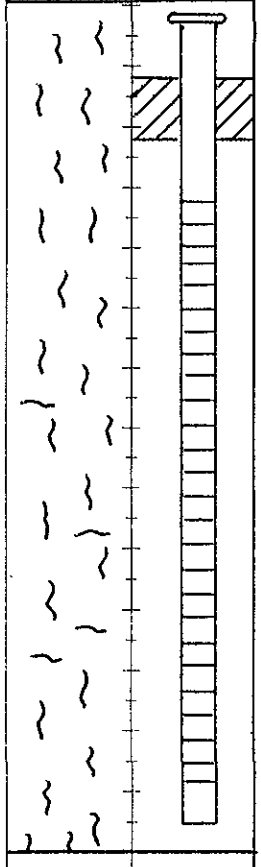
WATER LEVEL AT COMPLETION 4'½' ☑ B.G.S. ☐ B.M.P.

BOREHOLE DEPTH 14'

DEVELOPMENT ➤ METHOD — GALLONS PUMPED — PUMPING RATE — COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY/REMARKS
						0			Asphalt
M						1			
						2			(Fill Material) Silts, Sands, Gravel & Rocks, Moderate Brown 5YR 4/4,
M						3			
▼						4		3	
						5		4	
W						6		4	
						7			Silty Clay, Dark Greenish Gray, 5GY 4/1, Semi Plastic, (OH)
						8			
						9			
						10			
						11			
						12			
						13			
						14			

GRAPHIC LOG / WELL COMPLETION



10011.01/WELLLOG/121991-3

The ERM Group

ENVIRONMENTAL RESOURCES MANAGEMENT
ERM-WEST

FIELD WELL COMPLETION FORM

Job Name: FISC, Oakland Owner: US Navy

Location: Site 845 Job #: 1970.06.02

Logged By: Greg Mohr Reviewed By: _____ Project Manager: William Spong

Well Number: 845-MW-3 Driller: Wayne Drilling Co.

Date of Installation: 12-20-94 Hours Drilled: 2.5

Equipment: 10 Inch Hollow Stem Auger _____ Inch Rotary Wash

Gallons of Water Used During Drilling: None Gallons: —

Method of Decontamination Prior to Drilling: Steam Cleaning

Well Permit #: _____ Issuing Agency: _____

DEVELOPMENT

Method of Development: _____

Development Began Date: _____ Time: _____

Depth to Water Before Development: _____ Feet

Yield: GPM	Time: From: To	Date:
Yield: GPM	Time: From: To	Date:

Total Water Removed During Development: _____ Gallons

Description of Turbidity at End of Development: ☐ Clear ☐ Slightly cloudy ☐ Mod. Turbid ☐ Very Muddy

Odor of Water: _____

Water Discharged To: ☐ Ground Surface ☐ Storm Sewers ☐ Drums ☐ Tank Truck ☐ Storage Tank ☐ Other

Depth to Water After Development: _____ Feet

Date/Time Well Development Complete: _____

Well Elevation: _____ Feet ..... Measuring Point (i.e. Top of Casing): _____

MATERIALS USED

4 Sacks of #3 Silica (100 lbs Ea) Sand

1 Sacks of _____ Cement

3 Gallons of Grout Used

— Sacks of Powdered Bentonite

50 Pounds of Bentonite Pellets

3.26 Feet of 4 Inch PVC Blank Casing

10.0 Feet of 4 Inch PVC Slotted Screen

— Feet of — Inch Steel Conductor Casing

— Yard³ Cement-Sand (Redi-Mix) Ordered

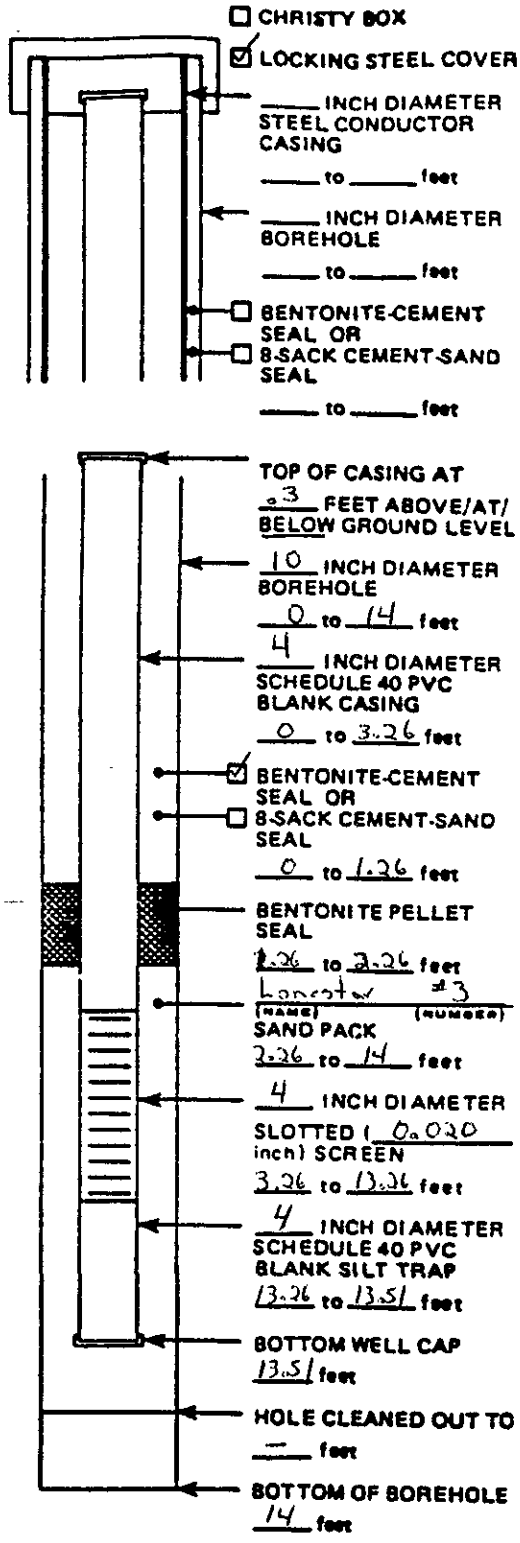
— Yard³ Cement-Sand (Redi-Mix) Used

Concrete Pumper Used? ✓ No _____ Yes

Name _____

Well Cover Used: ✓ Locking Steel Cover
_____ Diversified Well Products Box
_____ Christy Box
_____ Other _____

Silt Trap Used? _____ No ✓ Yes



NOT TO SCALE

ADDITIONAL INFORMATION: _____

ERM - WEST Project # 1970.06.02
Naval Supply Center
FISC / Oakland, California

TEG PROJECT #941128E

BTEX (EPA 8020) & TPH (EPA mod8015) ANALYSES OF WATERS

SAMPLE NUMBER	DATE SAMPLED	DATE ANALYZED	DIESEL ug/l	GASOLINE ug/l	BENZENE ug/l	TOLUENE ug/l	ETHYLBNZ ug/l	XYLENES ug/l
511-4W	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-5W	12/06/94	12/06/94	nd	nd	nd	nd	nd	nd
511-6W	12/06/94	12/06/94	nd	3120	225.1	28.3	160.0	179.6
511-7W	12/06/94	12/06/94	nd	967	134.1	nd	nd	10.2
511-8W	12/06/94	12/06/94	nd	nd	nd	nd	0.5	1.9
511-9W	12/06/94	12/06/94	nd	nd	2.1	0.5	2.5	1.1
842-1W	11/28/94	11/28/94	10640	nd	nd	nd	nd	nd
842-2W	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
842-3W	11/28/94	11/28/94	156000	nd	--	--	--	--
842-4W	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
842-5W	11/28/94	11/28/94	nd	nd	--	--	--	--
842-6W	11/28/94	11/28/94	nd	nd	3.0	16.3	5.8	25.2
842-6W dup	11/28/94	11/28/94	nd	nd	2.7	15.7	5.2	27.8
842-7W	11/28/94	11/28/94	nd	nd	nd	1.4	nd	2.6
842-8W	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
842-9W	11/28/94	11/28/94	nd	nd	nd	nd	nd	nd
845-10W	12/02/94	12/02/94	nd	nd	nd	nd	nd	nd
845-1W	11/29/94	11/29/94	nd	nd	nd	nd	nd	2.5
845-2W	11/29/94	11/29/94	nd	nd	nd	nd	nd	nd
845-3W	11/29/94	11/29/94	1454	nd	nd	nd	4.4	25.2
845-4W	11/29/94	11/29/94	nd	nd	nd	nd	nd	2.5
845-6W	11/29/94	11/29/94	nd	nd	nd	13.9	4.2	19.1
845-7W	11/29/94	11/29/94	nd	nd	nd	nd	nd	1.3
845-8W	11/29/94	11/29/94	7563	nd	nd	1.0 **	2.6 **	32.7 **
REPORTING LIMITS			500	500	0.5	0.5	0.5	1.5

'nd' INDICATES NOT DETECTED AT LISTED REPORTING LIMITS.
' DIESEL ' INCLUDES THE C12 - C24 RANGE
' – ' INDICATES ANALYSIS NOT REQUESTED
' ** ' INDICATES THESE COMPOUNDS MAY BE COELUTING WITH OTHER COMPOUNDS IN THE DIESEL RANGE

ANALYSES PERFORMED IN TEG's DHS CERTIFIED MOBILE LAB (#1671)
ANALYSES PERFORMED BY: Mr. Leif Jonsson
DATA REVIEWED BY: Mr. Mark Jerpbak 12-20-94

Transglobal Environmental Geochemistry
PO Box 162580, Sacramento, CA 95816 Phone: (916) 736-3233 Fax: (916) 452-5806

APPENDIX G

PERMEABILITY TESTING RESULTS

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.94	/////////	//////
MOIST SOIL +TARE (g)	681.9	613.2	//////
DRY SOIL + TARE (g)	0.0	520.4	58.5
LOSS OF WATER (g)	90.2	92.8	//////
TARE (g)	173.3	109.4	51.1
DRY SOIL (g)	418.4 =	411.0 +	7.4
WET SOIL (g)	508.6	503.8	======
MOISTURE CONTENT (%)	21.5	22.6	
SAMPLE HEIGHT (in)	5.55	=========	
WET DENSITY (pcf)	118.1		
DRY DENSITY (pcf)	97.2		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Brown Sand

BORING NO.: MW-211-2
DEPTH: 5-5.5 ft

BY: PS
DATE START: 1-27-95
DATE FINISH: 2-1-95

UNIT No: C1

::

k = 6.0E-03 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-27-95 UNIT No:C1
BORING NO.: MW-211-2 BY:PS
SAMPLE
DESCRIPTION: Brown Sand

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln\left(\frac{Ho}{Hf}\right)$$

a = 0.08
L (in) = 5.55 = 14.10 cm.
D (in) = 1.94
A (sq. cm.)= 19.07

Reading No.	Reading	min.	Time	Date
1	17.46	0.00	9.00	1-31-9
2	15.02	0.01	9.00	
3	13.08	0.02	9.00	
4	11.55	0.03	9.00	
5	10.00	0.04	9.00	
> > > > > > > >	2nd. RUN	< < < < < < < <		
1A	17.70	0.00	12.00	
2A	15.60	0.01	12.00	
3A	13.74	0.02	12.00	
4A	11.68	0.03	12.00	
5A	10.18	0.05	12.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	6.4E-03
1-3	0	6.5E-03
1-4	0	6.3E-03
1-5	0	6.3E-03
2-3	0	6.7E-03
2-4	0	6.2E-03
2-5	0	6.3E-03
3-4	0	5.7E-03
3-5	0	6.2E-03
4-5	0	6.6E-03
>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	6.1E-03
1A-3A	0	6.3E-03
1A-4A	0	6.1E-03
1A-5A	0	5.9E-03
2A-3A	0	6.5E-03
2A-4A	0	6.1E-03
2A-5A	0	5.9E-03
3A-4A	0	5.8E-03
3A-5A	0	5.7E-03
4A-5A	0	5.6E-03

Stabilized Value of K is 6.0E-03 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.94	/////////	//////
MOIST SOIL +TARE (g)	656.0	672.0	//////
DRY SOIL + TARE (g)	0.0	586.3	60.3
LOSS OF WATER (g)	73.6	85.7	//////
TARE (g)	171.3	184.3	51.2
DRY SOIL (g)	411.2 =	402.0 +	9.2
WET SOIL (g)	484.8	487.7	======
MOISTURE CONTENT (%)	17.9	21.3	
SAMPLE HEIGHT (in)	5.29	=========	
WET DENSITY (pcf)	118.1		
DRY DENSITY (pcf)	100.2		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Clayey Sand

BORING NO.: MW-331-2S
DEPTH: 5-5.5 ft

BY: PS
DATE START: 1-27-95
DATE FINISH: 2-1-95

UNIT No: B

::

k = 3.2E-03 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-27-95 UNIT No:B
BORING NO.: MW-331-2S BY:PS
SAMPLE
DESCRIPTION: Clayey Sand

PRESSURE(PSI) 4.00

$$k = aL/2At \ ln(Ho/Hf)$$

a = 0.08
L (in) = 5.29 = 13.44 cm.
D (in) = 1.94
A (sq. cm.)= 19.07

Reading No.	Reading	min.	Time	Date
1	20.77	0.00	9.00	1-31-9
2	18.51	0.02	9.00	
3	16.52	0.04	9.00	
4	14.81	0.06	9.00	
5	13.23	0.08	9.00	
> > > > > > > > >	2nd. RUN	< < < < < < < < <		
1A	17.58	0.00	12.00	
2A	15.94	0.01	12.00	
3A	14.56	0.02	12.00	
4A	13.21	0.04	12.00	
5A	11.70	0.06	12.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	3.0E-03
1-3	0	2.9E-03
1-4	0	2.8E-03
1-5	0	2.7E-03
2-3	0	2.7E-03
2-4	0	2.7E-03
2-5	0	2.7E-03
3-4	0	2.6E-03
3-5	0	2.6E-03
4-5	0	2.6E-03
>>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	4.1E-03
1A-3A	0	3.8E-03
1A-4A	0	3.4E-03
1A-5A	0	3.2E-03
2A-3A	0	3.5E-03
2A-4A	0	3.2E-03
2A-5A	0	2.9E-03
3A-4A	0	2.9E-03
3A-5A	0	2.8E-03
4A-5A	0	2.7E-03

Stabilized Value of K is 3.2E-03 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.95	/////////	//////
MOIST SOIL +TARE (g)	622.3	616.1	//////
DRY SOIL + TARE (g)	0.0	537.8	52.3
LOSS OF WATER (g)	76.4	78.3	//////
TARE (g)	171.3	164.3	51.2
DRY SOIL (g)	374.6 =	373.5 +	1.1
WET SOIL (g)	451.0	451.8	======
MOISTURE CONTENT (%)	20.4	21.0	
SAMPLE HEIGHT (in)	4.91	=========	
WET DENSITY (pcf)	117.2		
DRY DENSITY (pcf)	97.3		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Olive-Gray Sand

BORING NO.: MW-331-2E
DEPTH: 5-5.5 ft

BY: PS
DATE START: 1-27-95
DATE FINISH: 2-1-95

UNIT No: E3

::

k = 3.5E-03 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-27-95 UNIT No:E3
BORING NO.: MW-331-2E BY:PS
SAMPLE
DESCRIPTION: Olive-Gray Sand

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 4.91 = 12.47 cm.
D (in) = 1.95
A (sq. cm.)= 19.27

Reading No.	Reading	min.	Time	Date
1	18.45	0.00	9.00	1-31-9
2	16.16	0.01	9.00	
3	14.34	0.03	9.00	
4	13.07	0.04	9.00	
5	11.80	0.05	9.00	
> > > > > >	> > >	2nd. RUN	< < < < < <	< < <
1A	18.32	0.00	12.00	
2A	16.42	0.01	12.00	
3A	14.50	0.03	12.00	
4A	12.90	0.04	12.00	
5A	11.60	0.06	12.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	4.4E-03
1-3	0	3.9E-03
1-4	0	3.9E-03
1-5	0	3.8E-03
2-3	0	3.5E-03
2-4	0	3.6E-03
2-5	0	3.6E-03
3-4	0	3.7E-03
3-5	0	3.7E-03
4-5	0	3.8E-03
>>>>>>	2nd.	RUN <<<<<<
1A-2A	0	3.7E-03
1A-3A	0	3.9E-03
1A-4A	0	3.6E-03
1A-5A	0	3.5E-03
2A-3A	0	4.0E-03
2A-4A	0	3.6E-03
2A-5A	0	3.4E-03
3A-4A	0	3.2E-03
3A-5A	0	3.2E-03
4A-5A	0	3.2E-03

Stabilized Value of K is 3.5E-03 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.93	/////////	//////
MOIST SOIL +TARE (g)	697.1	685.7	//////
DRY SOIL + TARE (g)	0.0	591.1	63.8
LOSS OF WATER (g)	86.1	94.6	//////
TARE (g)	170.7	163.9	50.6
DRY SOIL (g)	440.3 =	427.2 +	13.2
WET SOIL (g)	526.4	521.8	======
MOISTURE CONTENT (%)	19.6	22.1	
SAMPLE HEIGHT (in)	5.77	=========	
WET DENSITY (pcf)	118.8		
DRY DENSITY (pcf)	99.4		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Brown Sand

BORING NO.: MW-332-2
DEPTH: 5.5-6 ft

BY: PS
DATE START: 1-27-95
DATE FINISH: 2-1-95

UNIT No: F3

::

k = 5.4E-03 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-27-95 UNIT No:F3
BORING NO.: MW-332-2 BY:PS
SAMPLE
DESCRIPTION: Brown Sand

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 5.77 = 14.66 cm.
D (in) = 1.93
A (sq. cm.)= 18.87

Reading No.	Reading	min.	Time	Date
1	18.22	0.00	9.00	1-31-9
2	15.88	0.01	9.00	
3	14.05	0.02	9.00	
4	12.45	0.03	9.00	
5	10.80	0.05	9.00	
> > > > > >	> > > 2nd. RUN	< < < < < <	< < <	
1A	18.26	0.00	12.00	
2A	16.24	0.01	12.00	
3A	14.35	0.02	12.00	
4A	12.70	0.03	12.00	
5A	11.50	0.04	12.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	6.6E-03
1-3	0	6.1E-03
1-4	0	5.7E-03
1-5	0	5.8E-03
2-3	0	5.7E-03
2-4	0	5.3E-03
2-5	0	5.6E-03
3-4	0	5.0E-03
3-5	0	5.5E-03
4-5	0	6.0E-03
>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	5.4E-03
1A-3A	0	5.7E-03
1A-4A	0	5.6E-03
1A-5A	0	5.4E-03
2A-3A	0	6.0E-03
2A-4A	0	5.7E-03
2A-5A	0	5.4E-03
3A-4A	0	5.3E-03
3A-5A	0	5.1E-03
4A-5A	0	4.8E-03

Stabilized Value of K is 5.4E-03 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.95	/////////	//////
MOIST SOIL +TARE (g)	686.8	685.2	//////
DRY SOIL + TARE (g)	0.0	587.5	61.6
LOSS OF WATER (g)	79.6	97.7	//////
TARE (g)	171.9	162.8	51.1
DRY SOIL (g)	435.3 =	424.7 +	10.6
WET SOIL (g)	514.9	522.4	=======
MOISTURE CONTENT (%)	18.3	23.0	
SAMPLE HEIGHT (in)	5.92	=========	
WET DENSITY (pcf)	110.9		
DRY DENSITY (pcf)	93.8		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Brown Sand

BORING NO.: MW-511-2
DEPTH: 4-4.5 ft

BY: PS/TL
DATE START: 1-27-95
DATE FINISH: 2-1-95

UNIT No: D2

::

k = 5.6E-03 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-27-95 UNIT No:D2
BORING NO.: MW-511-2 BY:PS/TL
SAMPLE
DESCRIPTION: Brown Sand

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 5.92 = 15.04 cm.
D (in) = 1.95
A (sq. cm.)= 19.27

Reading No.	Reading	min.	Time	Date
1	18.02	0.00	9.00	1-31-9
2	15.56	0.01	9.00	
3	13.49	0.03	9.00	
4	11.80	0.04	9.00	
5	10.30	0.05	9.00	
> > > > > > > > 2nd. RUN < < < < < < < <				
1A	17.60	0.00	12.00	
2A	15.70	0.01	12.00	
3A	13.83	0.02	12.00	
4A	11.77	0.04	12.00	
5A	9.72	0.06	12.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	5.7E-03
1-3	0	5.9E-03
1-4	0	6.0E-03
1-5	0	6.2E-03
2-3	0	6.1E-03
2-4	0	6.2E-03
2-5	0	6.4E-03
3-4	0	6.2E-03
3-5	0	6.6E-03
4-5	0	7.0E-03
>>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	6.5E-03
1A-3A	0	6.2E-03
1A-4A	0	5.8E-03
1A-5A	0	5.5E-03
2A-3A	0	5.9E-03
2A-4A	0	5.6E-03
2A-5A	0	5.3E-03
3A-4A	0	5.3E-03
3A-5A	0	5.1E-03
4A-5A	0	5.0E-03

Stabilized Value of K is 5.6E-03 cm/sec

PTS Laboratories, Inc.

Geotechnical Services

8100 Secura Way • Santa Fe Springs • CA 90670
Phone (310) 907-3607 • Fax (310) 907-3610

August 28, 1995

Linda Schneider
Sequoia Analytical
819 W. Striker Ave., Suite 8
Sacramento, CA 95834

Re: PTS File: 25122

Dear Ms. Schneider:

Enclosed are final data for analysis conducted on samples submitted. All analyses were performed by applicable ASTM, EPA or API methodology. Samples will be retained for 30 days before disposal unless prior arrangements are made.

We appreciate the opportunity to be of service and trust these data will prove beneficial in the development of this project. Please feel free to call myself or Fred Adame, Supervisor, should you have any questions or require additional information.

Sincerely,

PTS Laboratories, Inc.

Larry Kunkel
District Manager

LAK:lg
encl.

PTS Laboratories, Inc.

CLIENT: SEQUOIA ANALYTICAL

FILE NO: 25122
DATE: AUGUST 1995
PROJ. NAME: N/A
PROJ. NO: N/A

PHYSICAL PROPERTIES DATA

(METHODOLOGY: ASTM D2216, API RP40, EPA 9100)

									CONDUCTED AT 25.0 PSI CONFINING STRESS			
							PORE FLUID SATURATION, % Pv		NATIVE STATE EFFECTIVE PERMEABILITY TO AIR	NATIVE STATE EFFECTIVE AIR CONDUCTIVITY	NATIVE STATE EFFECTIVE PERMEABILITY TO WATER	NATIVE STATE EFFECTIVE WATER CONDUCTIVITY
SAMPLE ID.	DEPTH, ft.	SAMPLE ORIENT. (1)	MOISTURE CONTENT (% wt)	DENSITY BULK (g/cc)	DENSITY GRAIN (g/cc)	EFFECTIVE POROSITY, % Vb	WATER (2)	CONTAMINANT (3)	(millidarcy)	(cm/s)	(millidarcy)	(cm/s)
S5080977	N/A	V									563	6.26E-04
S5080980	N/A	V									195	2.17E-04

(1) SAMPLE ORIENTATION:
H = HORIZONTAL
V=VERTICAL

(2) 0.9986 gm/cc USED TO CALCULATE WATER SATURATION
(3) 0.7500 gm/cc USED TO CALCULATE HYDROCARBON SATURATION
ND = NOT DETECTED

Vb = BULK VOLUME, cc
Pv = PORE VOLUME, cc

ERM-West, Inc.

CHAIN OF CUSTODY RECORD

NO: 1213

455 Capitol Mall, Suite 800 • Sacramento, CA • 95814 • (916) 444-9378 • Fax (916) 444-5313

Page 1 of 1

PROJECT #	PROJECT NAME
1970.15.02	NAVY - FISC

SAMPLER: (PRINT NAME) BRUCE A. LEWIS

(SIGNATURE) Bruce A. Lewis

RECEIVING LABORATORY: SEQUOIA ANALYTICAL

SAMPLE I.D.	DATE	TIME	COMP	GRAB	SAMPLING METHOD	PRESERVATIVE	ICE (Y/N)	SAMPLING VOLUME	# OF CONTAINERS	MATRIX: SOIL	MATRIX: WATER	MATRIX: GAS	REQUESTED PARAMETERS: TPH GASOLINE w/ BTEX MODIFIED 8015 + 8020	REQUESTED PARAMETERS: TPH DIESEL - MOD 8015	REQUESTED PARAMETERS: TOTAL LEAD (CCR) 7420	REQUESTED PARAMETERS: PERMEABILITY	REQUESTED PARAMETERS: TPH - 418.1	REQUESTED PARAMETERS: CORROSIVITY, IGNITABILITY, REACTIVITY	REQUESTED PARAMETERS: BTEX 8020	REQUESTED PARAMETERS:	REQUESTED PARAMETERS:	REQUESTED PARAMETERS:	REQUESTED PARAMETERS:
331N-MW2	8/16/95	1515		✓	SS	NA	Y		2	X			X	X	X					5508 09716			A,B
331N-MW2P	8/16/95	1530		✓	SS	NA	Y		1	X						X					0977		
331N-MW3	8/17/95	0815		✓	SS	NA	Y		2	X			X	X	X						0978		A,B
334-MW2	8/17/95	1310		✓	SS	NA	Y		2	X			X	X	X						0979		
334-MW2P	8/17/95	1320		✓	SS	NA	Y		1	X						X					0980		
334-MW3	8/17/95	1600		✓	SS	NA	Y		2	X			X	X	X						0981		A,B
B20391	8/18/95	0800	✓		COMP	NA	Y		2	X					X		X	X	X		0982		

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY	DATE	TIME
Bruce A. Lewis	8/16/95	1545	Rebecca Maynard	8/16/95	1545
Rebecca Maynard	8/18/95	4:15	John Yowell	8/18/95	1615
John Yowell	8/18/95	1630	Stacy Adams	9/18/95	1630

REMARKS ON SAMPLE RECEIPT

☐ BOTTLE INTACT ☐ CUSTODY SEALS ☐ CHILLED
☐ PRESERVED ☐ SEALS INTACT ☐ SEE REMARKS

ERM REMARKS

FIELD REMARKS

331N-MW2: 3.0'-4.5' TPH, BTEX; PD
331N-MW2P: 10'
331N-MW2: 3.5-4.0'
332-MW2: 3.5-4.0
332-MW2P: 9-10'
332-MW3: 3.5'

SEND REPORT TO: BILL SPONG - SACRAMENTO

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

PTS Laboratories

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☒ 819 West Striker Ave. • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☐ 1900 Bates Ave., Suite LM • Concord, CA 94520 • (510) 686-9600 FAX (510) 686-9689

Company Name: Sequoia Analytical	Project Name:
Address: 819 W. Striker Ave. Ste 8	Billing Address (if different):
City: Sacramento State: CA Zip Code: 95834	
Telephone: 916-921-9600 FAX #: 916-921-0100	P.O. #:
Report To: Linda Schneider Sampler:	QC Data: ☐ Level A (Standard) ☐ Level B ☐ Level C ☐ Level D

Turnaround Time: ☐ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours Standard TAT ☒

☐ Drinking Water ☐ Waste Water ☒ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	Permeability to H2O	Comments
1. 55080977	8-16-95	S	1	core		X	Vertical Test
2. ↓ 0980	8-17-95	↓	↓	↓		X	↓
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

Pink - Client
Yellow - Sequoia
White - Sequoia

Relinquished By: Stacy O'Mara	Date: 8/21/95	Time: 1600	Received By: UPS-Overnight	Date:	Time:
Relinquished By:	Date:	Time:	Received By: Lisa Fuentes	Date: 8/22/95	Time: 11:00AM
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☒ Yes ☐ No Method of Shipment UPS-Overnight

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-25-95 UNIT No:E4
BORING NO.: 750-MW-1 BY:PS
SAMPLE
DESCRIPTION: Brown Sand (frozen)

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 4.48 = 11.38 cm.
D (in) = 1.93
A (sq. cm.)= 18.87

Reading No.	Reading	min.	Time	Date
1	17.75	0.00	1.00	1-27-9
2	16.97	0.04	1.00	
3	16.30	0.09	1.00	
4	15.76	0.12	1.00	
5	15.23	0.16	1.00	
> > > > > > > > >	2nd. RUN	< < < < < < < < <		
1A	18.23	0.00	2.00	
2A	16.90	0.08	2.00	
3A	15.83	0.17	2.00	
4A	14.95	0.25	2.00	
5A	14.11	0.33	2.00	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	4.3E-04
1-3	0	4.0E-04
1-4	0	3.9E-04
1-5	0	3.9E-04
2-3	0	3.8E-04
2-4	0	3.7E-04
2-5	0	3.8E-04
3-4	0	3.7E-04
3-5	0	3.8E-04
4-5	0	4.0E-04
>>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	3.7E-04
1A-3A	0	3.4E-04
1A-4A	0	3.2E-04
1A-5A	0	3.1E-04
2A-3A	0	3.1E-04
2A-4A	0	3.0E-04
2A-5A	0	2.9E-04
3A-4A	0	2.8E-04
3A-5A	0	2.8E-04
4A-5A	0	2.8E-04

Stabilized Value of K is 3.1E-04 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.93	////////	//////
MOIST SOIL +TARE (g)	554.3	479.3	//////
DRY SOIL + TARE (g)	0.0	423.4	59.6
LOSS OF WATER (g)	56.8	55.9	//////
TARE (g)	173.2	108.8	49.9
DRY SOIL (g)	324.3 =	314.6 +	9.7
WET SOIL (g)	381.1	370.5	======
MOISTURE CONTENT (%)	17.5	17.8	
SAMPLE HEIGHT (in)	4.48	=========	
WET DENSITY (pcf)	110.8		
DRY DENSITY (pcf)	94.3		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Brown Sand (frozen)

BORING NO.: 750-MW-1
DEPTH: 4-4.5 ft

BY: PS
DATE START: 1-25-95
DATE FINISH: 1-28-95

UNIT No: E4

::

k = 3.1E-04 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA SHEET | 1/2

	BEFORE TEST	AFTER TEST: SPECIMEN PORTION	AFTER TEST: WASH
SAMPLE DIAMETER (in)	1.91	/////////	//////
MOIST SOIL +TARE (g)	369.0	532.3	//////
DRY SOIL + TARE (g)	0.0	405.2	31.6
LOSS OF WATER (g)	127.7	127.1	//////
TARE (g)	0.0	164.3	31.2
DRY SOIL (g)	241.3 =	240.9 +	0.4
WET SOIL (g)	369.0	368.0	======
MOISTURE CONTENT (%)	52.9	52.8	
SAMPLE HEIGHT (in)	4.54	=========	
WET DENSITY (pcf)	108.1		
DRY DENSITY (pcf)	70.7		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Gray Clay

BORING NO.: 842-MW-1
DEPTH: 4.5-5 ft

BY: PS/TL
DATE START: 1-25-95
DATE FINISH: 1-28-95

UNIT No: B

::

k = 6.2E-07 cm/sec

2.12 x 10^-3

GPD/ft^2

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-25-95 UNIT No:B
BORING NO.: 842-MW-1 BY:PS/TL
SAMPLE
DESCRIPTION: Gray Clay

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 4.54 = 11.53 cm.
D (in) = 1.91
A (sq. cm.)= 18.49

Reading No.	Reading	min.	Time	Date
1	19.28	0.00	11.07	1-27-9
2	18.69	17.00	11.24	
3	17.15	72.00	12.19	
4	16.76	87.00	12.34	
5	16.39	102.00	12.49	
> > > > > > > > >	2nd. RUN	< < < < < < < < <		
1A	16.39	0.00	12.49	
2A	16.01	15.00	13.04	
3A	15.69	30.00	13.19	
4A	15.33	45.00	13.34	
5A	14.92	62.00	13.51	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	17	7.6E-07
1-3	72	6.8E-07
1-4	87	6.7E-07
1-5	102	6.6E-07
2-3	55	6.5E-07
2-4	70	6.5E-07
2-5	85	6.4E-07
3-4	15	6.4E-07
3-5	30	6.3E-07
4-5	15	6.2E-07
>>>>>> 2nd. RUN <<<<<<		
1A-2A	15	6.5E-07
1A-3A	30	6.1E-07
1A-4A	45	6.2E-07
1A-5A	62	6.3E-07
2A-3A	15	5.6E-07
2A-4A	30	6.0E-07
2A-5A	47	6.2E-07
3A-4A	15	6.4E-07
3A-5A	32	6.5E-07
4A-5A	17	6.6E-07

Stabilized Value of K is 6.2E-07 cm/sec

KLEINFELDER PERMEABILITY TEST DATA SHEET 1/2

	BEFORE TEST	AFTER TEST SPECIMEN PORTION	AFTER TEST WASH
SAMPLE DIAMETER (in)	1.94	/////////	//////
MOIST SOIL +TARE (g)	716.2	694.3	//////
DRY SOIL + TARE (g)	0.0	637.5	57.9
LOSS OF WATER (g)	64.2	56.8	//////
TARE (g)	169.5	162.8	50.1
DRY SOIL (g)	482.5 =	474.7 +	7.7
WET SOIL (g)	546.7	531.5	======
MOISTURE CONTENT (%)	13.3	12.0	
SAMPLE HEIGHT (in)	5.50	=========	
WET DENSITY (pcf)	128.1		
DRY DENSITY (pcf)	113.1		

JOB: Chromolab - ERM
JOB No: 10-2305-49

SAMPLE DESCRIPTION: Gravelly Clay (frozen)

BORING NO.: 845-MW-3
DEPTH: 4-4.5 ft

BY: PS
DATE START: 1-25-95
DATE FINISH: 1-28-95

UNIT No: F3

::

k = 3.0E-05 cm/sec

KLEINFELDER | PERMEABILITY TEST DATA | 2/2

JOB: Chromolab - ERM
JOB No: 10-2305-49
DATE STARTED: 1-25-95 UNIT No:F3
BORING NO.: 845-MW-3 BY:PS
SAMPLE
DESCRIPTION: Gravelly Clay (frozen)

PRESSURE(PSI) 4.00

$$k = \frac{aL}{2At} \ln(Ho/Hf)$$

a = 0.08
L (in) = 5.50 = 13.97 cm.
D (in) = 1.94
A (sq. cm.)= 19.07

Reading No.	Reading	min.	Time	Date
1	16.80	0.00	1.01	1-27-9
2	16.48	0.20	1.01	
3	16.15	0.39	1.01	
4	15.81	0.60	1.01	
5	15.49	0.78	1.02	
> > > > > >	> > > 2nd. RUN	< < < < < <	< < <	
1A	17.98	0.00	2.10	
2A	17.60	0.33	2.10	
3A	17.26	0.67	2.11	
4A	16.88	1.00	2.11	
5A	16.59	1.33	2.11	

Range Ho-Hf	t (min)	k (cm/sec)
1-2	0	4.6E-05
1-3	0	4.9E-05
1-4	1	5.0E-05
1-5	1	5.1E-05
2-3	0	5.2E-05
2-4	0	5.2E-05
2-5	1	5.2E-05
3-4	0	5.1E-05
3-5	0	5.2E-05
4-5	0	5.3E-05
>>>>>> 2nd. RUN <<<<<<		
1A-2A	0	3.1E-05
1A-3A	1	3.0E-05
1A-4A	1	3.1E-05
1A-5A	1	2.9E-05
2A-3A	0	2.9E-05
2A-4A	1	3.1E-05
2A-5A	1	2.9E-05
3A-4A	0	3.3E-05
3A-5A	1	2.9E-05
4A-5A	0	2.5E-05

Stabilized Value of K is 3.0E-05 cm/sec

ERM-West

2001 "P" Street, Suite 200 • Sacramento, CA • 95814 • (916) 444-9378

D. _____ Weather _____ Page __ : ___

20074 Chain of Custody Record

Job #	1970.06.02
Job Location	FISC ORIND
Sampler (signature)	WAE
Printed name	WAE
Lab Report Recipient	W TONG
Telephone No.	916 441 6379
Receiving Lab	CHEMTECH
Address	

Sample ID#	Time	W=water S=soil	C=comp G=grab	Volume	Collection: Container type	Collection: ICED	Collection: Preservative	Collection: Sampling method	8015M Purgeables (Gasoline)	8015M Extractables (Diesel)	601 / 8010 Halogenated Hydrocarbons	602 / 8020 Aromatic Hydrocarbons (BTEX)	624-8240 Purgeables (Volatile Organics)	625-8270 BNAs & Pest. (Semivolatile Organics)	418.1 Tot. Recoverable Petroleum Hydrocarbons	Inorg: Metals	Other: Preserved HCl	Number of Containers	Remarks
✓ 750-MW-1	1025	S	G		GLASS	Y	HNO3											1	
✓ 742-MW-1	0920	↓	↓		↓	↓	↓										←	↓	
✓ 734-MW-2	1215	↓	↓		↓	↓	↓												

Precautions: Conc: ☐ Lo ☐ Med ☐ Hi | Ship Via | Total Number of Containers:

Sample Relinquished By	Date	Time	Received By	Date	Time	Reason for Transfer (List Shipping Bill Number)
WA Tran Company	1-9-95	1500	Company ERM	1/12/95	1524	
Company			Company CHEMTECH	1/12/95	1527	

LABORATORY—Please Complete Lab sample custodian ☐ Samples Intact ☐ Samples at 4°C ☐ Samples not leaking ☐ # of containers matches C-of-C ☐ Container tags match C-of-C ☐ Cooler seals intact

Signature _____ Date _____ Time _____

Sample Disposition ☐ Return to Site ☐ Discard ☐ Hold ____ days

10.14.92 JJW