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NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

INTERMEDIATE MAINTENANCE FACILITY
FIELD INVESTIGATION REPORT
FINAL

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ABBREVIATIONS AND ACRONYMS
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ASTM	American Society of Testing and Materials
bgs	Below Ground Surface
BNA	Base Neutral/Acid Extractable Organic Compounds
$CaCl_2$	Calcium Chloride
Cal-EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CTO	Contract Task Order
DI	Deionized
DTSC	Department of Toxic Substances Control
DUP	Duplicate Sample
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
FIR	Field Investigation Report
HLA	Harding Lawson Associates
IMF	Intermediate Maintenance Facility
JMM	James M. Montgomery, Consulting Engineers, Inc.
M	Molar
MBAS	Methylene Blue Activated Substances
MCL	Maximum Contaminant Levels
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams Per Liter
mL	Milliliter
MSL	Mean Sea Level
NA	Not analyzed
NAS	Naval Air Station
NI	Not Ignitable
NR	Not Reported
NS	Not Submitted
pcf	Pounds Per Cubic Foot
POAM	Plan of Action and Milestones
ppm	Parts Per Million

ABBREVIATIONS AND ACRONYMS
(Page 2 of 2)

PRC	PRC Environmental Management, Inc.
RI/FS	Remedial Investigation/Feasibility Study
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TRPH	Total Recoverable Petroleum Hydrocarbons
TTLC	Total Threshold Limit Concentration
USCS	Unified Soil Classification System
VOC	Volatile Organic Compounds
WESTDIV	Department of the Navy, Western Division, Naval Facilities Engineering Command
WET	California Waste Extraction Test
µg/L	Micrograms Per Liter
µmhos/cm	Micromhos Per Centimeter

1.0 INTRODUCTION

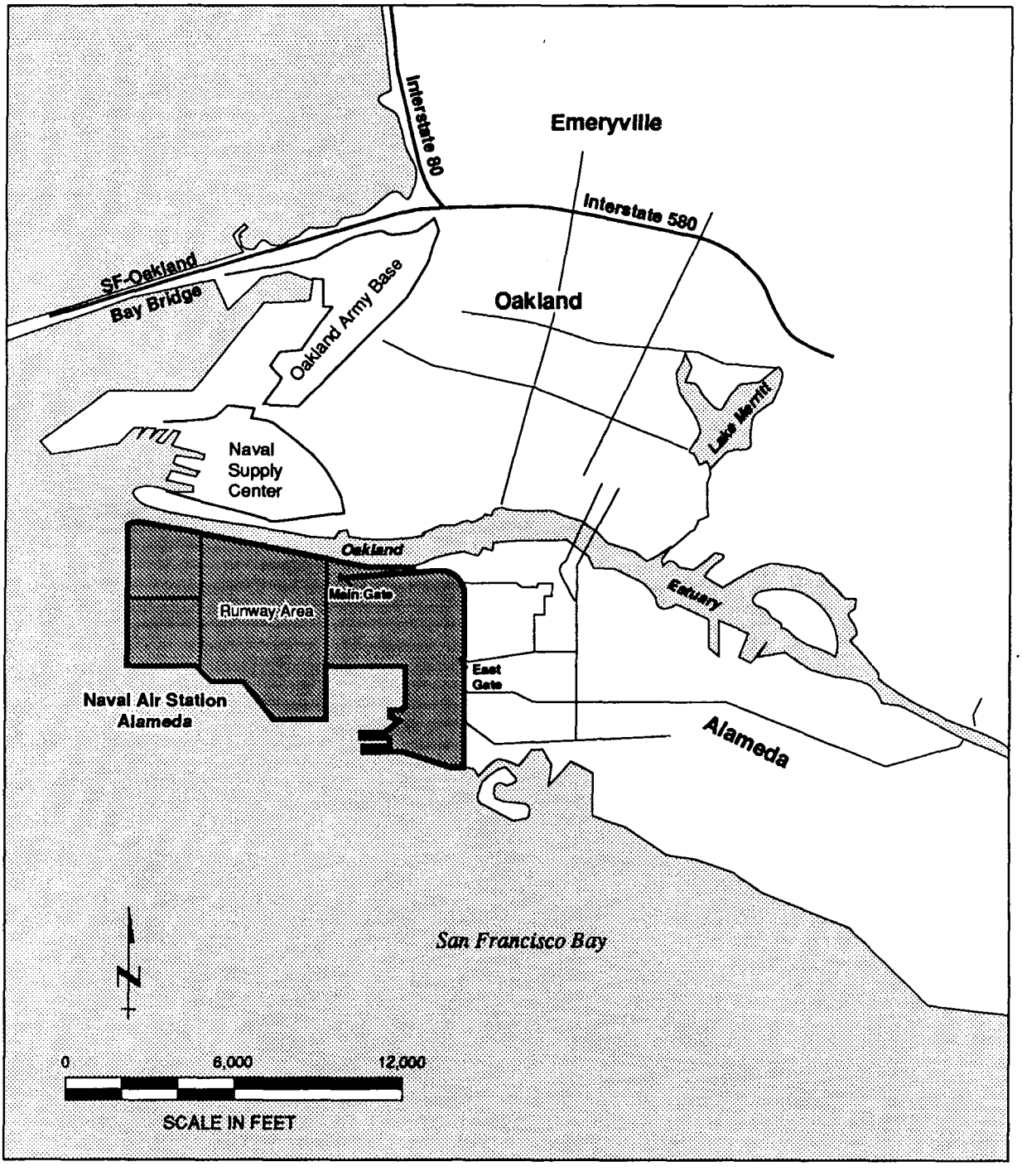
PRC Environmental Management, Inc. (PRC) received Contract Task Order (CTO) No. 0137 from the Department of the Navy, Western Division, Naval Facilities Engineering Command (WESTDIV); CTO No. 0137 directs PRC to prepare documents required for a removal action at the Intermediate Maintenance Facility (IMF) site at the Naval Air Station (NAS) Alameda (Figure 1-1). This request was initiated in response to a removal action issued to the Navy by the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC), due to the discovery of subsurface soils with low pH and high lead levels. WESTDIV requested that PRC review previous site investigation work, conduct an additional field investigation, and develop alternative conceptual plans of action and milestones (POAM) and an engineering evaluation/cost analysis (EE/CA) for conducting a removal action. This report addresses the results of a three-phased field investigation conducted at the IMF site to gather information sufficient for the generation of a POAM and EE/CA.

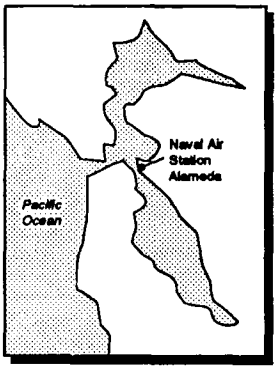
As PRC's Comprehensive Long-Term Environmental Action Navy (CLEAN) contract team member, James M. Montgomery Consulting Engineers, Inc. (JMM) performed the field investigation activities related to CTO No. 0137. This Draft Final IMF Field Investigation Report (FIR) documents the field and laboratory methods and presents the data generated by JMM during the field investigation. All activities were performed in accordance with the work plan and health and safety plan prepared by PRC and JMM (1991a, 1991b).

The organization of the FIR is designed to facilitate the presentation of each phase of investigation, refining the conceptual model of the site with the data collected from each field effort. Three sections follow this introduction. Section 2.0 provides a brief background on NAS Alameda and the IMF site. Section 3.0 describes field methods used during the three-phased field investigation, the site geology, and analytical results of the samples collected during each field effort. Section 4.0 presents the conclusions and recommendations based on these results.

2.0 BACKGROUND

NAS Alameda is located at the west end of Alameda Island, in Alameda and San Francisco Counties, California (Figure 1-1). Alameda Island lies along the eastern side of San Francisco Bay, adjacent the city of Oakland. The air station occupies 2,634 acres and is approximately 2 miles long and 1 mile wide. Most of the eastern portion of the air station is developed with offices and industrial facilities; runways and support facilities occupy the western portion of the station.





NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
REGIONAL LOCATION MAP

FIGURE 1-1

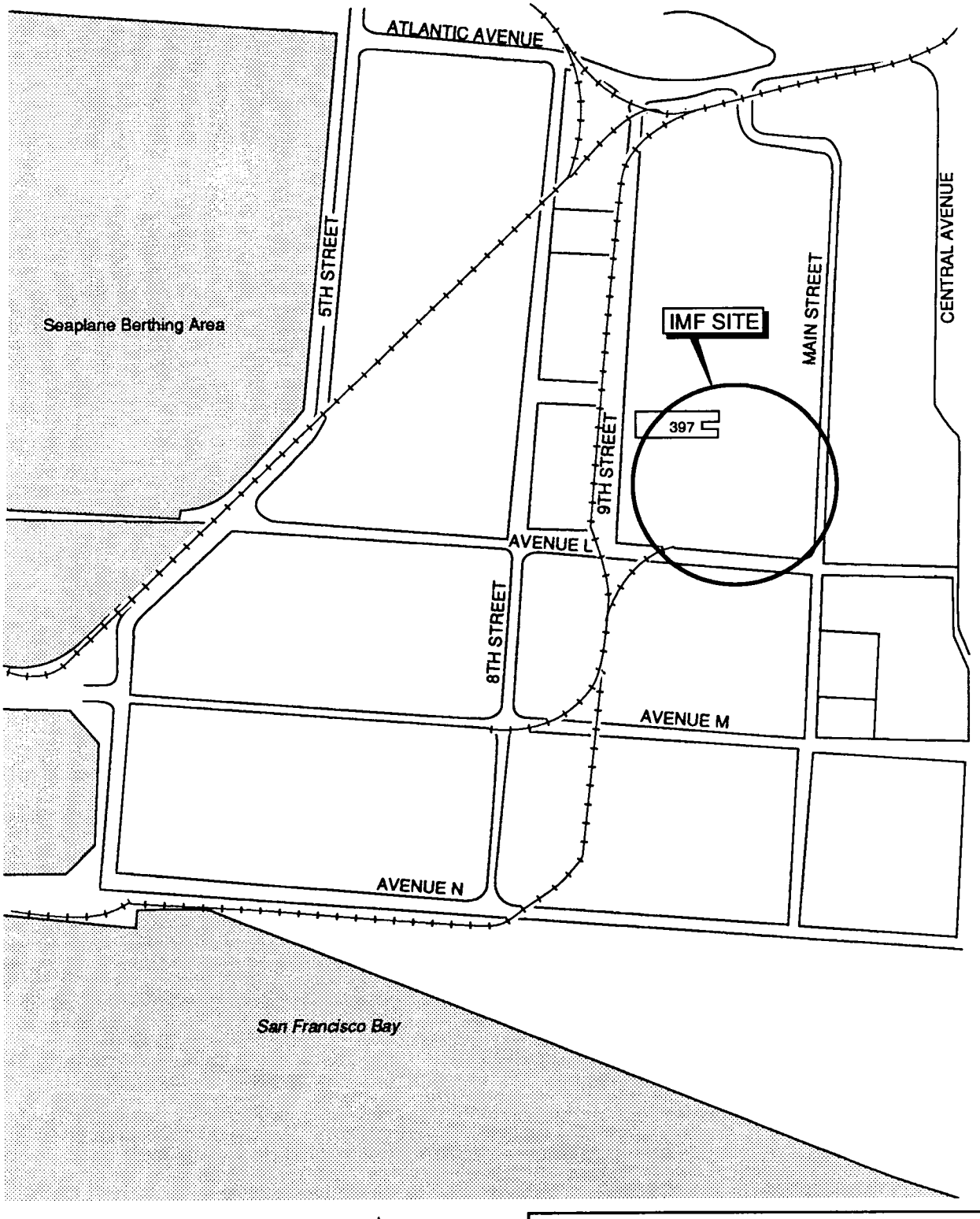
Originally a peninsula, the land that is now Alameda Island was isolated from the mainland in 1876, when a channel was cut through the peninsula's tip, linking San Leandro Bay with the main portion of San Francisco Bay. Dredging was conducted to deepen the canal and allow commercial and industrial traffic to and from the island's early industrial sites. These sites included a borax processing plant and an oil refinery, the Pacific Coast Oil Refinery.

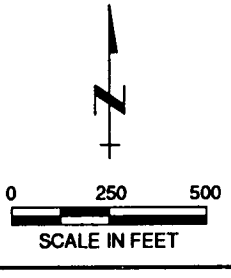
The U.S. Army acquired the site from the City of Alameda in 1930 and began construction activities in 1931. In 1936, the U.S. Navy acquired title to the land and began construction of the air station in response to the military buildup in Europe prior to World War II. After entry of the U.S. into the war in 1941, more land was acquired adjacent to the air station. Following the end of the war, the Navy returned NAS Alameda to its original primary mission of providing support for fleet aviation activities.

The IMF site at NAS Alameda is located as shown on Figure 2-1. The IMF site lies within the area formerly occupied by the Pacific Coast Oil Refinery. The refinery operated from 1879 to 1903, and refinery wastes and asphaltic residues were reportedly disposed of on the refinery property (Canonie, 1990). The U.S. Navy surfaced the area in the 1940s, and the later rupture of this surface was attributed to buildup of vapors from the refinery wastes (Canonie, 1990). It is reported that the U.S. Navy addressed the surface rupture problem by excavating a 30-square-foot area of material and pouring a concrete slab over the area (Canonie, 1990).

In 1989, the U.S. Navy began construction at the IMF site. During construction activities, petroleum odors and stained soil were encountered. Harding Lawson Associates (HLA) was contracted to investigate the extent of petroleum hydrocarbons present at the site (HLA, 1989). During the investigation, HLA drilled 18 soil borings (B-1 through B-18) and installed one groundwater monitoring well (MW-1) in the locations shown on Figure 2-2. Selected soil samples were analyzed for hydrocarbons, lead, and pH.

In HLA's boring B-7, a soil sample collected from a depth of 4.5 feet had a pH of 1.6 and contained lead at a concentration of 13,000 parts per million (ppm). All other soil samples collected from approximately the same depth interval throughout the site had pH values ranging from 7.0 to 9.2 and contained lead concentrations ranging from non-detectable to 140 ppm. Because HLA's investigation detected soils with low pH levels and high lead concentrations, the DTSC requested that the U.S. Navy perform a removal action in the vicinity of boring B-7. The presence of petroleum hydrocarbons in the site vicinity have been previously addressed in investigations conducted by HLA (1989) and Canonie (1990).





NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
IMF SITE LOCATION MAP

FIGURE 2-1

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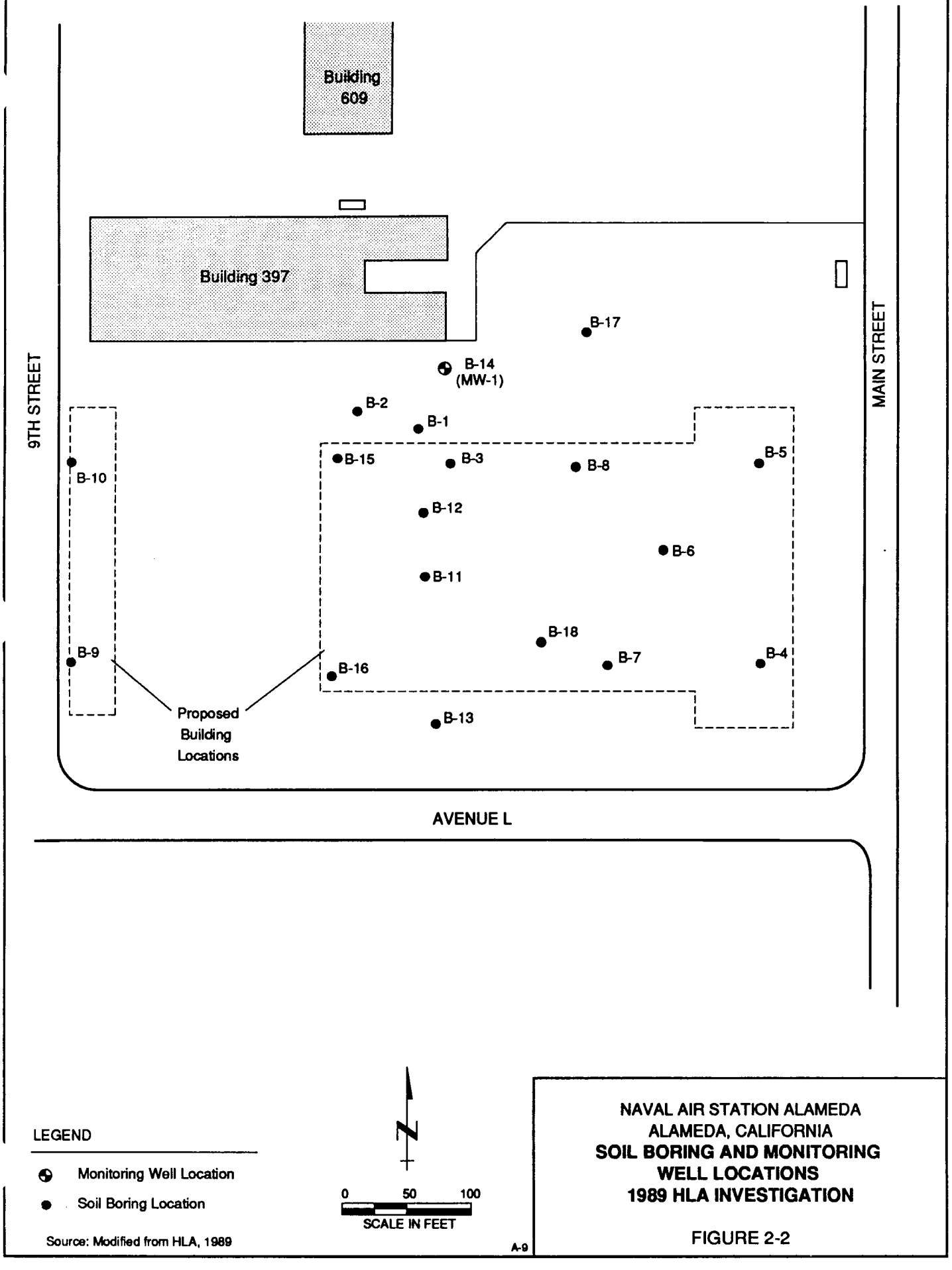


NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SOIL BORING AND MONITORING WELL LOCATIONS 1989 HLA INVESTIGATION

FIGURE 2-2

3.0 REMOVAL ACTION INVESTIGATION

The IMF field investigation was undertaken in response to the removal action issued by the DTSC. The purpose of the investigation was to delineate the area surrounding HLA's boring B-7 that contained soils with low pH and high lead levels. The field investigation was composed of three separate sampling phases to collect sufficient information to delineate and characterize the extent of contamination.

The methods used in the collection of soil samples and other field data during each phase of the investigation are summarized in the following sections. Analytical results from the sampling programs and the interpretation of the results are also presented. These methods are described in the March 14, 1991, work plan (PRC and JMM, 1991a). The U.S. Navy submitted the work plan to DTSC prior to the commencement of work.

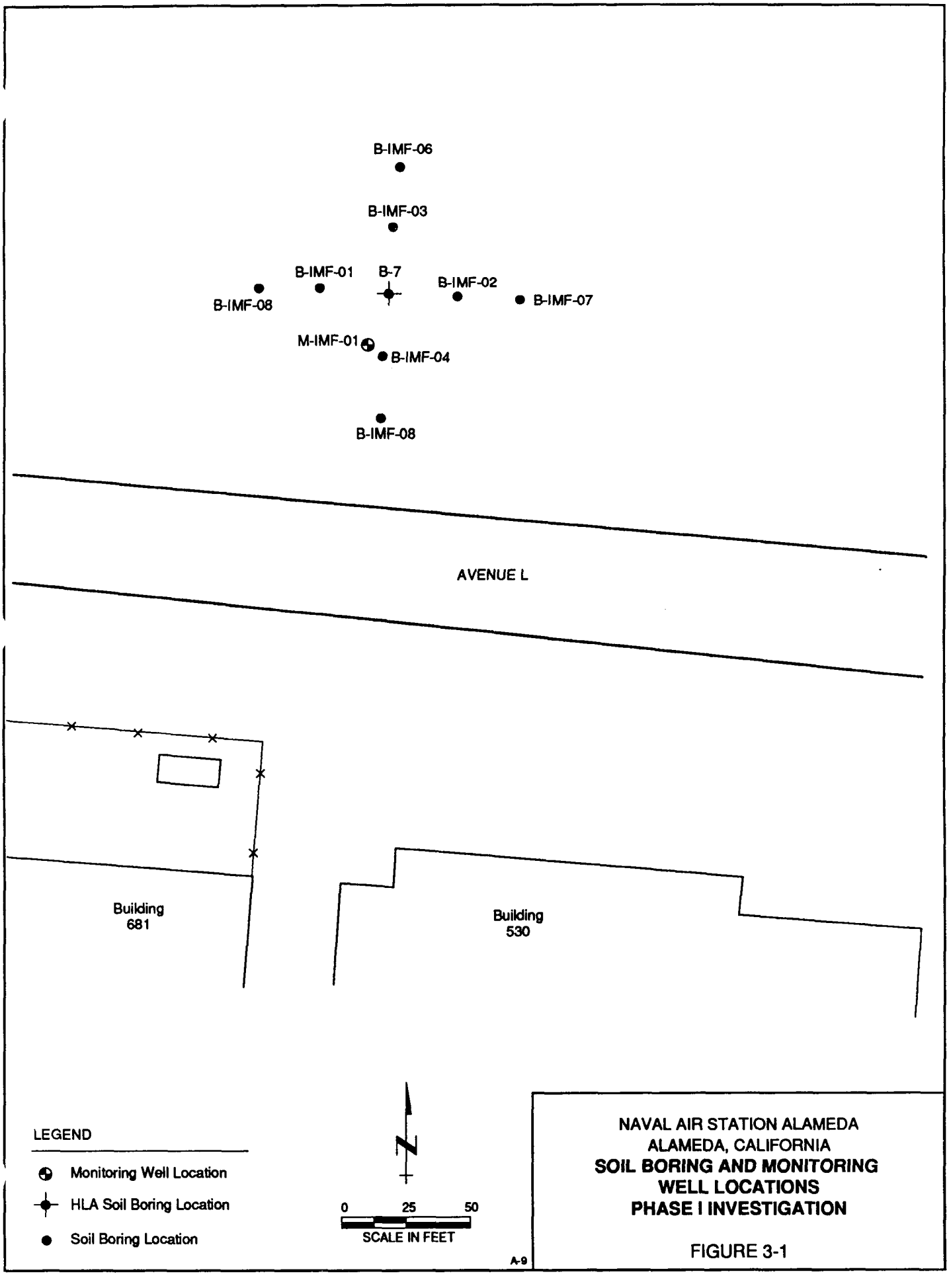
3.1 PHASE I INVESTIGATION METHODS

The Phase I investigation consisted of the drilling and sampling of eight shallow soil borings placed in the vicinity of HLA boring B-7 to delineate the extent of low pH, high lead soils. In addition, one monitoring well was drilled and installed to determine the impact of the soil contamination on water quality. The drilling and sampling methods for the Phase I investigation, as well as sample screening techniques and location surveying results, are presented in the following sections.

3.1.1 Soil Boring Drilling and Soil Sampling

Eight soil borings, B-IMF-01 through B-IMF-08, were drilled in the locations shown on Figure 3-1. All borings were advanced to a depth of 10 feet with a truck-mounted Mobile Drill B-40 drilling rig equipped with 6-inch outside diameter hollow stem augers. Soil samples were collected continuously from the ground surface to the total depth of each boring with a 2-inch inside diameter by 18-inch-long split-spoon sampler. The split-spoon sampler was advanced ahead of the augers into undisturbed soil with a 140-pound hammer dropped a distance of 30 inches. Soil samples are described on the boring log forms (Appendix A) using the Unified Soil Classification System (USCS).

Soil samples were collected for chemical analysis at the surface and at subsequent 2-foot intervals. A total of 47 soil samples and five duplicate samples were collected during the Phase I field effort. The samples were immediately removed from the split-spoon sampler and placed in laboratory-prepared glass containers. The containers were appropriately labeled and placed on ice pending shipment to the laboratory.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SOIL BORING AND MONITORING WELL LOCATIONS PHASE I INVESTIGATION

FIGURE 3-1

A portion of the soil from each chemical sampling interval was removed from the sampler and screened for pH and volatile organic compound (VOC) content. For field pH screening, a 4-ounce plastic vial was filled approximately half full with soil. The vial was then filled with deionized (DI) water, capped, and shaken. A pH reading of the fluid in the vial was recorded using pH paper. Samples were screened for VOC content by placing approximately 150 to 200 grams of soil in a sealed plastic bag. After approximately 10 minutes, the vapor in the bag was aspirated into a Photovac Microtip photoionization detector. The maximum reading of each sample is recorded on the boring logs (Appendix A).

All 47 soil samples plus 5 blind field duplicates (52 total) collected during the field effort were analyzed for laboratory pH using EPA Method 9040. The work plan for the Phase I investigation proposed that the two samples from each boring with the lowest field pH readings plus two duplicates (18 total) would be analyzed for total lead using the Contract Laboratory Program (CLP) Method. However, no soil samples from boring B-IMF-08 were submitted for the analysis of total lead because all field pH readings for boring B-IMF-08 were above a pH of 7.0. Two soil samples were selected for lead analysis from each of the other seven borings where field pH readings registered below 7.0. Upon the receipt of the total lead results, the seven soil samples with the highest total lead concentration were selected for analysis of soluble lead using the California Waste Extraction Test (WET) method. The three soil samples highest in total lead were also analyzed for leachable lead using the EPA Toxicity Characteristic Leaching Procedure (TCLP) method.

The three soil samples with the highest field-screened VOC concentrations were submitted for analysis of leachable VOCs by the TCLP method. On the basis of visual contamination (such as the presence of oily liquids in soil), three samples were selected for analysis of leachable base neutral/acid extractable organic compounds (BNA) by the TCLP method, and seven samples (six plus one duplicate) were selected for analysis of total recoverable petroleum hydrocarbons (TRPH) using U.S. Environmental Protection Agency (EPA) Method 418.1. The visual contamination criterion was also used to select two samples plus one duplicate for analysis of ignitability by EPA Method 1010.

A total of four soil samples from the eight soil borings were collected for geotechnical analysis. Geotechnical samples were collected by lining the split-spoon sampler with three 6-inch long brass sleeves. The collected samples were analyzed for moisture content (American Society of Testing and Materials [ASTM] D2937), dry density (ASTM D2937), and grain size (ASTM D422-63).

3.1.2 Soil Boring Backfilling

At the completion of drilling, the borings were backfilled with a cement grout containing approximately 5 percent powdered bentonite. Using a tremie pipe, the borings were backfilled from the bottom to the ground surface,

and a stainless steel bolt engraved with the boring identification was placed at the surface in the center of the grouted boring. Soil cuttings generated from the drilling activities were drummed and transferred to the temporary storage area near the landfills at NAS Alameda.

3.1.3 Monitoring Well Construction

At the completion of drilling, field log notes and field pH readings were reviewed to determine the appropriate placement of the monitoring well. Based on the field notes, the location of the monitoring well, M-IMF-01, was selected approximately 7.5 feet northwest of boring B-IMF-04. The monitoring well location was selected in close proximity to boring B-IMF-04 due to the low field pH readings recorded in that boring (field pH measurements of 1 and 3 at 4.6 feet and 8 feet, respectively). The monitoring well boring was drilled using 8-inch outside diameter hollow stem augers to a total depth of 14 feet. This depth was approximately 9 feet below groundwater, which was first encountered at 5 feet below ground surface. No soil samples were collected during the drilling of the monitoring well boring.

The monitoring well was constructed through the hollow stem augers. Well casing consisting of 2-inch diameter polyvinyl chloride (PVC) blank and 10 feet of well screen with 0.01-inch slots was placed in the augers. A filter pack consisting of Monterey #2/16 sand was poured around the well screen as the augers were incrementally removed from the borehole. The filter pack extends from the bottom of the borehole to 1 foot above the top of the screened interval. A 2-foot thick annular seal composed of 0.25-inch bentonite pellets was installed above the filter pack. Tap water was added to the borehole and the bentonite was allowed to hydrate for approximately 0.5 hours prior to completing the well. The remaining annular space was backfilled with cement grout containing approximately 5 percent powdered bentonite. A well construction diagram is included in Appendix A.

A 6-inch by 3-feet long protective steel casing was installed around the upper portion of the well casing. The well was completed at the surface with an expandable, locking well cap and a flush-mounted, traffic-rated Christy box. The surface completion is water-tight to prevent infiltration by precipitation and surface runoff.

3.1.4 Monitoring Well Development and Sampling

Well development was first attempted on July 26, 1991. A clear bailer was lowered to just below the water surface to check for the presence of floating product. Approximately 0.7 feet of black oily product was present in the well, which was removed using bailing techniques. Following product removal, the well was bailed dry, and groundwater removed from the well was relatively clear.

On August 9, 1991, a groundwater sample was collected from the well. A check for floating product identified that approximately 0.5 feet of product was present, which was bailed from the well prior to sampling. Samples for the analysis of general minerals (California Code of Regulations [CCR] Title 22 methods) and TRPH (EPA Method 418.1) were collected with a clean, disposable bailer and placed in laboratory-prepared containers. The containers were stored on ice and immediately shipped to the laboratory. On August 14, 1991, an additional groundwater sample was collected from the well for the analysis of dissolved metals (EPA Method 6010) and mercury (EPA Method 7470).

3.1.5 Soil Boring and Monitoring Well Location Surveys

Soil boring and the monitoring well locations were surveyed by Nolte Associates, California State License No. 6216, of Walnut Creek, California. All locations were surveyed vertically relative to United States Coast and Geodetic Survey mean low water and horizontally relative to the California Coordinate System, Zone 3, NAD 27. Survey data are summarized in Table 3-1.

3.2 PHASE I INVESTIGATION RESULTS

As discussed in Section 3.1, eight borings were drilled and soil samples were submitted for analysis of pH; total, soluble, and leachable lead; TRPH; leachable VOCs and BNAs; ignitability; and geotechnical parameters including moisture content, dry density, and grain size. One monitoring well was installed, and a groundwater sample collected from the monitoring well was analyzed for TRPH, dissolved metals, and mercury. Copies of the boring logs and the well construction diagram are included as Appendix A. Chemical analytical reports and geotechnical laboratory reports are included as Appendices B and C, respectively. Findings and analytical results are discussed below.

3.2.1 Site Geology

Near-surface geologic information was collected in the Phase I investigation as part of the continuous soil sampling performed during the drilling of soil borings. The boring logs developed during the drilling activities were reviewed to assess site-specific lithology at the IMF site. The IMF site is underlain by fill material dredged from the San Francisco Bay and/or Oakland Inner Harbor. The fill material in the IMF site area is a minimum of 10 feet thick (the total depth investigated) and consists of clay, clayey to silty sand, and fine- to medium-grained sand. Grain size analyses performed on four soil samples confirmed the field classification of soils (Table 3-2). Shell fragments, wood, petroleum coke, tar-like material, and paper were present in soil core samples. Black, oily soils were present in all but two of the eight borings (B-IMF-05 and B-IMF-08).

TABLE 3-1

SUMMARY OF SURVEY DATA
PHASE I INVESTIGATION

Point I.D.	Elevation (ft. above MSL)	Northing	Easting
M-IMF-01	12.69	469394.00783	1481964.49210
B-IMF-01	14.01	469364.85453	1481968.94545
B-IMF-02	13.07	169388.82881	1481969.73140
B-IMF-03	12.81	469411.73021	1482022.43726
B-IMF-04	12.73	469413.11216	1481998.03692
B-IMF-05	13.17	469415.86331	1481945.45461
B-IMF-06	13.21	469416.65136	1481920.97754
B-IMF-07	13.01	469439.63441	1481973.59581
B-IMF-08	13.07	469464.29356	1481975.80805

Notes:
Elevation for point M-IMF-01 is top of casing.

Northing and easting data relative to California Coordinate System, Zone 3, NAD 27.

TABLE 3-2

GEOTECHNICAL ANALYTICAL RESULTS
PHASE I INVESTIGATION

Sample I.D.	Percent Moisture	Dry Density (pcf)	USCS Classification	Description
B-IMF-01-06	28.4	86.66	SC	Clayey fine sand
B-IMF-02-04	13.4	102.16	SC	Clayey fine sand
B-IMF-05-05	10.8	95.27	SP	Fine sand
B-IMF-08-08	42.1	77.53	CL	Silty clay

Notes:
pcf - Pounds per cubic foot
USCS - United Soil Classification System

3.2.2 Soil Results

The black, oily soil encountered in six of the soil borings appears to be similar to the material described in HLA's 1989 report. The black material was present in the HLA boring B-7 in the interval which contained the pH of 1.6 and lead concentration of 13,000 ppm. Because the oily soils in the HLA investigation appeared to be related to the presence of low pH and high lead levels, oily soil was screened using field pH measurements wherever it was encountered during the Phase I investigation. In three boreholes, B-IMF-01 at 8.5 feet, B-IMF-04 at 4.5 feet, and B-IMF-06 from 4 to 10 feet, field pH screening indicated the oily soils had a lower pH than soils in the same boring that were not oily. However, oily soils did not consistently have lower pH values than soils that did not contain oil. In addition, laboratory-measured pH values were not consistently lower for samples collected from oily intervals. The field pH readings may have been affected by the presence of hydrogen sulfide in the soil, or the pH paper used for the field pH readings may not be accurate if used to measure aqueous solutions with low ionic strengths.

Field and laboratory pH results for the Phase I investigation are summarized in Table 3-3. A total of 52 samples were submitted to the laboratory to be analyzed for pH, and seven of the 52 samples had pH values below 7.0. The lowest pH value measured in the laboratory (pH of 4 units) was in boring B-IMF-01 at a depth of 8 feet. This sample was collected from an interval containing black oily soil. The remaining samples with laboratory-measured pH values below 7.0 were collected from intervals in which no black oily material was visible. As indicated in Table 3-3, there does not appear to be a consistent correlation between depth and pH values. Additionally, field and laboratory pH values were not mutually consistent in the soil samples.

A total of 18 soil samples were analyzed for total lead during the Phase I investigation. As shown in Table 3-4, total lead concentrations ranged from 3.3 to 602 milligrams per kilogram (mg/kg), well below the state total threshold limit concentration (TTLC) of 1,000 mg/kg. However, four soil samples (B-IMF-01 at 8 feet, B-IMF-04 at 8 feet, B-IMF-06 at 4 feet, and B-IMF-07 at 10 feet) contained lead in excess of ten times the state soluble threshold limit concentration (STLC) of 5 milligrams per liter (mg/L). WET analyses were performed on these samples as well as on three other samples with lead levels approaching ten times the STLC, including B-IMF-01 at 2 feet, the duplicate sample for B-IMF-06 at 4 feet, and B-IMF-07 at 8 feet. As discussed previously in Section 3.1.1, TCLP analyses for lead were proposed for the three samples with the highest total lead levels. Samples B-IMF-01 at 8 feet, B-IMF-04 at 8 feet, and B-IMF-06 at 4 feet were submitted for the TCLP lead analysis.

No samples analyzed using the WET method yielded soluble lead concentrations in excess of the STLC of 5 mg/L. No samples analyzed using TCLP method for lead yielded leachable lead concentrations in excess of the 5 mg/L TCLP action level for lead.

TABLE 3-3

SOIL ANALYTICAL RESULTS - pH
PHASE I INVESTIGATION

Sample I.D.	Sample Depth (feet)					
	0	2	4	6	8	10
B-IMF-01 - Lab	9	6	7.8	8.2	4	6.8
B-IMF-01 - Field	7	5	7	7	4	6.5
B-IMF-02 - Lab	8.4	9	7.4	7.4	7.6	NS
B-IMF-02 - Field	7	8	7	5	5	7
B-IMF-03 - Lab	7.6	8.4	8.4	7.8	5.2	10
B-IMF-03 - Field	7	6	5	5	4	4
B-IMF-04 - Lab	8.9	6.8	8.2	8.1 (8.9)	8.2	7.2
B-IMF-04 - Field	11	8	7	6	3	6
B-IMF-05 - Lab	9	9.1	7.5	9.2 (8.1)	8.5	8.4
B-IMF-05 - Field	7	7	7	1	8	7
B-IMF-06 - Lab	5.4	10.1	9 (8.6)	9.2	8.3	7
B-IMF-06 - Field	11	7	1	5	5	4
B-IMF-07 - Lab	6.3	9.1	9.4	9.4	7.2	6.2
B-IMF-07 - Field	7	7	7	6	5	4
B-IMF-08 - Lab	9.1	9.4	9.4	8.2 (9.4)	8.7	7.5 (7.3)
B-IMF-08 - Field	7	7	7	7	7	7

Notes:
NS = Not submitted to laboratory
Duplicate results in parentheses.
Laboratory pH measurements analyzed by EPA Method 9040

TABLE 3-4

SOIL ANALYTICAL RESULTS - LEAD
PHASE I INVESTIGATION

Sample I.D.	pH (EPA Method 9040) (units)	Total Lead (CLP Method) (mg/kg)	Soluble Lead (WET Method) (mg/L)	Leachable Lead (TCLP Method) (mg/L)
B-IMF-01-02	6	48.1	0.238	NA
B-IMF-01-08	4	148	3.830	2.240
B-IMF-01-10	6.8	21.4	NA	NA
B-IMF-02-06	7.4	27.2	NA	NA
B-IMF-02-08	7.6	3.3	NA	NA
B-IMF-03-04	8.4	15.8	NA	NA
B-IMF-03-08	5.2	9.67	NA	NA
B-IMF-03-10	10	3.69	NA	NA
B-IMF-04-06	8.1	9.95	NA	NA
B-IMF-04-06 (DUP)	8.9	6.1	NA	NA
B-IMF-04-08	8.2	63.5	0.258	0.359
B-IMF-05-00	9	13.7	NA	NA
B-IMF-05-06	9.2	5.02	NA	NA
B-IMF-06-04	9	602	3.620	2.060
B-IMF-06-04 (DUP)	8.6	41.3	1.540	NA
B-IMF-06-10	7	3.85	NA	NA
B-IMF-07-08	7.2	30.4	0.916	NA
B-IMF-07-10	6.2	52.3	0.717	NA

Notes:
WET - Waste Extraction Test
TCLP - Toxicity Characteristic Leaching Procedure
mg/kg - Milligrams per kilogram
mg/L - Milligrams per liter
Soluble and leachable lead results reported from laboratory in micrograms per liter (µg/L).
NA - Not analyzed

As described in Section 3.1.1, soil samples were selected for the analysis of leachable VOCs on the basis of the screening techniques used in the field. The three samples submitted for analysis included the 8-foot sample from B-IMF-01, the 10-foot sample from B-IMF-06, and the 10-foot sample from B-IMF-07. The results from the TCLP method of analysis for VOCs indicated that the sample from B-IMF-01 at 8 feet contained 2.9 micrograms per liter (µg/L) of leachable benzene. No other leachable VOCs were identified. A summary of the results is presented in Table 3-5.

Visual identification of oil-stained soil was the criterion used to select samples for the analysis of BNAs, TRPH, and ignitability. The three samples selected for BNA analysis using the TCLP method did not contain levels of leachable BNAs above the laboratory reporting limits. The five samples and one duplicate sample analyzed for TRPH all contained levels above the laboratory reporting limit, with concentrations ranging from 37.8 to 71,200 mg/kg. These samples were collected from intervals with the most obvious indications of contamination to provide indications of "worst case" hydrocarbon contamination. Analytical results on the ignitability of three samples (two samples and one duplicate) indicated that the samples were not ignitable below 60 degrees Centigrade. Table 3-5 summarizes the analytical results for BNAs, TRPH, and ignitability.

3.2.3 Groundwater Results

Groundwater analytical results are summarized in Table 3-6. General mineral results indicate the groundwater is brackish. Due to matrix interferences, no results for methylene blue active substances were provided by the laboratory. TRPH was detected at a concentration of 350 mg/L in the groundwater sample, but lead was not detected above the laboratory reporting limit. Antimony, nickel, and vanadium were detected at concentrations in excess of their respective EPA maximum contaminant levels (MCL). No information on the background concentrations of the detected constituents in groundwater is available, and it is not known whether they are related to the hydrocarbons present at the site.

3.3 PHASE II INVESTIGATION METHODS

Due to discrepancies between field pH screening results and laboratory results for two samples collected in the Phase I investigation, the DTSC requested that additional pH sampling be performed. The DTSC expressed a concern that the low pH values measured in the field (using pH paper) at boring B-IMF-06 at 4 feet were accurate, and that the pH of the sample had changed during shipment to the laboratory. To evaluate the consistency in field and laboratory pH measurements, a Phase II field investigation was designed to perform a pH study. The study consisted of the collection of selected surface soil samples using a stainless steel sampling spoon. Samples were

TABLE 3-5

SOIL ANALYTICAL RESULTS - ORGANIC COMPOUNDS AND IGNITABILITY
PHASE I INVESTIGATION

Sample I.D. Depth (feet)	B-IMF-01 8	B-IMF-02 4	B-IMF-03 4	B-IMF-04 6	B-IMF-04 6 (DUP)	B-IMF-05 0	B-IMF-06 4	B-IMF-06 4 (DUP)	B-IMF-06 10	B-IMF-07 10
TRPH (mg/kg-dry) **EPA Method 418.1**	19,700	34,100	1,470	38	-	4,230	71,200	2,820	-	-
VOCs (µg/L) **TCLP Method**										
Benzene	2.9	-	-	-	-	-	-	-	<1.0	<1.0
Carbon Tetrachloride	<2.6	-	-	-	-	-	-	-	<2.6	<2.6
Chlorobenzene	<1.4	-	-	-	-	-	-	-	<1.4	<1.4
Chloroform	<2.5	-	-	-	-	-	-	-	<2.5	<2.5
1,2-Dichloroethane	<2.5	-	-	-	-	-	-	-	<2.5	<2.5
1,1-Dichloroethylene	<3.2	-	-	-	-	-	-	-	<3.2	<3.2
Methyl Ethyl Ketone	<10.0	-	-	-	-	-	-	-	<10.0	<10.0
Tetrachloroethene	<1.9	-	-	-	-	-	-	-	<1.9	<1.9
Trichloroethene	<3.0	-	-	-	-	-	-	-	<3.0	<3.0
Vinyl Chloride	<4.6	-	-	-	-	-	-	-	<4.6	<4.6
BNAs (µg/L) **TCLP Method**										
2-Methyl Phenol	<20.0	<20.0	-	-	-	-	<20.0	-	-	-
3-Methyl Phenol	<20	<20	-	-	-	-	<20	-	-	-
4-Methyl phenol	<20.0	<20.0	-	-	-	-	<20.0	-	-	-
1,4-Dichlorobenzene	<10.0	<10.0	-	-	-	-	<10.0	-	-	-
2,4-Dinitrotoluene	<20	<20	-	-	-	-	<20	-	-	-
Hexachlorobenzene	<20	<20	-	-	-	-	<20	-	-	-
Hexachlorobutadiene	<20	<20	-	-	-	-	<20	-	-	-
Hexachloroethane	<15	<15	-	-	-	-	<15	-	-	-
Nitrobenzene	<10.0	<10.0	-	-	-	-	<10.0	-	-	-
Pentachlorophenol	<100	<100	-	-	-	-	<100	-	-	-
Pyridine	<15	<15	-	-	-	-	<15	-	-	-
2,4,5-Trichlorophenol	<30	<30	-	-	-	-	<30	-	-	-
2,4,6-Trichlorophenol	<45	<45	-	-	-	-	<45	-	-	-
Ignitability **EPA Method 1010**	-	-	-	NI	NI	-	-	-	-	NI

Notes:
"-" = Not analyzed
NI = Not ignitable below 60 degrees Centigrade

TABLE 3-6

GROUNDWATER SAMPLE ANALYTICAL RESULTS
PHASE I INVESTIGATION

Parameter	Concentration
TRPH (mg/L) **EPA Method 418.1**	350
General Minerals (mg/L) **CCR Title 22 Methods**	
Alkalinity, Total	4,370
Alkalinity, Phenolphthalein	<5.0
Alkalinity, Bicarbonate	4,370
Alkalinity, Carbonate	<5.0
Alkalinity, Hydroxide	<5.0
Chloride	5,188
Sulfate	1,439
Total Dissolved Solids	13,700
Hardness, Calculated	1,940
MBAS	NR
Metals (µg/L) **(EPA Methods 6010, 7470)**	
Aluminum	44
Antimony	30
Arsenic	9
Barium	22
Beryllium	<1.3
Cadmium	<3.0
Calcium	246,000
Chromium	<5.7
Cobalt	<6.1
Copper	<2.1
Iron	2,860
Lead	<2.0
Magnesium	322,000
Manganese	2,170
Mercury	<0.2
Nickel	34
Potassium	115,000
Selenium	<2.1
Silver	<4.9
Sodium	3,060,000
Thallium	<2.7
Vanadium	33
Zinc	4

Notes:
TRPH - Total Recoverable Petroleum Hydrocarbons
EPA - Environmental Protection Agency
CCR - California Code of Regulations
MBAS - Methylene Blue Activated Substances
NR - Not reported
mg/L - Milligrams per liter
µg/L - Micrograms per liter

collected from the surface area immediately adjacent to each of the eight boring locations shown on Figure 3-1 (Borings B-IMF-01 through B-IMF-08). Two 500-milliliter (mL) laboratory-supplied jars were filled at each location.

In addition to the surface soil sampling, subsurface soil samples were collected from a depth of approximately 4 feet below ground surface (bgs) in locations immediately adjacent to borings B-IMF-04, B-IMF-06, and HLA's boring B-7. A hand auger was used to drill and collect the subsurface soil samples. Upon reaching the sampling depth, the hand auger was removed and the auger bit, barrel, and rods were decontaminated. The auger was then reinserted into the borehole, and the next 6 to 12 inches of soil was collected in the auger barrel. After removal from the borehole, the soil was placed in two 500-mL glass jars. The shallow hand auger borings were backfilled with cuttings.

One of the jars from each surface and subsurface sampling location was submitted to the laboratory for the analysis of pH by EPA Method 9040. Soil samples from the remaining jars were screened for field pH using four procedures, each of which is described below.

1. **pH paper with DI water** - Field pH was first measured using methods identical to those used in the Phase I investigation. A 4-ounce plastic vial was filled approximately half-full with soil, filled with DI water, and then capped and shaken. A pH of the fluid in the vial was then recorded. The pH strip was allowed to remain in the fluid for approximately 20 minutes, and pH readings were recorded at 5 minute intervals over the 20-minute period.

2. **pH paper with Calcium Chloride ($CaCl_2$)** - Soils were also screened with pH paper using a mixture of soil and 0.01 molar (M) calcium chloride solution. In this procedure, approximately 20 grams of soil were mixed with 20 mL of 0.01M $CaCl_2$ solution. The solution was stirred, and allowed to stand for 1 hour. This allowed the suspended fine material to settle out of suspension. After 1 hour, the pH of the solution was measured using pH paper. The pH paper was allowed to remain in the solution for approximately 20 minutes prior to recording the pH measurement.

3. **pH meter with DI water** - Soils were screened using procedures outlined in the EPA's Method 9045 for both calcareous and non-calcareous soils. In the procedure for non-calcareous soils, 20 grams of soil were mixed with 20 mL of deionized water. The solution was stirred frequently for approximately 30 minutes. The solution was then allowed to sit for approximately 45 minutes to allow most of the fine material to settle out of suspension. The pH of the supernatant was then measured using a calibrated pH probe.

4. **pH meter with $CaCl_2$** - In the procedure for calcareous soils, approximately 10 grams of soil were mixed with 20 mL of 0.01M $CaCl_2$ solution. The solution was stirred frequently for approximately 30 minutes and then allowed to stand for approximately 45 minutes. This allowed any fine material to settle out of suspension. The pH of the supernatant was then measured using a calibrated pH probe.

All results were recorded in a field notebook. The remaining portions of the soil samples were archived for potential later use.

3.4 PHASE II INVESTIGATION RESULTS

The analytical results from the Phase II pH sampling study are presented in Table 3-7. Measurements using the 0.01M $CaCl_2$/soil mixture were generally slightly lower than those using the DI water/soil mixture. The differences in ionic strength of the $CaCl_2$ solution and the DI water could account for the variation in pH measurements. The sampling and analysis of subsurface soil at 4 feet bgs immediately adjacent to HLA's boring B-7 was performed to confirm the soil pH reported by HLA at 4.5 feet bgs (1.6 pH units; HLA, 1989). As shown in Table 3-7, the confirmation sample B7-04 confirmed the low pH level, as the pH results from the field screening methods and laboratory analysis indicated a pH of approximately 1 unit.

With the exception of the 4-foot sample from B-IMF-06, the field and laboratory pH measurements were generally consistent. Field measurements of the 4-foot sample from B-IMF-06 detected a pH between 4 and 5, but the laboratory pH measurements for this sample and a blind duplicate of this sample were 0.9 and 2.2. In the Phase I investigation, soils from this interval had a field pH of 1 and a laboratory pH of 9 and 8.6 (Table 3-3). The differences in pH may be related to the presence of a black petroleum coke-like material with a plastic texture. Fragments of this material were occasionally present in samples from the 4- to 10-foot interval, and was observed in the B-IMF-06-04 sample. A fragment of this material was placed on a piece of wet pH paper and an acid reaction was observed emanating from the area where the material contacted the paper. Thus, the sporadic occurrence of low pH within a single sampling interval may be related to this material being in the portion of the sample analyzed. During the Phase I investigation, the coke-like material did not appear to be widespread in the area investigated.

3.5 PHASE III INVESTIGATION METHODS

The Phase I and Phase II investigations did not fully characterize the extent of the low pH levels in the vicinity of HLA boring B-7 at a scale of less than a 25-foot grid. Following the conclusion of the Phase II investigation, the DTSC requested by letter (DTSC, 6 March 1992) that additional soil and groundwater sampling be

TABLE 3-7

SOIL ANALYTICAL RESULTS - pH
PHASE II INVESTIGATION

Sample I.D.	Field Measurements				Laboratory pH (EPA Method 9040)
	pH Paper/ DI Water	pH Probe/ DI Water	pH Paper/ Calcium Chloride Solution	pH Probe/ Calcium Chloride Solution	
B-IMF-01-00	8	8.04	7	7.41	8.7
B-IMF-01-04	7	7.70	7.5	7.38	7.9
B-IMF-01-04 (DUP)	7	7.89	7	7.48	7.5
B-IMF-02-00	9	7.43	6	6.69	7.6
B-IMF-02-00 (DUP)	9	8.81	7	7.4	8.5
B-IMF-03-00	7	6.95	6	6.44	8.4
B-IMF-04-00	7	7.15	7	6.09	8.1
B-IMF-04-04	7	8.13	7.5	7.33	7.9
B-IMF-05-00	9	7.69	7	7.00	8.3
B-IMF-06-00	8	8.24	6.5	7.28	8.1
B-IMF-06-04	4	5.25	5	4.61	0.9
B-IMF-06-04 (DUP)	4	5.04	4	4.61	2.2
B-IMF-07-00	9	7.95	7.5	7.18	7.9
B-IMF-08-00	8	8.37	7	7.33	8.0
B-IMF-08-00 (DUP)	7	8.26	7	7.47	8.6
B7-04	1	0.89	0	0.86	0.7
B7-04 (DUP)	0.5	0.82	0.5	0.92	0.9

Notes:
DI - Deionized
Calcium chloride solution - 0.01 Molar calcium chloride solution provided by ESE Analytical Laboratory
EPA - Environmental Protection Agency
(DUP) - Duplicate sample

performed at the IMF site at NAS Alameda. Specifically, further investigation in the vicinity of HLA boring B-7 was requested. JMM prepared a description of the proposed Phase III investigation in response to the DTSC letter and was authorized by WESTDIV to perform the additional sampling. The additional sampling activities focused on the immediate area surrounding boring B-7. Soil and groundwater quality within 10 feet of boring B-7 was characterized to determine whether potential impacts of low pH and high lead values in the immediate vicinity of boring B-7 were not identified by the Phase I and Phase II investigations. The Phase III investigation also included the evaluation of areal groundwater gradient and flow direction. Specific approaches to the Phase III investigation are described in the following sections.

3.5.1 Areal Groundwater Gradient Evaluation

The first task of the Phase III investigation was to determine the gradient and flow direction at the IMF site. Five existing monitoring wells were selected for inclusion in the evaluation, including M-IMF-01 (installed during the Phase I investigation), three wells installed by Canonie (MWOR-1, MWOR-2, and MWOR-3), and one well installed by HLA (MW-1). The locations of these wells are presented in Figure 3-2. A vertical survey was first performed to ensure the five wells were surveyed on the same grid. A check was made to determine the presence of floating product prior to collecting the water level measurements; approximately 5 feet of floating product were detected in M-IMF-01. Efforts to remove the floating product by bailing were unsuccessful; M-IMF-01 quickly recharged with additional product. Since the water level measurements on M-IMF-01 were not accurate with the product present, this well was not included in the groundwater gradient and flow direction evaluation. In addition, the water level in HLA's well MW-1 appeared anomalously high, perhaps due to utilities in the vicinity. This well was also excluded and groundwater gradient and flow direction at the IMF site was evaluated based on the three monitoring wells installed by Canonie.

3.5.2 Soil Investigation

Three soil borings, B-IMF-09, B-IMF-10, and B-IMF-11, were drilled in the vicinity of boring B-7 in the Phase III investigation. Soil boring B-IMF-10 was located to the east of boring B-7 in the upgradient position, while borings B-IMF-09 and B-IMF-11 were located on north and south of boring B-7, respectively. As shown on Figure 3-3, the borings were located equidistant from boring B-7 at a distance of approximately 6 feet. These locations were selected to provide data on soil pH and lead concentrations in close proximity to boring B-7. Soil samples were collected at the surface, 0.5 feet, 1 foot, and at additional 1-foot intervals until the groundwater table was reached. All soil samples collected from the soil borings were analyzed in the laboratory for pH (EPA Method 9040) and total lead (CLP Method). The sampling frequency was selected to provide sufficient analytical data over the interval above the groundwater table.

FIGURE 3-2
WELL LOCATION MAP FOR AERIAL GRADIENT EVALUATION

FINAL
INTERMEDIATE MAINTENANCE FACILITY
FIELD INVESTIGATION REPORT

THE ABOVE IDENTIFIED FIGURE IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY SOUTHWEST DIVISION TO LOCATE THIS FIGURE. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

QUESTIONS MAY BE DIRECTED TO:

DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
SOUTHWEST
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

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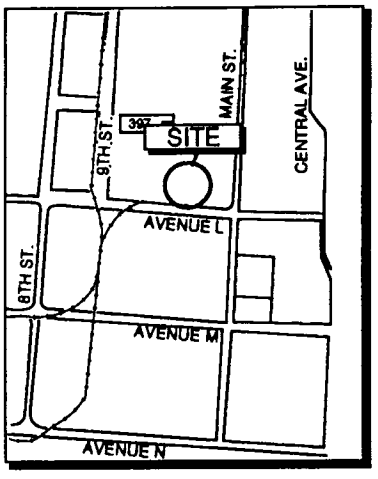

B-IMF-06

B-IMF-03

B-IMF-09

B-7

B-IMF-01

B-IMF-08

B-IMF-10

M-IMF-02

B-IMF-02

B-IMF-07

B-IMF-11

M-IMF-01

B-IMF-04

B-IMF-08

AVENUE L

LEGEND

- Monitoring Well Location
- HLA Soil Boring Location
- Soil Boring Location, Phase I Investigation
- Soil Boring Location, Phase III Investigation

N

0 15 30

SCALE IN FEET

A-9

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SOIL BORING AND MONITORING WELL LOCATIONS PHASE III INVESTIGATION

FIGURE 3-3

A groundwater sample was collected using a Hydropunch sampling device in borings B-IMF-09 and B-IMF-10 at depths of 5.5 and 8 feet, respectively. A Hydropunch sampling attempt was made in boring B-IMF-11, but there was no sample recovery due to the presence of viscous hydrocarbon material. The Hydropunch was advanced approximately 2 feet ahead of the hollow stem augers and allowed to fill with groundwater. A groundwater sample was then collected with a stainless steel bailer that was lowered into the Hydropunch sampler. Field and laboratory analyses performed on the Hydropunch samples are described in Section 3.5.3.

3.5.3 Groundwater Investigation

During the Phase III investigation, monitoring well M-IMF-02 was installed directly downgradient (west) of and 5 feet from boring B-7 (Figure 3-3). The location of the new monitoring well was selected based on the survey and water level measurement activities performed during the field effort and is shown on Figure 3-3. During drilling, soil samples were collected from depths consistent with the soil sampling described in Section 3.5.2. Drilling continued to a total depth of approximately 14 feet, and the monitoring well was installed. Construction methods for the monitoring well were consistent with the specifications previously described in Section 3.1.3.

Well development and sampling procedures for monitoring well M-IMF-02 were performed according to the specifications described in Section 3.1.4. In addition to the groundwater sample collected from M-IMF-02, a groundwater sample was collected from monitoring well M-IMF-01, which was installed during the Phase I investigation. The groundwater samples from the two monitoring wells and the Hydropunch samples collected from two of the three soil borings were analyzed in the field for pH, specific conductivity, and temperature. The samples were filtered through a 0.45 micron filter and submitted to the laboratory for the analysis of dissolved lead (CLP Method).

3.6 PHASE III INVESTIGATION RESULTS

Section 3.5 described the field activities associated with the Phase III investigation at the IMF site. Following the assessment of the groundwater gradient and flow direction, three soil borings were drilled and soil samples were submitted for analysis of moisture content, pH, and total lead. Soil samples were also submitted in conjunction with the drilling of one monitoring well. Four groundwater samples were collected from selected monitoring wells and soil borings and analyzed in the laboratory for dissolved lead. Copies of the boring logs and the well construction diagram are included as Appendix D. Chemical analytical reports are included as Appendix E. Findings and analytical results are discussed in the following sections.

3.6.1 Areal Groundwater Gradient Evaluation

The vertical survey was performed by Nolte and Associates for the five monitoring wells in the IMF site area. Top of casing elevations were measured on each of the wells, and the surveying results are presented in Table 3-8. Water levels were measured in four of the five wells, including MWOR-1, MWOR-2, MWOR-3, and MW-1. As mentioned in Section 3.5.1, the presence of floating product in monitoring well M-IMF-01 prevented its use in the areal groundwater gradient evaluation. Based on the water level measurements, the water depths range from 8.39 to 10.21 feet above mean sea level and are presented in Table 3-8.

The groundwater level data compiled during the Phase III investigation indicates a groundwater flow direction to the west in the vicinity of the IMF site. Figure 3-4 presents a water level contour map for the IMF site based on the information collected during the Phase III investigation.

3.6.2 Soil Results

The near-surface soils found in the vicinity of HLA boring B-7 are consistent with the findings of the Phase I investigation. Materials found in monitoring well M-IMF-02 and soil borings B-IMF-09, B-IMF-10, and B-IMF-11 generally consist of clay, clayey to silty sand, and fine- to medium-grained sand. Shell and wood fragments, tar- or coal-like materials, and vitrified petroleum fragments were present in a number of soil core samples. Oil-soaked sands and a hydrocarbon odor were also frequently encountered. Boring logs are presented in Appendix D.

The black, tar-like materials, similar to that found during the Phase I investigation and previous studies, were first encountered at a depth of 1.4 to 1.5 feet in the three soil borings and at approximately 4 feet in the monitoring well boring. The presence of oily or oil-soaked sands was noted in all three soil borings but was absent in the monitoring well boring. Monitoring well boring M-IMF-02 did not encounter the vitrified, tar-like materials over as large an interval as the soil boring locations, as the boring log for M-IMF-02 shows the material was only identified from approximately 4 to 5.8 feet. Tar-like or oily materials were identified in the three soil borings over intervals of 4.1 feet (B-IMF-09), 5.5 feet (B-IMF-10), and 6.5 feet (B-IMF-11).

Laboratory results for the Phase III investigation of soils are summarized in Table 3-9. A total of 22 soil samples (including two blind field duplicate samples) were submitted to the laboratory for the analysis of pH and total lead. Thirteen of the 22 samples had pH values below 7.0, and the lowest pH value (1.2) was measured in the 2-foot sample from B-IMF-11. A duplicate sample from this depth also registered a pH of 1.2. Nine of the 13 samples with pH values below 7.0 were collected at depths where black, tar-like, or oily materials were identified. The remaining four of the 13 samples had pH values ranging from 6.4 to 6.8 and were from samples collected near

TABLE 3-8

LOCATION SURVEY AND WATER LEVEL DATA
PHASE III INVESTIGATION

Well Number	Top of Casing Elevation (Feet above MSL)	Water Depth (Feet above MSL)
MWOR-1	12.55	9.21
MWOR-2	12.30	8.39
MWOR-3	13.12	10.21
MW-1	14.09	9.96
M-IMF-01	12.69	NA

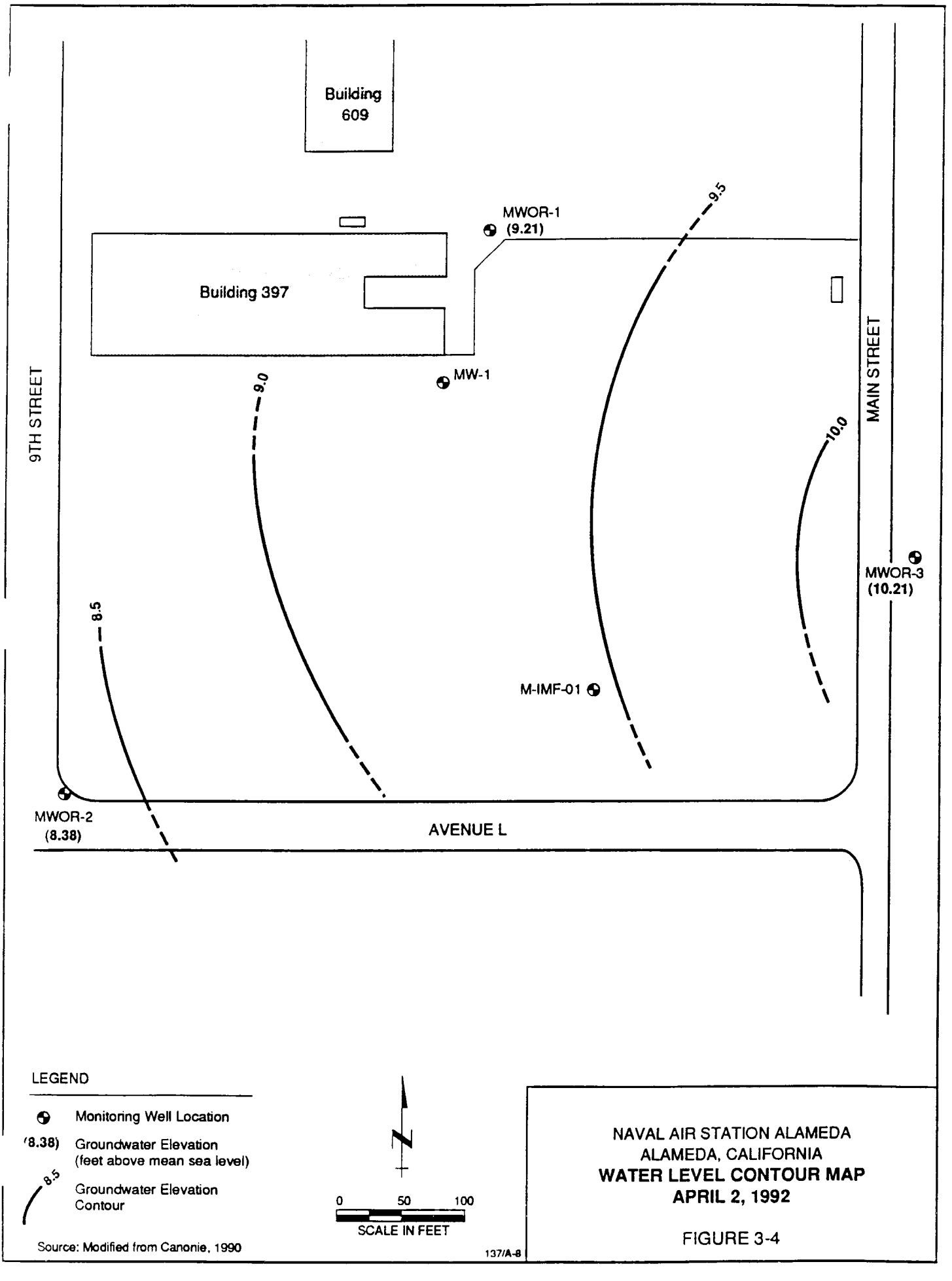
Notes:
MSL - Mean sea level
NA - Not applicable due to presence of floating product

TABLE 3-9

SOIL ANALYTICAL RESULTS
PHASE III INVESTIGATION

Sample I.D.	Percent Moisture (ASTM D2216)	pH (EPA Method 9040) (units)	Total Lead (CLP Method) (mg/kg)
M-IMF-02-00	0.4	8.1	6.30
M-IMF-02-0.5	3.7	8.8	4.70
M-IMF-02-01	6.7	7.9	4.62
M-IMF-02-02	10.2	7.3	113
B-IMF-09-00	0.9	6.8	9.15
B-IMF-09-0.5	8.1	8.0	12.6
B-IMF-09-01	19.5	1.7	368
B-IMF-09-02	12.6	2.7	60.9
B-IMF-10-00	0.4	6.4	6.40
B-IMF-10-0.5	6.2	6.5	73.7
B-IMF-10-01	11.3	6.8	28.5
B-IMF-10-02	12.5	7.8	3.34
B-IMF-10-03	23.6	1.9	1980
B-IMF-10-03 (DUP)	14.9	3.2	115
B-IMF-11-00	0.6	7.7	13.6
B-IMF-11-0.5	4.9	7.4	13.4
B-IMF-11-01	8.7	7.0	19.4
B-IMF-11-02	13.3	4.4	22.7
B-IMF-11-03	12.1	1.2	139
B-IMF-11-03 (DUP)	13.8	1.2	314
B-IMF-11-04	17.9	1.9	568
B-IMF-11-5.5	17.7	3.8	4.15

Notes:
ASTM - American Society of Testing and Materials
EPA - Environmental Protection Agency
CLP - Contract Laboratory Program
mg/kg - Milligrams per kilogram
(DUP) - Duplicate sample



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WATER LEVEL CONTOUR MAP
APRIL 2, 1992

FIGURE 3-4

the surface in B-IMF-10 or at the surface in B-IMF-09. In general, the low pH values can be correlated with the black, tar-like, or oily materials encountered in the soil borings.

As shown in Table 3-9, total lead concentrations ranged from 3.34 to 1,980 mg/kg in the 22 soil samples submitted for laboratory analysis in the Phase III investigation. The maximum concentration of 1,980 mg/kg was reported in the 3-foot sample from B-IMF-03; however, a duplicate sample collected at that depth contained only 115 mg/kg. A direct relationship between lead concentration and pH is not apparent; in general, however, the higher lead levels do correspond with lower pH values and the presence of tar-like or oily materials.

3.6.3 Groundwater Results

Groundwater samples were collected from monitoring wells M-IMF-01 and M-IMF-02, and Hydropunch samples were collected from soil borings B-IMF-09 and B-IMF-10 during the Phase III investigation. Measurements of pH, specific conductivity, and temperature were collected in the the field, and the samples were then submitted to the laboratory for the analysis of dissolved lead. The analytical results from the field and laboratory analyses are presented in Table 3-10.

The four pH measurements recorded in the field ranged from 0.92 to 6.66 pH units, with the lowest pH value recorded in the Hydropunch sample from B-IMF-09. Specific conductivity values ranged from a low of 2,000 micromhos per centimeter (µmhos/cm) in the Hydropunch sample from B-IMF-10 to a high of 22,000 µmhos/cm in the Hydropunch sample in B-IMF-09. Field measurements of temperature on the four groundwater samples ranged from 18.4 to 20.4 degrees Centigrade. The dissolved lead analyses performed in the laboratory detected lead above the laboratory reporting limit in all four samples, and the concentrations varied from 1.5 µg/L in the groundwater sample from monitoring well M-IMF-01 to 1,770 µg/L in the Hydropunch sample from boring B-IMF-09.

There appears to be a relationship between the low pH values and high lead values in the groundwater samples collected in the Phase III investigation. As shown in Table 3-10, the groundwater sample with the highest pH reading (M-IMF-01) had the lowest lead concentration, and the sample with the lowest pH reading had the highest lead concentration (B-IMF-09). The pH values recorded in the groundwater samples from monitoring well M-IMF-02 and boring B-IMF-10 were also low at 2.99 and 2.80 units, respectively. Dissolved lead concentrations in the two samples were quite similar, at 92.2 µg/L (M-IMF-02) and 76.5 µg/L (B-IMF-10).

4.0 CONCLUSIONS AND RECOMMENDATIONS

Soils with low pH values were encountered in only 3 of 64 soil samples analyzed over a large grid during the Phase I and Phase II investigations. However, over half of the soil samples collected within 6 feet of boring B-7

TABLE 3-10

GROUNDWATER ANALYTICAL RESULTS
PHASE III INVESTIGATION

Sample I.D.	Field Measurements			Dissolved Lead (CLP Method) (µg/L)
	pH	Specific Conductivity (µmhos/cm)	Temperature (Degrees C)	
M-IMF-01	6.66	11,000	18.4	1.5
M-IMF-02	2.99	3,000	18.9	92.2
B-IMF-09	0.92	22,000	19.8	1,770
B-IMF-10	2.80	2,000	20.4	76.5

Notes:
µmhos/cm - Micromhos per centimeter
Degrees C - Degrees Centigrade
CLP - Contract Laboratory Program
µg/L - Micrograms per liter

in the Phase III investigation had low pH values. The low pH measurements appear to be associated with soils containing a fragmented, black, tar-like or oily material that contains some acidic component. The plastic nature of the material and the higher pH values of other soils in the area indicate that the acid constituents may be isolated and not influence regional soil or groundwater quality.

Field and laboratory pH analysis during the Phase II investigation indicates that field pH measurements are generally consistent with those measured in the laboratory, and it appears that the pH of soil samples does not change significantly during shipment to the laboratory. As mentioned above, the occurrence of low pH values may be related to the presence of a tar-like or oily material that contains acid constituents. In one instance during the Phase II investigation, the material was observed to cause an acid reaction when placed on wet pH paper.

The highest concentration of total lead measured in the soil samples from the three-phased investigation is 1,980 mg/kg. However, the duplicate sample taken at the same sample location contained only 115 mg/kg. WET and TCLP method analyses performed on selected soil samples during the Phase I investigation did not identify contaminant concentrations in excess of state regulatory standards. A groundwater sample collected during the Phase I investigation in the vicinity of areas known to contain soil with lower pH and/or higher lead concentrations did not contain lead above detection limits. However, three of four groundwater samples collected during the Phase III investigation in borings or monitoring wells where tar-like or oily materials were present had low pH values and contained elevated levels of lead.

Heavy molecular weight petroleum hydrocarbons, possibly related to past refinery operations at the site, were present throughout the area investigated. The hydrocarbon contamination will be addressed under the remedial investigation/feasibility study (RI/FS) program and was not an issue of concern in the removal action issued by the DTSC. However, the low pH and high lead effects of this material in the soil and groundwater are of concern.

A review of available data on pH and lead content in soils at the IMF site indicates that continuing work related to the removal action is warranted in the vicinity of HLA boring B-7. High lead levels were identified in soil samples from soil borings and a monitoring well boring drilled in close proximity to boring B-7. In general, the low pH values and elevated lead concentrations correlate with the presence of a black, tar-like material. Therefore, it is recommended that a POAM and an EE/CA be developed as an initial step to performing a possible removal action at the IMF site.

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APPENDIX A

BORING LOGS/WELL CONSTRUCTION DIAGRAM
PHASE I INVESTIGATION

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-06 CLIENT PRC/US NAVY

DATE STARTED 7/19/91 COMPLETED 7/19/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0312

ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	13			SW	gravelly SAND (SW), olive brown (2.5Y 4/3), dense, dry, 10 to 15% fines, fine sand, 15 to 20% gravel, high estimated K	field pH=11
			20			SP		
			27	9.1			SAND (SP), light yellowish brown (2.5Y 6/4), medium dense, moist, 5 to 10% fines, fine sand, high estimated K	field pH=9
			17					
2		CHEM	20					field pH=7
			23	7.4				
			9					! DEPTH TO WATER=3 feet
			32				@ 3.5 feet-contains coke, sand is black with strong HC odor	
4		CHEM	33	138				field pH=1
			10			SC	clayey SAND (SC), dark olive (5Y 4/3), medium dense, wet, 25 to 30% fines, fine sand, moderate estimated K	
			13					
			13	92				field pH=5
6		CHEM	10					
			15					
			40	5.8			clayey SAND (SC), olive yellow (2.5Y 6/8), very dense, moist, 30 to 40% fines, fine sand, low K	field pH=5
			44				@ 7.5 feet-as above, oily areas	
8		CHEM	50/4"	438				field pH=5
		CHEM	40	541			@ 9.5 feet-as above, moist to wet	field pH=4
							TOTAL DEPTH 9.5 feet	
10								
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES

HOLE DIAMETER 8.25 INCHES BIT TYPE HOLLOW STEM AUGER

TOTAL DEPTH OF BORING 9.5 FEET DRILLER DAVE RYAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER *IMF-05* CLIENT *PRC/US NAVY*

DATE STARTED *7/19/91* COMPLETED *7/19/91* PROJECT/JMM PROJECT NO. *NAS ALAMEDA/2738.0312*

ELEVATION *0 FEET* GEOLOGIST *KAREN KRAMER*

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
						SP	gravelly SAND (SP), olive brown (2.5Y 4/4), dry, 5 to 10% fines, fine sand, 10 to 15% gravel, moderate to high estimated K	field pH=7
		CHEM	30					field pH=5
			46	2.4			SAND (SP), light olive brown (2.5Y 5/4), dense, moist, trace fines, fine sand, high estimated K, contains shell fragments and fish scales	field pH=6
			29					
2		CHEM	44				@ 2 feet-as above, moist and 5 to 10% fines	
			50	4.1				field pH=7
			25					
			32					
4		CHEM	36	5.8				field pH=7
			18				@ 4.5 feet-as above, wet	
			32					
			40					! DEPTH TO WATER=5.5 feet
6		CHEM	17	7.4		SM	silty SAND (SM), light olive brown (2.5Y 5/4), dense, wet, 15 to 20% fines, fine sand, high estimated K	field pH=6
			21					
			23	5.8			@ 7 feet-gradational color change to olive (5Y 4/30, dense, wet, shell fragments and rocks common	
			11			CL SC		field pH=10
8		CHEM	5				CLAY (CL) and clayey SAND (SC), olive (5Y 4/3), medium stiff, moist to wet, 50 to 100% fines, low to moderate estimated K	
			4	2.4				field pH=8
			4			CL	@ 9 to 9.5 feet-CLAY (CL), as above	
			6			SC CL	clayey SAND (SC) and CLAY (CL), color as above, SC contains 50 to 60% fine sand	
10		CHEM	50/4"	10				field pH=7
							TOTAL DEPTH 10.5 feet	
12								

DRILLING METHOD/RIG TYPE *AUGER/MOBILE B-40* DRILLING CONTRACTOR *EXPLORATION GEOSERVICES*

HOLE DIAMETER *8.35 INCHES* BIT TYPE *HOLLOW STEM AUGER*

TOTAL DEPTH OF BORING *10.5 FEET* DRILLER *DAVE RYAN*

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER *IMF-04* CLIENT *PRC/US NAVY*

DATE STARTED *7/18/91* COMPLETED *7/18/91* PROJECT/JMM PROJECT NO. *NAS ALAMEDA/2738.031*

ELEVATION *0 FEET* GEOLOGIST *KAREN KRAMER*

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	13			SP	SAND (SP), light olive brown (2.5Y 6/4), dense, dry, 5 to 10% fines, fine sand, high estimated K, shell fragments	field pH=11
			22					
			24				@ 0.5 feet-as above, moist, trace fines, no shell fragments	field pH=6
			14					
2		CHEM	16					
			18					field pH=8
			1					
			6			SC	clayey SAND (SC) and CLAY (CL), olive, mottled with light olive brown, Fe-staining throughout	field pH=7
4		CHEM	6			CL		
			8			CL	CLAY (CL), olive (5Y4/3), stiff, moist, 100% fines, low estimated K, H2S odor, contains asphalt pieces	field pH=1
			4					field pH=7
			5				sandy CLAY (CL), olive (5Y 4/3), stiff, moist, 50 to 60% fines, fine sand, low to moderate K, sand occurs in layers, contains oily black coke at 5 feet	
6		CHEM	2					
			3					field pH=6
			7					
			6				silty CLAY (CL), olive (5Y 4/3), stiff, moist, contains pieces of cardboard, HC odor	
8		CHEM	50/1"					field pH=3
			50				@ 9 to 10 feet-silty SAND, black, very dense, moist, 30 to 40% fines, fine sand, moderate estimated K, contains coke fragments	field pH=6
		CHEM	30					
10							TOTAL DEPTH 10 feet	
12								

DRILLING METHOD/RIG TYPE *AUGER/MOBILE B-40* DRILLING CONTRACTOR *EXPLORATION GEOSERVICES*

HOLE DIAMETER *8.35 INCHES* BIT TYPE *HOLLOW STEM AUGER*

TOTAL DEPTH OF BORING *10 FEET* DRILLER *DAVE RYAN*

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-03 CLIENT PRC/US NAVY
DATE STARTED 7/18/91 COMPLETED 7/18/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0[illegible]
ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	7			SP	SAND (SP), light yellowish brown (2.5Y 6/2), loose, dry, 5 to 10% fines, fine to medium sand, high estimated K, shell fragments common	field pH=7
			13					
			20					
			13				@ 1.5 feet-as above, except light olive brown (2.5Y 5/4), moist, medium dense	
2		CHEM	28					field pH=6
			29					
			7			SM	silty SAND (SM), dark olive (5Y 3/6), medium dense, moist, 30 to 40% fines, very fine to fine sand, oily, strong HC odor, moderate estimated K	
			11					field pH=5
4		CHEM	15				@ 4 feet-as above, but 10 to 20% fines	
			5				@ 4.5 feet-color change to olive (5Y 4/4), higher percent of fines, contains wood fragments	! DEPTH TO WATER=4.5 feet
			8					
			13					field pH=5
6		CHEM	7					
			17			SC	clayey sand (SC), olive (5Y 4/4), dense, moist, 30 to 40% fines, fine sand, low estimated K	field pH=5
			50/5"					
			18					
8		CHEM	40				@ 8 feet-color change to olive gray, strong odor	field pH=4
			50/5"					
			31					
		CHEM	50/4"					field pH=4
10							@ 10.5 feet-Fe staining on sample	
							TOTAL DEPTH 10.5 feet	
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES
HOLE DIAMETER 8.35 INCHES BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 10.5 FEET DRILLER DAVE RYAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-02 CLIENT PRC/US NAVY

DATE STARTED 7/19/91 COMPLETED 7/19/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.021

ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	4	0		SP	SAND (SP), light yellowish brown (2.5Y 6/4), dry, fine to medium sand, trace fines, shell fragments common, high estimated K	field pH=7
			8					
			14	0.2				field pH=6
			4				@ 1.5 feet-as above except medium dense and moist	
2		CHEM	17					
			22	0.4				field pH=8
			12				@ 3 feet-strong HC odor, wet	! DEPTH TO WATER=3 feet
			14					
4		CHEM	21	0.4		SC	clayey SAND (SC), olive, medium dense, wet, 30 to 35% clay, fine sand, high estimated K	field pH=7
			12					
			14				@ 4.5 feet-floating product, clayey SAND (SC), dark olive brown (2.5Y 3/3), 30 to 35% fines, fine sand, high estimated K, strong odor,	field pH=6
			41	0.6				
6		CHEM	28				@ 6 to 7 feet-appears to be ash, black (N2/) or very silty fine sand	
			42					field pH=5
			50/5"	0.4			clayey SAND (SC), light olive brown (2.5Y 5/6), very dense, moist, 30 to 40% fines, fine sand, moderate K	
			37					
8		CHEM	50/4"				@ 7.5 feet-as above except olive yellow (2.5Y 6/6), moist, no odor	
			25	0.4				field pH=5
			45					field pH=5
		CHEM	50/5"	0.4				
10								
			38					
			50/5"				@ 11 feet-as above	
							TOTAL DEPTH 11.5 feet	
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES

HOLE DIAMETER 8.35 INCHES BIT TYPE HOLLOW STEM AUGER

TOTAL DEPTH OF BORING 11.5 FEET DRILLER DAVE RYAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-01 CLIENT PRC/US NAVY

DATE STARTED 7/19/91 COMPLETED 7/19/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0312

ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	40	0		SM	silty SAND (SM), olive brown (2.5Y 4/4), loose, dry, fine sand, 15 to 20% fines, high estimated K	field pH=7
			49			SP		
			43	2.4			SAND (SP), light yellowish brown (2.5Y 6/4), dense, damp, fine sand, trace fines, high estimated K	field pH=7
			19					
2		CHEM	19					
			29	2.4		CL SC	CLAY (CL) and clayey SAND (SC), olive (5Y 4/3), stiff, moist/damp, fine sand, 50 to 90% fines, low estimated K	field pH=5
			2			CL		
			3				CLAY (CL), as above, isolated pockets of sand (SP), sandy areas are oxidized and have some roots	
4		CHEM	4	4.1				field pH=7
			2				CLAY (CL), as above, with pockets of clayey sand (SC), moist, thin, black layer (organics or HC)	
			3					
			4	4.1				field pH=7
6		CHEM	6			SC CL	clayey SAND (SC) and CLAY (CL), olive (5Y 4/3), soft, moist, fine sand, 30 to 40% fines, moderate estimated K, sand zones were saturated	field pH=7
			2					
			2	4.1				DEPTH TO WATER=7 feet
			6			SM	@ 7.5 feet-as above, HC odor, oily sheen	
8		CHEM	23					
			32	255			@ 8.5 to 9 feet-coke/tar, black, oily, wood common throughout	field pH=4
			40					
		CHEM	50/5"	62			silty SAND (SM), pale olive (5Y 6/3), dense, damp, very fine to fine sand, 30 to 35% fines, moderate estimated K, contains coke fragments	field pH=6.5
10							TOTAL DEPTH 10 feet	
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES

HOLE DIAMETER 8.25 INCHES BIT TYPE HOLLOW STEM AUGER

TOTAL DEPTH OF BORING 10 FEET DRILLER DAVE RYAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

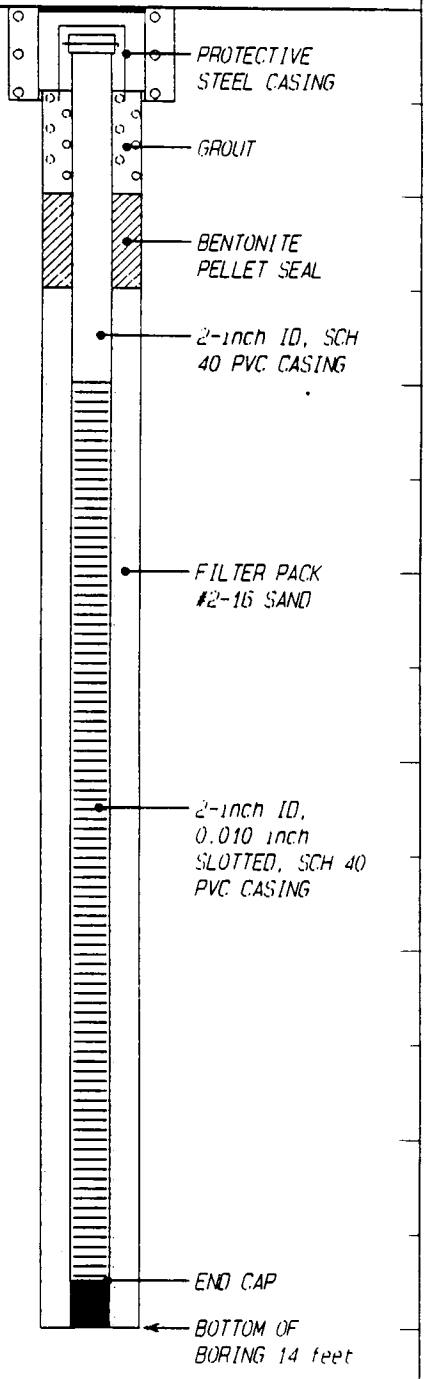
BORING/WELL NUMBER MMF-01 CLIENT PRC/US NAVY

DATE STARTED 7/23/91 COMPLETED 7/23/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0312

REF. ELEVATION 0 FEET, TOP OF CASING GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
2							No samples collected, see log of Borings IMF-01 and IMF-04.
4							
6							
8							
10							
12							

WELL DIAGRAM



DRILLING METHOD/RIG TYPE AUGER/CME 750 DRILLING CONTRACTOR/DRILLER EXP. GEOSER./DAVE RYAN

HOLE DIAMETER 8.35 INCHES BIT TYPE HOLLOW STEM AUGER

TOTAL DEPTH OF BORING 14 FEET WELL COMPLETION DEPTH 14 FEET

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-07 CLIENT PRC/US NAVY
DATE STARTED 7/19/91 COMPLETED 7/19/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.07.12
ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	15	2.4		SP	SAND (SP), light yellowish brown (2.5Y 6/4), dense, moist, 10 to 15% fines, fine sand, high estimated K	field pH=7
			20					
			33	4.1				field pH=7
			14					
2		CHEM	26					
			20					! DEPTH TO WATER=2.5 feet
			10				@ 3 feet-as above, saturated	
			10	4.1				field pH=7
4		CHEM	10					
			14	4.1		SM	silty SAND (SM), dark olive brown (2.5Y 3/3), dense, wet, 20 to 30% fines, fine sand, high estimated K, saturated with oil	field pH=7
			42					
			50	728				field pH=6
6		CHEM	32					
			50/5"	140			@ 6.5 feet-as above, saturated with oil, tar and coke throughout	field pH=6
			34					
8		CHEM	50/5"	293				field pH=5
			13	1149		SC	clayey SAND (SC), olive, 20 to 30% fines	
			32					
10		CHEM	50/3"					field pH=4
							TOTAL DEPTH 10.5 feet	
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES
HOLE DIAMETER 8.35 INCHES BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 10.5 FEET DRILLER DAVE RYAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER IMF-08 CLIENT PRC/US NAVY

DATE STARTED 7/19/91 COMPLETED 7/19/91 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0312

ELEVATION 0 FEET GEOLOGIST KAREN KRAMER

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS 6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
		CHEM	30			SW	gravelly SAND (SW), olive brown (2.5Y4/4), dense, moist, 10 to 15% fines, 15 to 20% gravel, fine sand, high estimated K	field pH=7
			40					
			50	7.4		SP	SAND (SP), light olive brown (2.5Y 5/4), dense, moist, trace fines, fine sand, high estimated K	field pH=7
			42					
2		CHEM	50					
			50/4"	5.8				field pH=7
			36					
			34				@ 3.5 feet-very moist	
4		CHEM	39	4.1				field pH=7
			24					
			24			CL	@ 5 feet-grades into a sandy CLAY (CL)	
			14	10			sandy CLAY (CL), light olive brown (2.5Y 5/4), dense, moist to wet, 60 to 90% fines, 10 to 40% fine sand, moderate estimated K	! DEPTH TO WATER=5.5 feet
6		CHEM	1					
			2				silty CLAY (CL), olive (5Y 4/3), soft, moist, 80 to 100% fines, trace fine sand, low estimated K	field pH=7
			2	9.1				
			2			CL SC	silty CLAY (CL) and clayey SAND (SC), olive (5Y 4/3), CL contains 80 to 100% fines, trace fine sand, SC contains 20 to 30% fines, 70 to 80% fine sand	field pH=7
8		CHEM	3					
			3					field pH=7
			2				@ 9 feet-as above	
			3					
10		CHEM	3	2.4				field pH=7
							TOTAL DEPTH 10.5 feet	
12								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-40 DRILLING CONTRACTOR EXPLORATION GEOSERVICES

HOLE DIAMETER 8.35 INCHES BIT TYPE HOLLOW STEM AUGER

TOTAL DEPTH OF BORING 10.5 FEET DRILLER DAVE RYAN

APPENDIX B

LABORATORY ANALYTICAL REPORTS
PHASE I INVESTIGATION

Analytical Data and

Supporting Laboratory QC for

Alameda Naval Air Station

CTO-137

Soil & Groundwater

Prepared By:
Environmental Science & Engineering, Inc.

September 23, 1991

Case Narrative

I. Case Narrative CTO-137

Fifty-two soil samples were received in good condition. All samples were analyzed for pH. Selected samples were analyzed for total lead (Pb), TCLP VOAs, TCLP BNAs, TRPH and ignitability. Based on the total Pb results, additional samples were selected for soluble Pb by WET and TCLP.

One groundwater sample (MIMF-01) was received. This sample contained a separate "oil" layer. The "oil" was removed using a freon/glasswool extraction prior to the TDS, alkalinity and ion chromatograph analyses. MBAS was not analyzed for, because of the oil. TDS analysis was conducted outside of holding time. The matrix spike and matrix spike duplicate (MS/MSD) had 0 % recovery for the Thallium. The thallium data should be considered an estimate, with a negative bias.

Analytical Data

Environmental Science & Engineering 09/16/91 STATUS :FINAL PAGE 1
PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA CTO - 137
FIELD GROUP ALS3 PROJECT MANAGER JACKIE HARGROVE

SAMPLE ID'S		IMF-01-00	IMF-01-02	IMF-01-04	IMF-01-06	IMF-01-08	IMF-01-08	IMF-01-10	IMF-02-00	IMF-02-02	IMF-02-04	IMF-02-04	IMF-02-06	IMF-02-08	IMF-03-00	IMF-03-02
PARAMETERS	STORET	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3
UNITS	METHOD	1	2	3	4	5	5	6	7	8	9	9	10	11	13	14
DATE		07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/30/91	07/19/91	07/18/91	07/18/91	07/18/91	07/31/91	07/18/91	07/18/91	07/18/91	07/18/91
TIME		09:55	10:19	10:22	10:24	10:36	18:00	10:46	09:29	09:46	10:10	18:00	10:20	10:30	12:15	13:51
PH,SED	70310	9.0	6.0	7.8	8.2	4.0	NRQ	6.8	8.4	9.0	7.4	NRQ	7.4	7.6	7.6	8.4
STD.UNITS	1															
% SOLIDS	70318	NRQ	65.2	NRQ	NRQ	80.8	NRQ	83.3	NRQ	NRQ	81.9	NRQ	81.4	84.9	NRQ	NRQ
% OF WET W	CALC															
MOISTURE	70320	NRQ	34.8	NRQ	NRQ	19.2	NRQ	16.7	NRQ	NRQ	18.1	NRQ	18.6	15.1	NRQ	NRQ
%WET WT	1															
HYDROCARBONS,PETROL	98233	NRQ	NRQ	NRQ	NRQ	19700	NRQ	NRQ	NRQ	NRQ	34100	NRQ	NRQ	NRQ	NRQ	NRQ
UG/G-DRY	1															
LEAD	1052	NRQ	48.1	NRQ	NRQ	148	NRQ	21.4	NRQ	NRQ	NRQ	NRQ	27.2	5.30	NRQ	NRQ
MG/KG -DRY	CLP															
LEAD,WET	1051	NRQ	238	NRQ	NRQ	3830	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	CLP															
TCLP EXTRACTION - ME	97160	NRQ	NRQ	NRQ	NRQ	08/25/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
TALS	M															
LEAD	1051	NRQ	NRQ	NRQ	NRQ	NRQ	2240	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TCLP EXTRACTION - BN	97160	NRQ	NRQ	NRQ	NRQ	07/31/91	NRQ	NRQ	NRQ	NRQ	07/31/91	NRQ	NRQ	NRQ	NRQ	NRQ
AS	BNA															
2-METHYL PHENOL	99073	NRQ	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
3-METHYL PHENOL	97206	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
4-METHYL PHENOL	99074	NRQ	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,4-DICHLOROBENZENE	34571	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4-DINITROTOLUENE	34611	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROBENZENE	39700	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROBUTADIENE	34391	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROETHANE	34396	NRQ	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
NITROBENZENE	34447	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
PENTACHLOROPHENOL	39032	NRQ	NRQ	NRQ	NRQ	NRQ	<100	NRQ	NRQ	NRQ	NRQ	<100	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
PYRIDINE	97208	NRQ	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4,5-TRICHL'PHENOL	77687	NRQ	NRQ	NRQ	NRQ	NRQ	<30	NRQ	NRQ	NRQ	NRQ	<30	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4,6-TRICHL'PHENOL	34621	NRQ	NRQ	NRQ	NRQ	NRQ	<45	NRQ	NRQ	NRQ	NRQ	<45	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															

SAMPLE ID'S		IMF-01-00	IMF-01-02	IMF-01-04	IMF-01-06	IMF-01-08	IMF-01-08	IMF-01-10	IMF-02-00	IMF-02-02	IMF-02-04	IMF-02-06	[illegible]	[illegible]	[illegible]	IMF-03-02
PARAMETERS	STORET	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3
UNITS	METHOD	1	2	3	4	5	5	6	7	8	9	9	10	11	13	14
DATE		07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/30/91	07/19/91	07/18/91	07/18/91	07/18/91	07/31/91	[illegible]	[illegible]	[illegible]	07/18/91
TIME		09:55	10:19	10:22	10:24	10:38	18:00	10:46	09:29	09:46	10:10	18:00	[illegible]	[illegible]	12:15	13:51
TCLP EXTRACTION - VOAS	97160 ZHE	NRQ	NRQ	NRQ	NRQ	07/30/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZENE	34030	NRQ	NRQ	NRQ	NRQ	NRQ	2.9	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CARBON TETRACHLORIDE	32102	NRQ	NRQ	NRQ	NRQ	NRQ	<2.6	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CHLOROBENZENE	34301	NRQ	NRQ	NRQ	NRQ	NRQ	<1.4	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CHLOROFORM	32106	NRQ	NRQ	NRQ	NRQ	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,2-DICHLOROETHANE	34531	NRQ	NRQ	NRQ	NRQ	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,1-DICHLOROETHYLENE	34501	NRQ	NRQ	NRQ	NRQ	NRQ	<3.2	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
METHYL ETHYL KETONE	81595	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TETRACHLOROETHENE	34475	NRQ	NRQ	NRQ	NRQ	NRQ	<1.9	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TRICHLOROETHENE	39180	NRQ	NRQ	NRQ	NRQ	NRQ	<3.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
VINYL CHLORIDE	39175	NRQ	NRQ	NRQ	NRQ	NRQ	<4.6	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA CTO - 137
FIELD GROUP ALS3 PROJECT MANAGER JACKIE HARGROVE

SAMPLE ID'S			IMF-03-04	IMF-03-06	IMF-03-08	IMF-03-10	IMF-04-00	IMF-04-02	IMF-04-04	IMF-04-06	IMF-04-08	IMF-04-08	IMF-04-10	IMF-04-00	IMF-05-02	IMF-05-04	IMF-05-06
PARAMETERS		STORET	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3
	UNITS	METHOD	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28
DATE			07/18/91	07/18/91	07/18/91	07/18/91	07/18/91	07/18/91	07/18/91	07/18/91	07/18/91	08/25/91	07/18/91	07/19/91	07/19/91	07/19/91	07/19/91
TIME			13:57	14:11	14:15	14:19	15:23	15:38	15:45	15:49	16:01	02:30	16:09	11:10	11:31	11:33	11:47
PH,SED		70310	8.4	7.8	5.2	10.0	6.9	6.8	8.2	8.1	8.2	NRQ	7.2	9.0	9.1	7.5	9.2
	STD.UNITS	I															
% SOLIDS		70318	86.1	NRQ	87.0	86.3	NRQ	NRQ	NRQ	75.8	63.0	NRQ	NRQ	99.4	NRQ	NRQ	83.7
	% OF WET W	CALC															
MOISTURE		70320	13.9	NRQ	13.0	13.7	NRQ	NRQ	NRQ	24.2	37.0	NRQ	NRQ	0.6	NRQ	NRQ	16.3
	%WET WT	I															
HYDROCARBONS,PETROL		96253	1470	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	37.8	NRQ	NRQ	NRQ	4230	NRQ	NRQ	NRQ
	UG/G-DRY	I															
LEAD		1052	15.8	NRQ	9.67	3.69	NRQ	NRQ	NRQ	9.95	63.5	NRQ	NRQ	15.7	NRQ	NRQ	5.02
	MG/KG -DRY	CLP															
LEAD,WET		1051	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	258	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
	UG/L	CLP															
TCLP EXTRACTION - ME		97160	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	08/25/91	NRQ	NRQ	NRQ	NRQ	NRQ
TALS		M															
LEAD		1051	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	35.9	NRQ	NRQ	NRQ	NRQ	NRQ
	UG/L	TCLP															

SAMPLE ID'S		IMF-05-08	IMF-05-10	IMF-06-00	IMF-06-02	IMF-06-04	IMF-06-04	IMF-06-06	IMF-06-08	IMF-06-10	IMF-06-10	IMF-07-00	IMF-07-02	IMF-07-04	IMF-07-06	IMF-07-08
PARAMETERS	STORET	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3
UNITS	METHOD	29	30	31	32	33	33	34	35	36	36	37	38	39	40	41
DATE		07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/31/91	07/19/91	07/19/91	07/19/91	07/30/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91
TIME		11:54	11:58	14:55	15:05	15:10	18:00	15:17	15:23	15:29	18:00	15:47	16:02	16:04	16:16	16:20
PH,SED	70310	8.5	8.4	5.4	10.1	9.0	NRQ	9.2	8.3	7.0	NRQ	6.3	9.1	9.4	9.4	7.2
STD.UNITS	I															
% SOLIDS	70318	NRQ	NRQ	NRQ	NRQ	79.6	NRQ	NRQ	NRQ	83.0	NRQ	NRQ	NRQ	NRQ	NRQ	79.4
% OF WET W	CALC															
MOISTURE	70320	NRQ	NRQ	NRQ	NRQ	20.4	NRQ	NRQ	NRQ	17.0	NRQ	NRQ	NRQ	NRQ	NRQ	20.6
%WET WT	I															
HYDROCARBONS,PETROL	98233	NRQ	NRQ	NRQ	NRQ	71200	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/G-DRY	I															
IGNITABILITY	99741	NRQ	NRQ	NRQ	NRQ	>60	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DEG-C	I															
LEAD	1052	NRQ	NRQ	NRQ	NRQ	602	NRQ	NRQ	NRQ	3.85	NRQ	NRQ	NRQ	NRQ	NRQ	30.4
MG/KG -DRY	CLP															
LEAD,WET	1051	NRQ	NRQ	NRQ	NRQ	3620	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	916
UG/L	CLP															
TCLP EXTRACTION - METALS	97160 M	NRQ	NRQ	NRQ	NRQ	08/25/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
LEAD	1051	NRQ	NRQ	NRQ	NRQ	NRQ	2060	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TCLP EXTRACTION - BNAS	97160 BNA	NRQ	NRQ	NRQ	NRQ	07/30/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
2-METHYL PHENOL	99073	NRQ	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
3-METHYL PHENOL	97206	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
4-METHYL PHENOL	99074	NRQ	NRQ	NRQ	NRQ	NRQ	<20.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,4-DICHLOROBENZENE	34571	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4-DINITROTOLUENE	34611	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROBENZENE	39700	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROBUTADIENE	34391	NRQ	NRQ	NRQ	NRQ	NRQ	<20	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
HEXACHLOROETHANE	34396	NRQ	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
NITROBENZENE	34447	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
PENTACHLOROPHENOL	39032	NRQ	NRQ	NRQ	NRQ	NRQ	<100	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
PYRIDINE	97208	NRQ	NRQ	NRQ	NRQ	NRQ	<15	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4,5-TRICHLOROPHENOL	77687	NRQ	NRQ	NRQ	NRQ	NRQ	<30	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
2,4,6-TRICHLOROPHENOL	34621	NRQ	NRQ	NRQ	NRQ	NRQ	<45	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA CTO - 137
FIELD GROUP ALS3 PROJECT MANAGER JACKIE HARGROVE
ALL LAB COORDINATOR JACKIE HARGROVE

SAMPLE ID'S		IMF-05-08	IMF-05-10	IMF-06-00	IMF-06-02	IMF-06-04	IMF-06-04	IMF-06-06	IMF-06-08	IMF-06-10	IMF-06-10	IMF-07-00	IMF-07-02	IMF-07-04	IMF-07-06	IMF-07-06
PARAMETERS	STORET	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3
UNITS	METHOD	29	30	31	32	33	33	34	35	36	36	37	38	39	40	41
DATE		07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/31/91	07/19/91	07/19/91	07/19/91	07/30/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91
TIME		11:54	11:58	14:55	15:05	15:10	18:00	15:17	15:23	15:29	18:00	15:47	16:02	16:04	16:16	16:20
TCLP EXTRACTION - VO AS	97160 ZHE	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	07/30/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZENE	34030	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.0	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CARBON TETRACHLORIDE	32102	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.6	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CHLOROBENZENE	34301	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.4	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
CHLOROFORM	32106	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,2-DICHLOROETHANE	34531	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
1,1-DICHLOROETHYLENE	34501	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.2	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
METHYL ETHYL KETONE	81595	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TETRACHLOROETHENE	34475	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.9	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
TRICHLOROETHENE	39180	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.0	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															
VINYL CHLORIDE	39175	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<4.6	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP															

SAMPLE ID'S		IMF-07-10	IMF-07-10	IMF-08-00	IMF-08-02	IMF-08-04	IMF-08-06	IMF-08-08	IMF-08-10	IMF-DUP	IMF-DUP	IMF-DUP	IMF-DUP	IMF-DUP
PARAMETERS	STORET	ALS3	ALS3L	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3	ALS3
UNITS	METHOD	42	42	43	44	45	46	47	48	49	50	51	52	53
DATE		07/19/91	07/30/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/19/91	07/18/91	07/18/91	07/19/91
TIME		16:22	18:00	12:13	12:36	12:40	12:55	12:57	13:05					
PH,SED	70310	6.2	NRQ	9.1	9.4	9.4	8.2	8.7	7.5	8.1	7.3	8.9	9.4	8.6
STD.UNITS	1													
% SOLIDS	70318	80.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	72.6	NRQ	82.1
% OF WET W	CALC													
MOISTURE	70320	19.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	27.4	NRQ	17.9
%WET WT	1													
IGNITABILITY	99741	>60	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	60
DEG-C	1													
LEAD	1052	52.3	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	6.10	NRQ	41.3
MG/KG -DRY	CLP													
LEAD,WET	1051	717	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	1540
UG/L	CLP													
HYDROCARBONS,PETROL	98233	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	2810
UG/G-DRY	1													
TCLP EXTRACTION - VOAS	97160 ZHE	07/30/91	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZENE	34030	NRQ	<1.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
CARBON TETRACHLORIDE	32102	NRQ	<2.6	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
CHLOROBENZENE	34301	NRQ	<1.4	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
CHLOROFORM	32106	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
1,2-DICHLOROETHANE	34531	NRQ	<2.5	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
1,1-DICHLOROETHYLENE	34501	NRQ	<3.2	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
METHYL ETHYL KETONE	81595	NRQ	<10.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
TETRACHLOROETHENE	34475	NRQ	<1.9	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
IGNITABILITY	99741	NRQ	NRQ	NRQ	NRQ	>60	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DEG-C	1													
TRICHLOROETHENE	39180	NRQ	<3.0	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													
VINYL CHLORIDE	39175	NRQ	<4.6	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
UG/L	TCLP													

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA NAS CTO-137
FIELD GROUP ALW3 PROJECT MANAGER J.M. HARGROVE

SAMPLE ID'S		MIMF-01	MIMF-01
PARAMETERS	STORET	ALW3	ALW3
UNITS	METHOD	1	2
DATE		08/09/91	08/14/91
TIME		14:00	10:35
PH,FIELD	400		NRQ
STD UNITS	0		
SP.COND.,FIELD@25C	94		NRQ
UMHOS/CM	0		
WATER TEMP	10		NRQ
C	0		
HYDROCARBONS,PETRO	45501	350	NRQ
MG/L	I		
ALKALINITY,T.	410	4370	NRQ
MG/L-CACO3	I		
ALKALINITY,PHENOLPH	415	<5.0	NRQ
MG/L	I		
ALKALINITY,BICA	425	4370	NRQ
MG/L-CAC03	I		
ALKALINITY,CARB	430	<5.0	NRQ
MG/L-CAC03	I		
ALKALINITY,NC/OH	420	<5.0	NRQ
MG/L- CACO	I		
CHLORIDE	940	5188	NRQ
MG/L	IC		
SULFATE	945	1439	NRQ
MG/L	IC		
RESIDUE,DISS	70300	13700	NRQ
MG/L	I		
HARDNESS	900	3300	NRQ
MG/L-CACO3	TITR		
HARDNESS,DISS,CAL	99280	NRQ	1940
MG/L-CACO3	CALC		
MBAS(FOAMING AGENTS)	38260	NRQ	NA
MG/L	I		
ALUMINUM,TOTAL	1105	NRQ	44.3
UG/L	CLP		
ANTIMONY,TOTAL	1097	NRQ	30.0
UG/L	CLP		
ARSENIC,TOTAL	1002	NRQ	9.1
UG/L	CLP		
BARIUM,TOTAL	1007	NRQ	22.1
UG/L	CLP		
BERYLLIUM, TOTAL	1012	NRQ	<1.3
UG/L	CLP		
CADMIUM,TOTAL	1027	NRQ	<3.0
UG/L	CLP		
CALCIUM,TOTAL	82032	NRQ	246000
UG/L	CLP		
CHROMIUM,TOTAL	1034	NRQ	<5.7
UG/L	CLP		

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA NAS CTO-137
ALL LAB COORDINATOR JACKIE HARGROVE

SAMPLE ID'S		MIMF-01	MIMF-01
PARAMETERS	STORET	ALW3	ALW3
UNITS	METHOD	1	2
DATE		08/09/91	08/14/91
TIME		14:00	10:35
COBALT,TOTAL	1037	NRQ	<6.1
UG/L	CLP		
COPPER,TOTAL	1042	NRQ	<2.1
UG/L	CLP		
IRON,TOTAL	1045	NRQ	2860
UG/L	CLP		
LEAD,TOTAL	1051	NRQ	<2.0
UG/L	CLP		
MAGNESIUM,TOTAL	927	NRQ	322000
UG/L	CLP		
MANGANESE,TOTAL	1055	NRQ	2170
UG/L	CLP		
MERCURY,TOTAL	71900	NRQ	<0.2
UG/L	CLP		
NICKEL,TOTAL	1067	NRQ	34.4
UG/L	CLP		
POTASSIUM,TOTAL	82034	NRQ	115000
UG/L	CLP		
SELENIUM,TOTAL	1147	NRQ	<2.1
UG/L	CLP		
SILVER,TOTAL	1077	NRQ	<4.9
UG/L	CLP		
SODIUM,TOTAL	82035	NRQ	3060000
UG/L	CLP		
THALLIUM,TOTAL	1059	NRQ	<2.7
UG/L	CLP		
VANADIUM,TOTAL	1087	NRQ	33.2
UG/L	CLP		
ZINC,TOTAL	1092	NRQ	4.0
UG/L	CLP		

APPENDIX C

GEOTECHNICAL LABORATORY REPORTS
PHASE I INVESTIGATION

WOODWARD-CLYDE CONSULTANTS

MOISTURE CONTENT (%), WET & DRY DENSITY (PCF)

PROJECT NAME J.M. MONTGOMERY 2738.0312 PROJECT NO. 90C0137A DATE 08/28/91

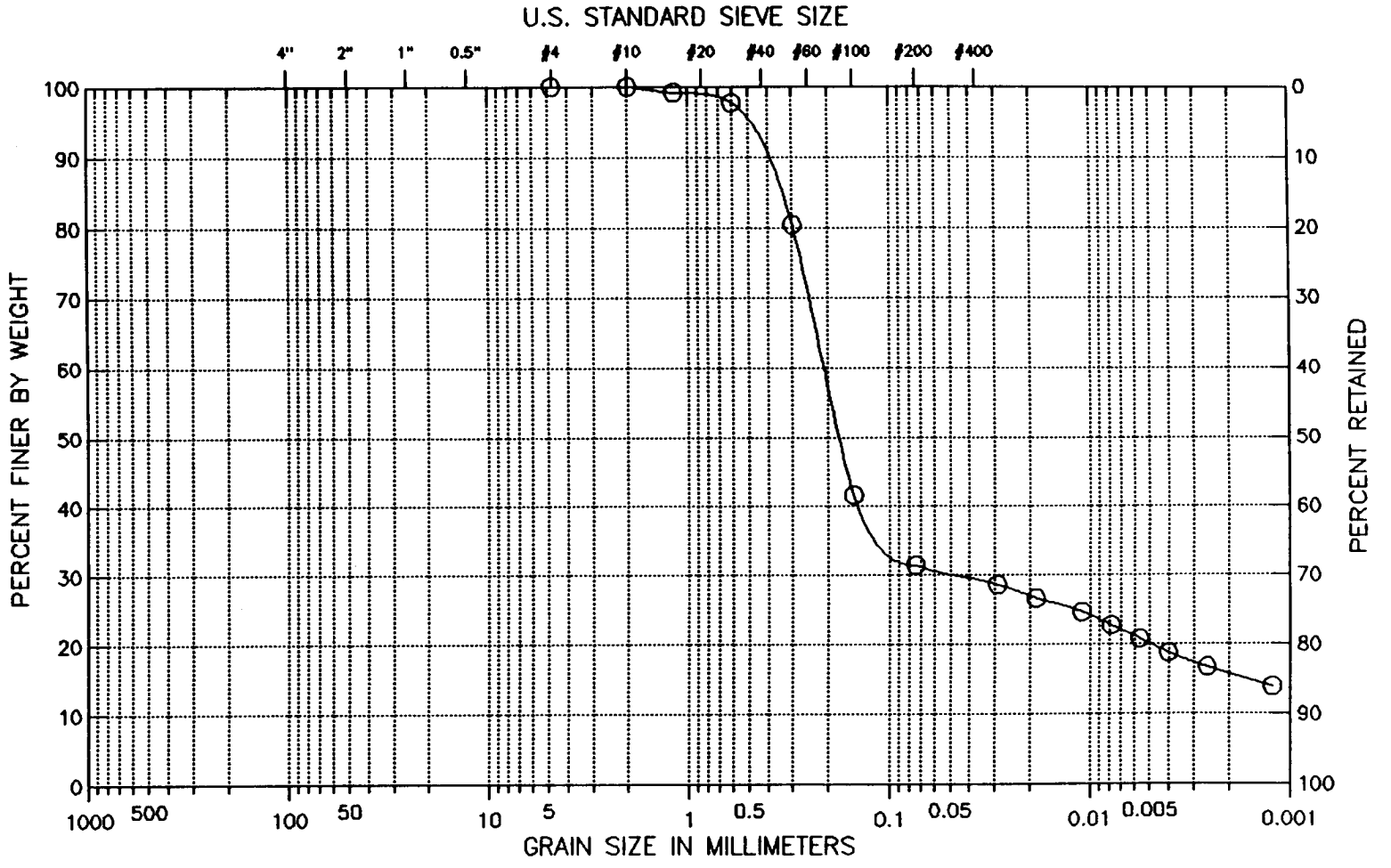
TESTED BY N. JOHNSON REDUCED BY N. JOHNSON CHECKED BY S. CAPPS

(A) (B) (C) (D) LOCATION: ALAMEDA NAVEL AIR STATION

SAMPLE NUMBER	DIAM. INCH	HEIGHT CM.	WET WT. GRAMS	DRY WT. GRAMS	SAMPLE DESCRIPTION	MOISTURE CONTENT	WET DENSITY	DRY DENSITY
IMF 01-06	2.43	12.3	656.1	511.1	BROWN GRAY CLAYEY SAND/ SILTY CLAY	28.37	111.24	86.66
IMF 08-08	2.43	13.7	723.8	509.3	GRAY SILTY FINE SANDY CLAY	42.12	110.18	77.53
IMF 05-05	2.43	14.4	728.9	657.8	BROWN SILTY FINE SAND	10.81	105.57	95.27
IMF 02-04	2.43	13.4	744.6	656.4	DARK BROWN SILTY CLAYEY SAND W/VOID	13.44	115.89	102.16

Woodward-Clyde Consultants

Boring No. : IMF	Project : J.M. MONTGOMERY 2738.0312
Sample No: 01-06	Project No.: 90C0137A
Tested by : N. JOHNSON	Location: ALAMEDA NAVEL AIR STATION
Filename : IMF01-06	Date : Tue Sep 03 1991



Classification :
()

Visual Description :
BROWN GRAY SILTY CLAYEY SAND TO SILTY CLAY

Remarks :
.

Figure 1

Woodward-Clyde Consultants

Tue Sep 03 15:41:18 1991

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 01-06
Location : ALAMEDA NAVEL AIR STATION
Soil Description : BROWN GRAY SILTY CLAYEY SAND TO SILTY CLAY
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF01-06
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

HYDROMETER

Hydrometer ID : 1734
Weight of air-dried soil = 100 gm
Specific Gravity = 2.72

Hygroscopic Moisture Content :
Weight of Wet Soil = 100 gm
Weight of Dry Soil = 98.11 gm
Moisture Content = 0.0192641

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
2.00	36.00	23.80	28.45	0.029	29	0.029
5.00	34.10	23.80	26.55	0.019	27	0.019
15.00	32.10	23.80	24.55	0.011	25	0.011
30.00	30.20	23.80	22.65	0.008	23	0.008
60.00	28.10	24.10	20.69	0.006	21	0.006
120.00	26.20	23.90	18.69	0.004	19	0.004
300.00	24.10	24.00	16.64	0.003	17	0.003
1440.00	22.00	22.50	13.85	0.001	14	0.001

Woodward-Clyde Consultants

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 01-06
Location : ALAMEDA NAVEL AIR STATION
Soil Description : BROWN GRAY SILTY CLAYEY SAND TO SILTY CLAY
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF01-06
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

FINE SIEVE SET

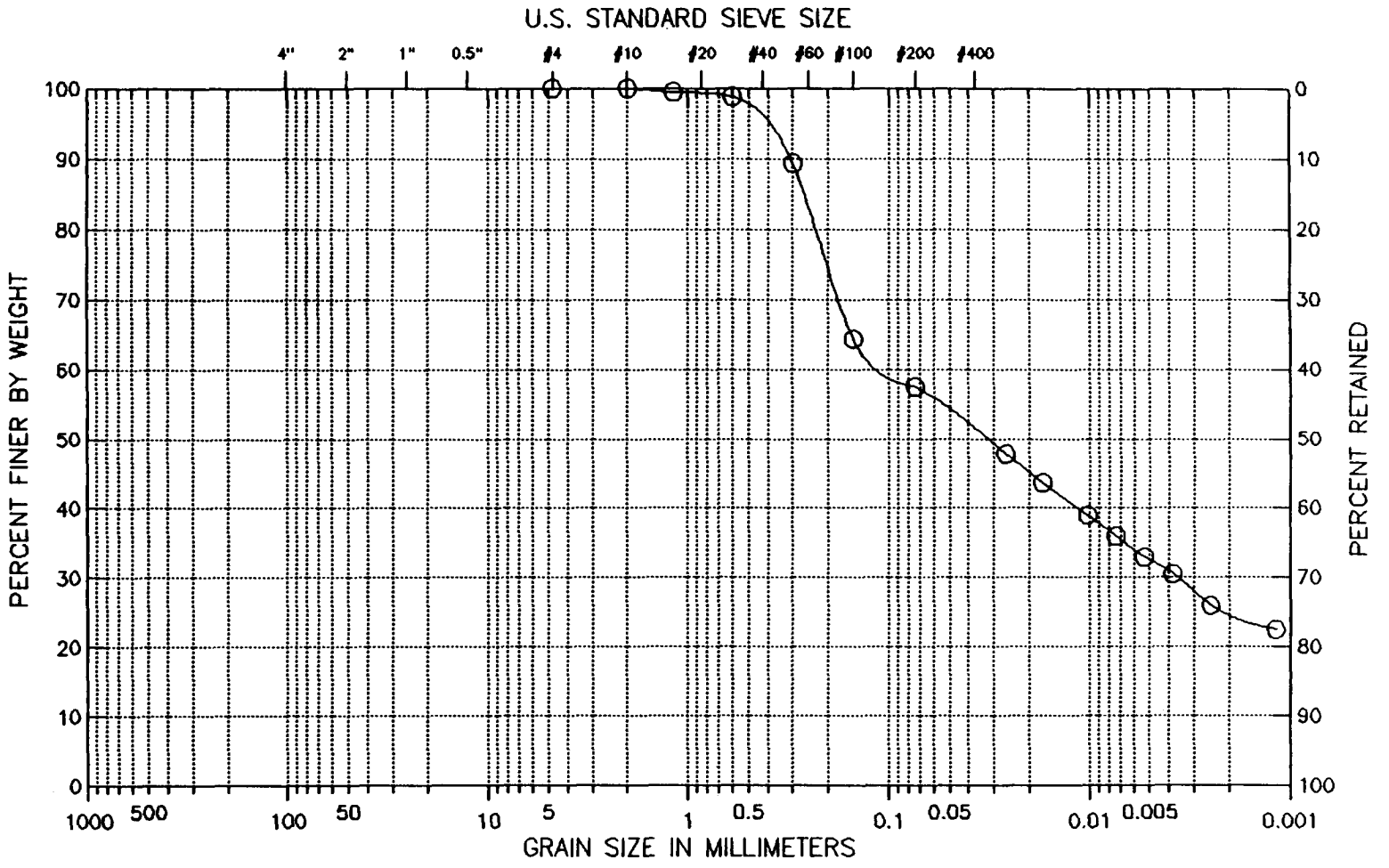
Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.00	0.00	100
#16	0.046	1.18	0.84	0.84	99
#30	0.024	0.60	1.41	2.25	98
#50	0.012	0.30	16.94	19.19	80
#100	0.006	0.15	37.98	57.17	42
#200	0.003	0.07	10.09	67.26	31
Pan			30.85	98.11	0

Total Weight of Sample = 98.11
Tare Weight = 0
Moisture Content = 0.0192641

D85 : 0.3603 mm
D60 : 0.2081 mm
D50 : 0.1739 mm
D30 : 0.0460 mm
D15 : 0.0016 mm
D10 : 0.0004 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

Boring No. : IMF	Project : J.M. MONTGOMERY 2738.0312
Sample No.: 08-08	Project No.: 90C0137A
Tested by : N. JOHNSON	Location: ALAMEDA NAVEL AIR STATION
Filename : IMF08-08	Date : Tue Sep 03 1991



Classification :
()

Visual Description :
GRAY SILTY FINE SANDY CLAY

Remarks :

Figure 1

Woodward-Clyde Consultants

Tue Sep 03 13:00:09 1991

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 08-08
Location : ALAMEDA NAVEL AIR STATION
Soil Description : GRAY SILTY FINE SANDY CLAY
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF08-08
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

HYDROMETER

Hydrometer ID : 1734
Weight of air-dried soil = 85 gm
Specific Gravity = 2.74

Hygroscopic Moisture Content :
Weight of Wet Soil = 85 gm
Weight of Dry Soil = 82.11 gm
Moisture Content = 0.0351967

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
2.00	47.50	23.80	39.95	0.026	48	0.026
5.00	44.00	23.80	36.45	0.017	44	0.017
15.00	40.10	23.80	32.55	0.010	39	0.010
30.00	37.50	24.00	30.04	0.007	36	0.007
60.00	35.00	24.00	27.54	0.005	33	0.005
120.00	33.00	24.00	25.54	0.004	31	0.004
300.00	29.20	24.00	21.74	0.002	26	0.002
1440.00	27.00	22.50	18.85	0.001	23	0.001

Woodward-Clyde Consultants

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 08-08
Location : ALAMEDA NAVEL AIR STATION
Soil Description : GRAY SILTY FINE SANDY CLAY
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF08-08
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

FINE SIEVE SET

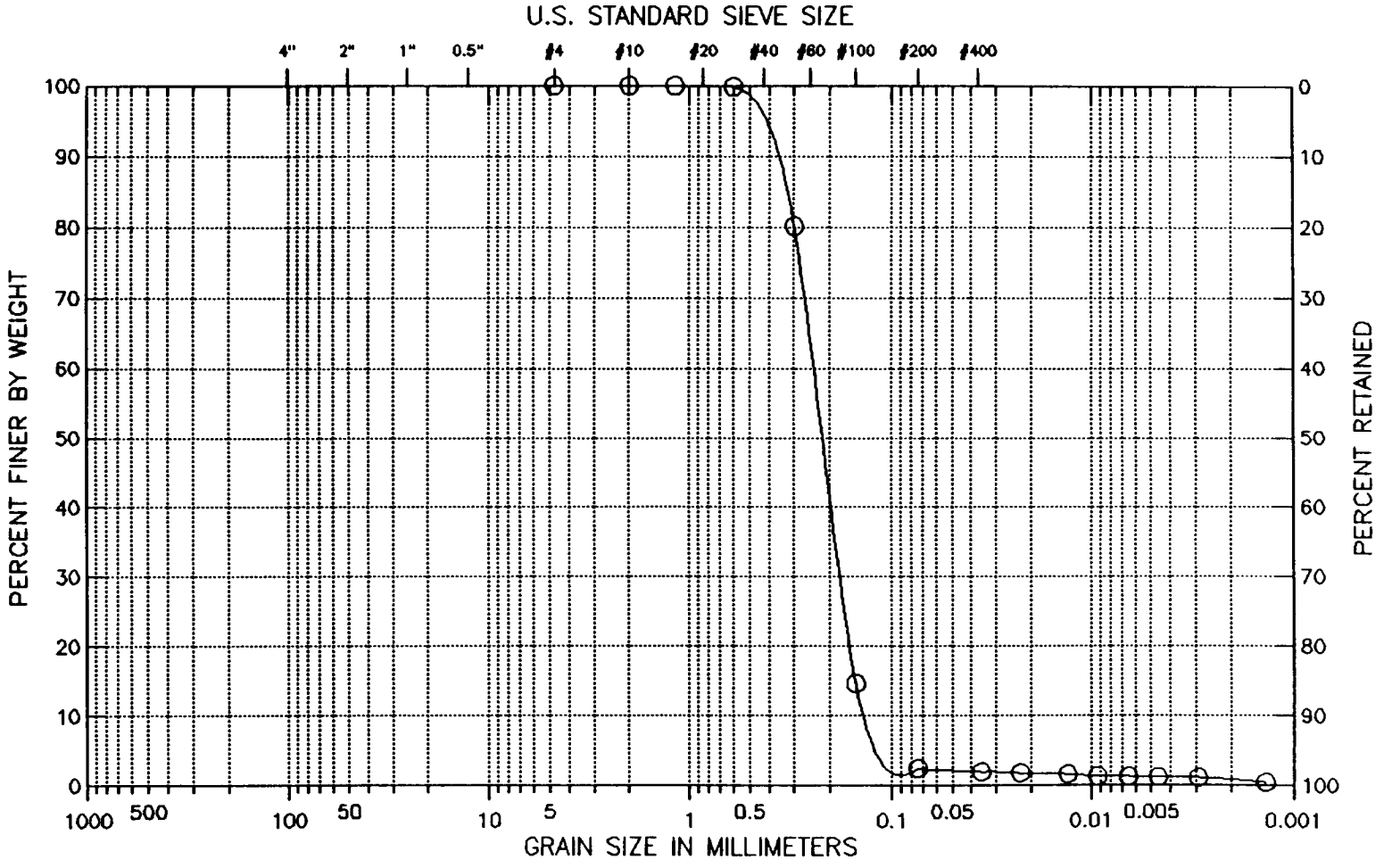
Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.00	0.00	100
#16	0.046	1.18	0.43	0.43	99
#30	0.024	0.60	0.55	0.98	99
#50	0.012	0.30	7.79	8.77	89
#100	0.006	0.15	20.49	29.26	64
#200	0.003	0.07	5.66	34.92	57
Pan			47.19	82.11	0

Total Weight of Sample = 82.11
Tare Weight = 0
Moisture Content = 0.0351967

D85 : 0.2661 mm
D60 : 0.0959 mm
D50 : 0.0332 mm
D30 : 0.0036 mm
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

Boring No. : IMF	Project : J.M. MONTGOMERY 2738.0312
Sample No: 05-05	Project No.: 90C0137A
Tested by : N. JOHNSON	Location: ALAMEDA NAVEL AIR STATION
Filename : IMF05-05	Date : Tue Sep 03 1991



Classification :
(SP) Poorly graded sand
Visual Description :
BROWN POORLY GRADES SAND (SP)

Remarks :

Figure 1

Woodward-Clyde Consultants

Tue Sep 03 14:00:10 1991

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 05-05
Location : ALAMEDA NAVEL AIR STATION
Soil Description : BROWN POORLY GRADES SAND (SP)
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF05-05
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

HYDROMETER

Hydrometer ID : 1734
Weight of air-dried soil = 120 gm
Specific Gravity = 2.62

Hygroscopic Moisture Content :
Weight of Wet Soil = 120 gm
Weight of Dry Soil = 119.46 gm
Moisture Content = 0.00452034

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
2.00	9.90	23.70	2.30	0.036	2	0.036
5.00	9.70	23.70	2.10	0.023	2	0.023
15.00	9.50	23.70	1.90	0.013	2	0.013
30.00	9.20	23.70	1.60	0.009	1	0.009
60.00	9.00	24.00	1.54	0.007	1	0.007
120.00	8.90	24.00	1.44	0.005	1	0.005
300.00	8.80	24.00	1.34	0.003	1	0.003
1440.00	8.70	22.50	0.55	0.001	0	0.001

Woodward-Clyde Consultants

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 05-05
Location : ALAMEDA NAVEL AIR STATION
Soil Description : BROWN POORLY GRADES SAND (SP)
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF05-05
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

FINE SIEVE SET

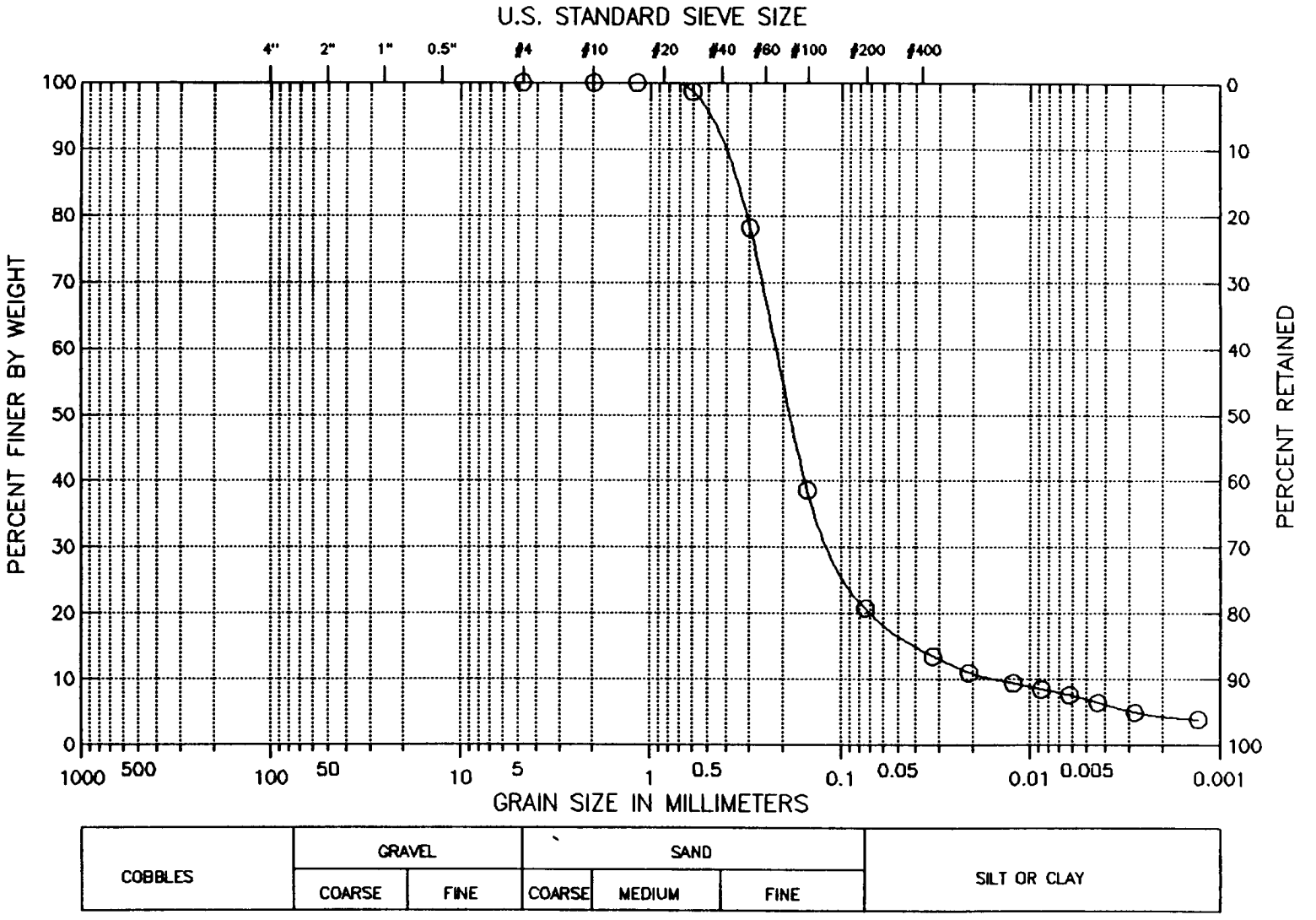
Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.00	0.00	100
#16	0.046	1.18	0.00	0.00	100
#30	0.024	0.60	0.22	0.22	100
#50	0.012	0.30	23.48	23.70	80
#100	0.006	0.15	78.22	101.92	15
#200	0.003	0.07	14.63	116.55	2
Pan			2.91	119.46	0

Total Weight of Sample = 119.46
Tare Weight = 0
Moisture Content = 0.00452034

D85 : 0.3558 mm
D60 : 0.2423 mm
D50 : 0.2180 mm
D30 : 0.1764 mm
D15 : 0.1505 mm
D10 : 0.1145 mm

Soil Classification
ASTM Group Symbol : SP
ASTM Group Name : Poorly graded sand
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

Boring No. : IMF	Project : J.M. MONTGOMERY 2738.0312
Sample No: 02-04	Project No.: 90C0137A
Tested by : N. JOHNSON	Location: ALAMEDA NAVEL AIR STATION
Filename : IMF02-04	Date : Tue Sep 03 1991



Classification :
()

Remarks :

Visual Description :
DK. BROWN SILTY CLAYEY SAND W/LARGE VOID IN MIDDLE

Figure 1

Woodward-Clyde Consultants

Tue Sep 03 13:06:04 1991

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 02-04
Location : ALAMEDA NAVEL AIR STATION
Soil Description : DK. BROWN SILTY CLAYEY SAND W/LARGE VOID IN MIDDLE
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF02-04
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

HYDROMETER

Hydrometer ID : 1734
Weight of air-dried soil = 100 gm
Specific Gravity = 2.7

Hygroscopic Moisture Content :
Weight of Wet Soil = 100 gm
Weight of Dry Soil = 99.12 gm
Moisture Content = 0.00887813

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
2.00	21.00	24.00	13.54	0.033	14	0.033
5.00	18.50	24.00	11.04	0.021	11	0.021
15.00	16.90	24.00	9.44	0.012	9	0.012
30.00	16.00	24.00	8.54	0.009	9	0.009
60.00	15.00	24.20	7.63	0.006	8	0.006
120.00	14.00	23.90	6.49	0.004	6	0.004
300.00	12.50	23.90	4.99	0.003	5	0.003
1440.00	12.00	22.60	3.90	0.001	4	0.001

Woodward-Clyde Consultants

GEOTECHNICAL LABORATORY TEST DATA

Project : J.M. MONTGOMERY 2738.0312
Project No. : 90C0137A
Boring No. : IMF
Sample No. : 02-04
Location : ALAMEDA NAVEL AIR STATION
Soil Description : DK. BROWN SILTY CLAYEY SAND W/LARGE VOID IN MIDDLE
Remarks :

Depth :
Test Date : 09/03/91
Test Method : D422-63

Filename : IMF02-04
Elevation :
Tested by : N. JOHNSON
Checked by : S. CAPPS

FINE SIEVE SET

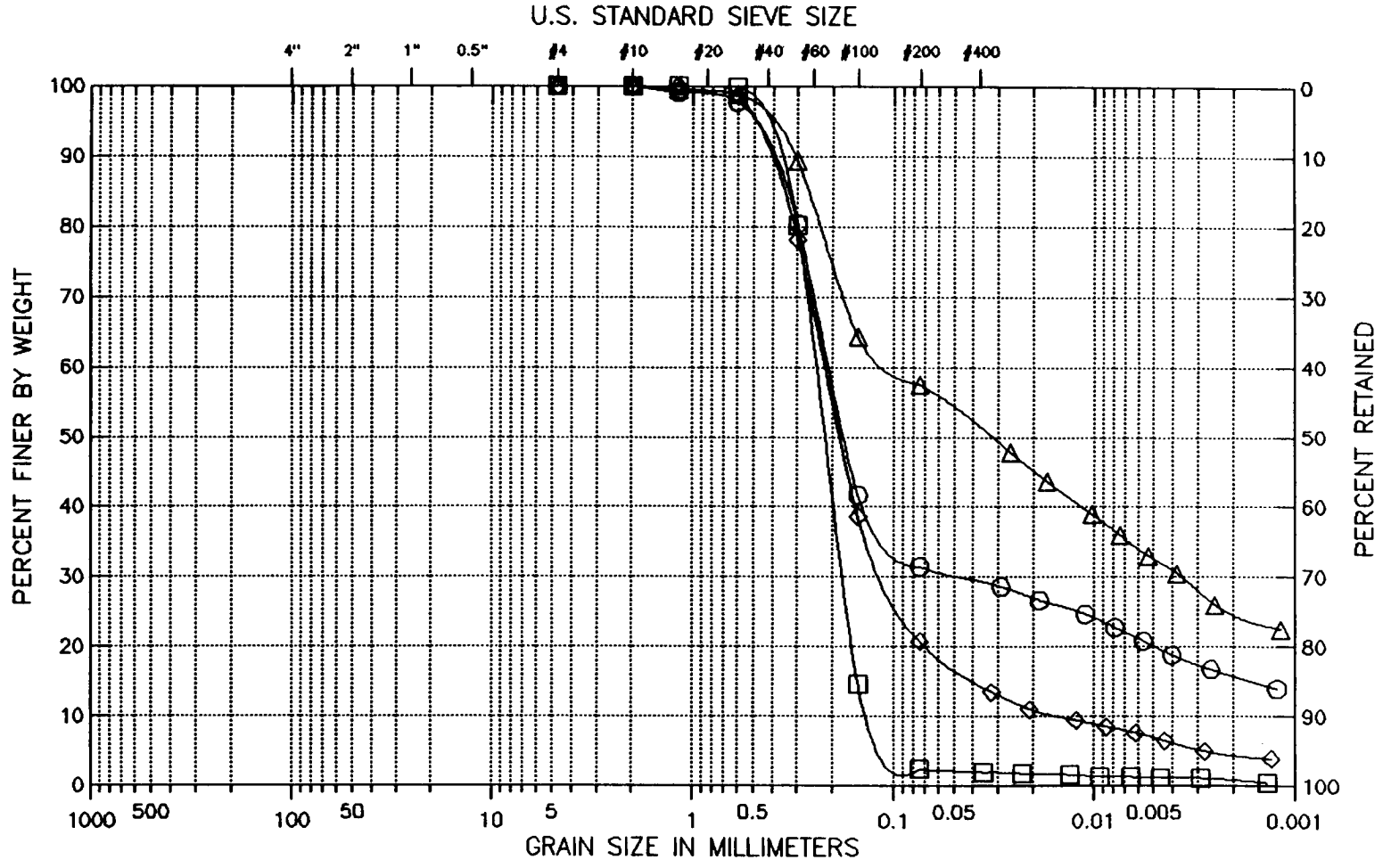
Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.00	0.00	100
#16	0.046	1.18	0.00	0.00	100
#30	0.024	0.60	1.31	1.31	99
#50	0.012	0.30	20.35	21.66	78
#100	0.006	0.15	39.20	60.86	39
#200	0.003	0.07	17.63	78.49	21
Pan			20.63	99.12	0

Total Weight of Sample = 99.12
Tare Weight = 0
Moisture Content = 0.00887813

D85 : 0.3781 mm
D60 : 0.2183 mm
D50 : 0.1832 mm
D30 : 0.1066 mm
D15 : 0.0384 mm
D10 : 0.0147 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

Project : J.M. MONTGOMERY 2738.0312
Project No.: 90C0137A
Location: ALAMEDA NAVEL AIR STATION
Date : Tue Sep 03 1991



Symbol	Boring No.	Sample No.	Depth	Filename	Classification / Description
⊖	IMF	01-06		IMF01-06	BROWN GRAY SILTY CLAYEY SAND TO SILTY CLAY
△	IMF	08-08		IMF08-08	GRAY SILTY FINE SANDY CLAY
⊟	IMF	05-05		IMF05-05	SP Poorly graded sand
◇	IMF	02-04		IMF02-04	DK. BROWN SILTY CLAYEY SAND W/LARGE VOID IN MIDDLE

Figure 1

APPENDIX D

BORING LOGS/WELL CONSTRUCTION DIAGRAM
PHASE III INVESTIGATION

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER *B-IMF-10* CLIENT *PRC/US NAVY*

DATE STARTED *4/3/92* COMPLETED *4/3/92* PROJECT/JMM PROJECT NO. *NAS ALAMEDA/2738.0312*

ELEVATION *0 FEET* GEOLOGIST *RICH HALKET*

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
						SW	SAND (SW), medium grained, 10% fines, loose, damp at 1 foot, wood fragments and black petroleum material at 1.5 feet	
			5					
1			5					
			5					
2			4				SAND (SW), as above, oily at 2 feet, shell fragments	
			10					
3			20				SAND (SW), oil soaked, contains fragments of black tar-like substance, similar to asphalt	
			9					
4			4				@ 4 feet-oil soaked sand with vitrified fragments of tar-like substance	
			20					
5			9				@ 5 feet-oil soaked sand with wood fragments	
			4					
6								
			10					
7			14			SC	clayey SAND (SC), white-gray, dense, moist, 30% fines, fine sand, low to moderate estimated K	
			45					
8							Hydropunch sample at 8 feet	

DRILLING METHOD/RIG TYPE *AUGER/MOBILE B-53* DRILLING CONTRACTOR *GREGG DRILLING*

HOLE DIAMETER *6.5 INCHES* BIT TYPE *HOLLOW STEM AUGER*

TOTAL DEPTH OF BORING *8.0 FEET* DRILLER *RICHARD HERMAN*

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

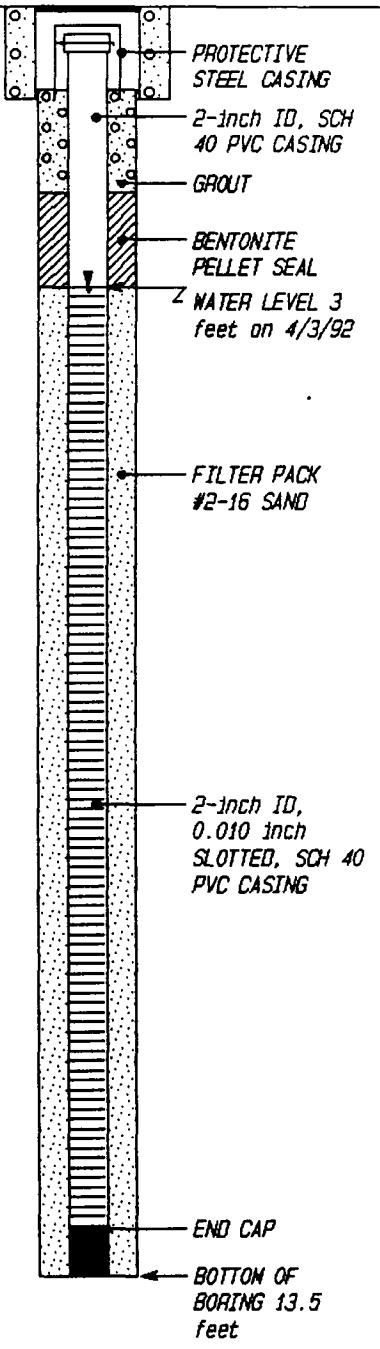
365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER *M-IMF-02* CLIENT *PRC/US NAVY*

DATE STARTED *4/3/92* COMPLETED *4/3/92* PROJECT/JMM PROJECT NO. *NAS ALAMEDA/2738.0312*

REF. ELEVATION *0 FEET, TOP OF CASING* GEOLOGIST *RICH HALKET*

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID meter units	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
1			13			SP	SAND (SP), brown, medium dense, moist, 5% fines, fine sand, trace oyster shell fragments
			6				
2			9				
			11				SAND (SP), brown, medium dense, wet, 5% fines, fine sand, trace oyster shell fragments
3			2				
			2			CL	CLAY (CL), gray, soft, wet, trace fine sand, trace plant debris, low estimated K
4			26			SP	@ 4 feet-vitrified tar-like substance mixed with wood fragments
			8				
			12				
			16				@ 5.5 feet-vitrified material interspersed with SP, 6 inch fragments of white pulp-like material (possibly paper or insulation)
6			6				
			30			SC	@ 5.8 feet-2 inch wood fragment
7			30				clayey SAND (SC), tan-white, moist, 25% fine sand, low estimated K
			10				clayey SAND (SC), mottled gray-brown, wet, moderate estimated K, iron staining, oily patches, hydrocarbon odor
8			20				
			21				
9			5				
			10				
10			11				
			8				
11			20				
			24				
12			8				@ 12 feet-as above
			20				
13			24				
							TOTAL DEPTH 13.5 feet



DRILLING METHOD/RIG TYPE *AUGER/MOBILE B-53* DRILLING CONTRACTOR/DRILLER *GREGG DRILLING/R. HERMAN*

HOLE DIAMETER *6.5 INCHES* BIT TYPE *HOLLOW STEM AUGER*

TOTAL DEPTH OF BORING *13.5 FEET* WELL COMPLETION DEPTH *13.5 FEET*

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER B-IMF-09 CLIENT PRC/US NAVY
DATE STARTED 4/3/92 COMPLETED 4/3/92 PROJECT/JMM PROJECT NO. NAS ALAMEDA/2738.0312
ELEVATION 0 FEET GEOLOGIST RICH HALKET

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0			6			SP	SAND (SP), brown, medium dense, moist, 5-10% fines, fine sand, high estimated K	
1			5					
			9				@ 1.4 feet-black tar-like substance (2.5 inch layer), strong hydrocarbon odor, vitreous luster	
2			4				@ 2.2 feet-black tar-like substance (2 inch layer), strong hydrocarbon odor, vitreous luster	Water level 2.25 feet on 4/3/92
			10					
3			15					
			3				@ 3.5 feet-color change to black (saturated with oil), abundant wood fragments, strong hydrocarbon odor, vitrified	
4			6					
			12					
5								
6							Hydropunch sample from 5.5 to 6 feet	
7								
8								
9								

DRILLING METHOD/RIG TYPE AUGER/MOBILE B-53 DRILLING CONTRACTOR GREGG DRILLING
HOLE DIAMETER 6.5 INCHES BIT TYPE HOLLOW STEM AUGER
TOTAL DEPTH OF BORING 6 FEET DRILLER RICHARD HERMAN

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

365 LENNON LANE, WALNUT CREEK, CALIFORNIA, 94598 / (415) 975-3400

BORING/WELL NUMBER *B-IMF-11* CLIENT *PRC/US NAVY*

DATE STARTED *4/3/92* COMPLETED *4/3/92* PROJECT/JMM PROJECT NO. *NAS ALAMEDA/2738.0312*

ELEVATION *0 FEET* GEOLOGIST *DONNA COURINGTON*

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/6 IN	HNU-PID	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
1						SP	SAND (SP), brown, 15% fines, FeO2 staining, black vitreous material @ 1.5 feet	
2			6 20				SAND (SP), as above, lower 3 inches is black, dense, dry, coal-like material, hard, strong hydrocarbon odor	
3			40 12					
4			13 20				@ 3.5 feet-entire sampler is black, coal-like, oily and damp in lower 1 foot	
5			4 9				@ 5 feet-asphalt, sticky black oil with sand and brick fragments, wood, lower 6 inches is oily SP as above	
6			12				@ 6 feet-upper 6 inches is oily asphalt, sticky, with sand and gravel, lower 12 inches is SM to SC, moist, red-brown, oily, strong odor	
7								
8							Hydropunch sample driven from 8 to 9 feet, no groundwater sample recovered	
9								

DRILLING METHOD/RIG TYPE *AUGER/MOBILE B-53* DRILLING CONTRACTOR *GREGG DRILLING*

HOLE DIAMETER *6.5 INCHES* BIT TYPE *HOLLOW STEM AUGER*

TOTAL DEPTH OF BORING *8.0 FEET* DRILLER *RICHARD HERMAN*

APPENDIX E

LABORATORY ANALYTICAL REPORTS
PHASE III INVESTIGATION

Analytical Data and

Supporting Laboratory QC for

Alameda Naval Air Station

CTO-137 Modification #1

Soil & Groundwater

Prepared By:
Environmental Science & Engineering, Inc.

April 29, 1992

Case Narrative

I. Case Narrative CTO-137

Twenty-two soil samples and four groundwater samples were received in good condition. Groundwater samples were analyzed for lead (Pb). Soil samples were analyzed for total Pb and pH.

The samples were analyzed within established EPA holding times and in accordance with the referenced methods. Overall, the laboratory QC requirements were met and sample matrix quality control outliers are due to matrix effects. The soils had a great deal of matrix interferences for Pb, especially by atomic absorption.

Analytical Data

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA NAS-CTO-137
FIELD GROUP ALW3A PROJECT MANAGER J.M. HARGROVE

STORET CODE:					400	94	10	1051
METHOD CODE:					0	0	0	CLP90
PARAMETER:					FIELD PH	SP COND	H2O TEMP	PB
UNITS:					STD UNITS	UMHOS/CM	C	UG/L
FLD.GRP.	#	SAMPLE ID	DATE	TIME				
ALW3A	1	M-IMF-02	04/17/92	13:15	2.99	3000	18.9	92.2
ALW3A	2	B-IMF-09	04/03/92	12:50	0.920	22000	19.8	1770
ALW3A	3	B-IMF-10	04/03/92	15:00	2.80	2000	20.4	76.5
ALW3A	5	M-IMF-01	04/17/92	15:30	6.66	11000	18.4	1.5

PROJECT NUMBER 3914042 0201 PROJECT NAME JMM/ALAMEDA NAS-CTO-137
FIELD GROUP ALS3A PROJECT MANAGER J.M. HARGROVE

STORET CODE:					72015	70310	70318	70320	1052
METHOD CODE:					0	1	CALC	1	CLP
PARAMETER:					DEPTH	PH,SED	% SOLIDS	MOISTURE	PB
UNITS:					FEET	STD.UNITS	% WET WT	%WET WT	MG/KG-DRY
FLD.GRP.	#	SAMPLE ID	DATE	TIME					
ALS3A	1	M-IMF-02-0	04/03/92	09:28	0.0	8.1	99.6	0.4	6.30
ALS3A	2	M-IMF-02-.5	04/03/92	09:43	0.5	8.8	96.3	3.7	4.70
ALS3A	3	M-IMF-02-1	04/03/92	09:45	1.0	7.9	93.3	6.7	4.62
ALS3A	4	M-IMF-02-2	04/03/92	09:56	2.0	7.3	89.8	10.2	113
ALS3A	9	B-IMF-09-000	04/03/92	08:50	0.0	6.8	99.1	0.9	9.15
ALS3A	10	B-IMF-09-.5	04/03/92	09:07	0.5	8.0	91.9	8.1	12.6
ALS3A	11	B-IMF-09-1	04/03/92	09:09	1.0	1.7	80.5	19.5	368
ALS3A	12	B-IMF-09-2	04/03/92	09:19	2.0	2.7	87.4	12.6	60.9
ALS3A	17	B-IMF-10-000	04/03/92	09:00	0.0	6.4	99.6	0.4	6.40
ALS3A	18	B-IMF-10-.5	04/03/92	14:00	0.5	6.5	93.8	6.2	73.7
ALS3A	19	B-IMF-10-1	04/03/92	14:08	1.0	6.8	88.7	11.3	28.5
ALS3A	20	B-IMF-10-2	04/03/92	14:08	2.0	7.8	87.5	12.5	3.34
ALS3A	21	B-IMF-10-3	04/03/92	14:15	3.0	1.9	76.4	23.6	1980
ALS3A	25	B-IMF-11-0	04/03/92		0.0	7.7	99.4	0.6	13.6
ALS3A	26	B-IMF-11-0.5	04/03/92	15:30	0.5	7.4	95.1	4.9	13.4
ALS3A	27	B-IMF-11-001	04/03/92	15:30	1.0	7.0	91.3	8.7	19.4
ALS3A	28	B-IMF-11-002	04/03/92	15:37	2.0	4.4	86.7	13.3	22.7
ALS3A	29	B-IMF-11-003	04/03/92	15:49	3.0	1.2	87.9	12.1	139
ALS3A	30	B-IMF-11-004	04/03/92	15:55	4.0	1.9	82.1	17.9	568
ALS3A	31	B-IMF-11-5.5	04/03/92	15:57	5.5	3.8	82.3	17.7	4.15
ALS3A	33	DUP-S3-1	04/03/92			3.2	85.1	14.9	115
ALS3A	34	DUP-S3-2	04/03/92			1.2	86.2	13.8	314