Characterization and Conceptual Remedial Action Plan for Soil at a Portion of AC Transit's Emeryville Facility

AC Transit

AC Transit Emeryville Site

July 1988.

KAISER ENGINEERS

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Kaiser Engineers, Inc.

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ENVELOPE
No. ____ of ____

OWNER AC Transit
Address 1177-47th St.
Oakville Phone
Contractor Kaiser Engineers
Address 1800 Harrison
Oak Phone 268-6376
OTHER (Specify)
Address
Phone
CONTACT FOR INVESTIGATION

PLAN REVIEW		By	Date
$ 700.00	Rec'd.	mrc	7/11
No.	Plans Rec'd.	mrc	7/11
Plans Approved			
Layout Made			
Rejected			
Applicant Notified			
Plans Returned			
Permit Issued			

CONSTRUCTION PROGRESS ACCEPTANCE			
FOOD	Pre-Plaster/drywall		
	Pre-Final		
	Final		

		By	Date
POOL	Pre-Concrete/Gunite		
	Pre-Plaster		
	Final		
EXCAVATION	Septic Tank		
	Absorption Field		
	Absorption Bed		
FINAL	House Sewer		
	Septic Tank		
	Absorption Field		
	Absorption Bed		
OTHER			

		By
U.G. TANKS	Pre-Covering	
	Final	

REMARKS

Date	By	

REMARKS

Date	By	

LOCATION

Vicinity Map

Project # US24536
Fee Paid $700.00
Date 7-11-88

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AC Transit Emeryville Facility

Soil Characterization, Planned Remediation and Construction

INTRODUCTION

This report on site soil characterization, remediation and construction plans has been prepared in response to requirements presented by Lowell Miller and Dennis Byrne of the Alameda County Health Agency (ACHA), Division of Hazardous Materials in a meeting on June 22, 1988. This agency is the designated reviewing agency in this geographic region. Copies of this report will be sent to the California State Regional Water Quality Control Board (RWQCB) and Department of Health Services (DOHS) offices as requested by them.

The need for site characterization results from the following two factors. First, hydrocarbon contamination was discovered at the site in the course of reconstruction. The California Regional Water Quality Control Board, San Francisco Bay Region Guidelines for Addressing Fuel Tank Leaks (September, 1985) directs that "....This will require excavation to less than 1,000 ppm total hydrocarbons in most instances." Therefore, the soil was initially characterized to determine what, if any, fitted into the above category and must be removed. The area encompassed by the initial site characterization is more or less the entire site area shown on Figure 1. Second, reconstruction plans require that the existing grade of a small part of the site be lowered by excavation of the top 4 feet of soil so that the area can be paved; this excavation will result in a surplus of soil that must be disposed of off site. Additional characterization of site soils was required to determine whether or not this soil or what part of it could be off-hauled to a Class III disposal facility (at a cost of about $3/cubic yard compared to a Class I facility at a cost of between $150 to $200/cubic yard). This comparatively smaller region of the augmented site characterization is shown on Figure 2. Discussion of this area of augmented site characterization forms a major part of this report as those data will provide the Alameda ACHA a basis from which to evaluate the sampling and excavation plan.

SITE HISTORY

General Background

This section of the report presents a general history of site demolition and reconstruction, including discussions of tank removal and the attendant soil sampling and analysis results.

The AC Transit Division 2, Emeryville, Operating Division has been in existence since 1937. The locations of the old demolished and the newly constructed features at the site are shown on the general site plan presented as Figure 1. The original facilities for bus maintenance and operations included a large combined administration and maintenance building, a fuel island for fueling buses, a bus washer, and yard space for bus parking. The District began reconstruction of the facility in October of 1983. The reconstruction is being performed in stages, while operations continue at the facility.

An employee parking structure, an administration and operations building, a new fuel island, and a new maintenance building were constructed in the former bus parking area of the yard. As the various new facility elements were completed and became operational, the old existing corresponding elements were abandoned and demolished. The old fuel island was demolished in November of 1986; the old bus washer was demolished in September of 1986. The old combined maintenance and administration building was demolished in August of 1987. These features are shown on Figure 1.

o Tank Removal - Old Fuel Island

Removal of the old fuel island (see Figure 1) was performed by Roebbelen Engineering as part of their construction contract. Removal of the five fuel tanks was planned for November of 1986. During preparation for the removal, the District engaged an environmental consulting firm to perform sampling in the underground tank area. The sampling showed that soils in that area were above the California DOHS action limits. The Alameda County Health Agency was notified by letter on October 29, 1986.

On November 6, 1986, a meeting was held at the site with Ted Gerow and Rafat Shahid of the Alameda County Health Agency. A copy of the soil report was given to County personnel and the cleanup discussed. The plan was that all soils contaminated above 1,000 ppm would be removed to a Class I disposal site. County personnel requested, and were given, a work plan and a safety plan. The tanks were removed and Class I material taken to a Class I disposal site. Monitoring wells were installed.

water was sampled and tested, and the results were furnished to the County. On March 5, 1987, the District received a letter from Mr. Shahid stating that the County considered the correction plan complete.

o Tank Removal - Old Maintenance Building (Eastern Half)

Demolition of the old maintenance building required removal of an abandoned tank and an active waste oil tank. The location of these tanks is shown on Figure 2. Arrangements for removal of these tanks were made with the Martinez Industrial Services in Richmond. The tanks were removed on October 15, 1987. The County was notified in advance of the removal date. George Warren, a member of the Emeryville Fire Department, witnessed all activities during tank removal. The contents of the tanks were analyzed, then removed and transported to a waste facility. The backfill in the vaults was sampled and analyzed. The results showed that the vaults contained Class I material; therefore it was off-hauled to the PWI Class I disposal site at Button Willow, California. Chemical analysis reports (CAR's) for the above mentioned samples are dated October 15, 1987 and are included in Appendix A.

After excavation and removal of the tank vaults, soil samples were taken from beneath the vaults and analyzed. Analyses showed soils immediately beneath the vaults to be Class I material (samples FTL-1,2,3). An additional 3 feet of this material was excavated and off-hauled and further tests performed. The results showed that deeper soils were not contaminated (sample FTL-4) and the hole resulting from the removal of the vault was backfilled with clean material (see Appendix A for CAR's of these samples).

During about the same time interval, soil contamination was found during removal of the old work pits in the western half of the building (see Figure 2). This contamination will be discussed in greater detail in the site characterization section of this report.

Other than the tanks, no other feature existed in the eastern half of the building that would be suspected of causing soil contamination. After tank removal, the concrete floor slab was removed, and the site graded to the elevation of the pavement subgrade. Excavated soils were stockpiled and tested. Analytical results showed the soils to be Class III. The test results were furnished to Beth Levine of CRWQCB by Kaiser Engineers' letter of March 17, 1988. Beth Levine responded by letter on March 22, 1988, and certified these soils for removal to West Contra Costa County landfill. Approximately 1,600 cubic yards of soil were off-hauled to the landfill.

o Old Maintenance Building - **Western Half**

During excavation and removal of the old bus maintenance work pits, soil contamination was found beneath the concrete floors. AC Transit advised the RWQCB of this by a letter dated October 15, 1987; a copy of this letter was also sent to the Alameda County Health Agency. As a result of the presence of contamination, work was halted on this portion of the facility to permit site soil characterization. In March of 1988, the augmented site characterization (presented in this report and outlined in Figure 2) was begun by Kaiser Engineers' EC&R Group; some preliminary findings of this characterization were discussed with Beth Levine of the CRWQCB. "Dental" excavation of Class I material began on June 16, 1988. Identification of regions to be excavated was based on information obtained as a result of the augmented site characterization. The regions excavated are shown on Figures 5 and 6. Approximately 1,500 cubic yards of material were excavated and transported by IT Corporation to PWI waste facility at Button Willow. Approximately 1,500 cubic yards of additional material comprised of both Class I and Class II soil have been excavated, stockpiled, and covered at the site. Samples have been taken at the bottom of the dental excavation to determine if Class I contaminants still remain in the excavation. Results of chemical analyses for these samples are discussed in the Site Characterization section of this report. Plans are to treat the excavated material on site using enhanced bioremediation, if regulatory approval for this technique can be obtained. Currently, Kaiser Engineers' EC&R Group is preparing an application for variance which, if obtained, will permit the bioremediation to proceed; otherwise, the material will be off-hauled.

o Old Bus Washing Area

The location of this area is shown on Figure 1. All wash water from this area was collected by the sanitary sewer shown on Figure 2. Excavation of this sewer line is described in the Excavation Plan section of this report (in that part of the report the location is described as along the C column line as shown on Figure 4). The following information about chemicals used in this area is provided to satisfy a specific request by the Alameda County Health Agency. The chemical used for the bus washer was Car Wash Detergent ZEP 956. This detergent contained no hazardous ingredients and has a pH in the range of 10.8 to 11.0 for a one percent solution.

o Steam Cleaning Area

Location of the steam cleaning area is shown on Figure 2. As with the old bus washing area, information about chemicals used in this area is provided to satisfy a specific request by the Alameda County Health Agency. In that regard, the steam cleaner did not use any detergent; but, at one time the Transit District did have metal soak tanks for cleaning metal parts and these tanks were located in the steam cleaning area. The following cleaning agents were used: for ferrous metals, Pennsolves 814 and for aluminum parts, Acme Aluminum Clean 36. Both metal cleaning tanks were emptied periodically into the sanitary sewer. During the past seven years, the wastewater emptied into this sewer has been periodically tested by EBMUD and the Transit District. During this time, EBMUD permit limitations for metals have not been exceeded and, in most cases, results of wastewater analyses have been much lower than permit limitations. Permit limitations are available if needed.

o Previous Structures in Area Under Construction

The only part of the site in which additional construction needs to be completed is the small region shown on Figure 2. This area is scheduled for paving as soon as possible. The soils in this region are characterized in the "Augmented Site Characterization" section of this report. In the past, this area was under a portion of the old maintenance building (see Figure 2). The features previously located in this area include:

a. The service pits, possible source of the contamination near Grid D-H/2.5-6.

b. Unit (machine) shop.

c. Parts storeroom (dry goods).

d. Steam cleaning/parts cleaning area (possible source of contamination near Grid AA-BB/10-11).

e. Sanitary sewer from the previously demolished bus washer and fuel island.

f. Battery charging area, tire changing shops, and compressor room (Grid D-H/2-2.5).

SITE CHARACTERIZATION

Initial Site Characterization

Field work for the initial characterization of the site was performed September 14 through 16, 1987 and included the drilling of six soil borings and construction of three groundwater monitoring wells. The wells were drilled to a depth of 30 to 40 feet and the soil borings to 20 feet. Locations of the wells and borings are shown in Figure 3 and their geologic logs appear in Appendix B. As indicated in Figure 3, the initial characterization addressed an area larger than the current area of interest. As described previously, construction has already been completed in part of the area covered by this initial assessment.

Soil samples were collected at 5-foot intervals during the drilling of both the soil borings and the monitor wells. In all, 32 samples were taken. Analytical results from the shallowest two samples (i.e., 5 feet and 10 feet) are presented in Table 1. All samples from a depth of 5-foot are above the water table and are of interest to this report. Soil samples from a depth of 10 feet are below the water table and, while not applicable to shallow soil characterization, are included when high values were reported. Additional shallow samples were taken during the detailed site investigation to determine if high values were present above the water table. Sampling procedures, analytical methods, and CAR's for these samples are presented in Appendix B.

A fourth monitoring well is present on site. The location of this well is also shown on Figure 3. Groundwater level for all wells was found to be at a depth of 7-8 ft below the surface. Water levels in these wells indicate that for the period of record, the groundwater gradient has been in a westerly direction.

Chemical analyses of soil samples taken above and just below the water table within this area during the initial investigation suggested that additional contamination may be encountered during the planned reconstruction excavation and therefore, a program to conduct a more detailed characterization was undertaken. This investigation is referred to as the augmented site characterization and it is discussed in the next few paragraphs.

Augmented Site Characterization

The augmented site characterization began March 25, 1988 and continued until June, 1988. The region of the site covered by this investigation is shown on Figures 1 and 2. During this period a total of 147 soil samples were analyzed to achieve site characterization. Soil sample locations and analytical results

for TFH and TOG concentrations are shown on Figures 4a and 4b. Analytical results for soil analyses are presented in Tabular form in Table 2. CAR's for all soil analyses are presented in Appendix C.

Prior to sampling, a grid was laid out to determine accurate sample locations. Sampling for the augmented characterization began by excavating 20 exploratory pits to depths of 15 feet in the vicinity of "hot spots" identified during the initial phase of characterization. This work was concentrated in the section of the site north of grid line 6.0. Twenty-six samples, from depths up to 10 feet, were analyzed for TFH and TOG (CAR's 1-5 in Appendix C). Pit excavation was accomplished between the dates of March 25 and March 29, 1988.

Analytical results from the above sampling indicated that contamination extended beyond the identified hot spots. To aid in determining the extent of this contamination, additional backhoe sampling was conducted at various locations and depths around the site north of what was later to become grid line 9 (see Figures 4a and 4b). Between April 12 and April 14, 1988, 29 exploratory pits were excavated to depths varying between 4 and 16 feet. Thirty-eight samples were obtained from depths of 10 feet and above. Each of the samples was analyzed for TFH and TOG (CAR's 6-15 in Appendix C).

From April 22 to May 11, 1988, 28 additional, shallow soil samples (from depths between 6 inches to 2 feet) were taken to add definition to the sampling program mostly in the vicinity of coordinate lines 9 and 10 (see Figure 4a for grid location). TFH and TOG analyses showed that shallow soils in this southern part of the site contain levels of TFH and TOG primarily in the Class II range (between 100 and 1,000 mg/kg). At this point, the frequency with which Class II material had been identified to date indicated that contamination was more prevalent than had been suspected and that a systematic sampling of the entire site was needed. Samples were obtained from suspect grid locations where no samples had been previously taken (CAR's 16-23 in Appendix C).

From May 24 to 25, 1988, 55 soil samples were taken. Twelve of these were taken at depths of 4 and 7 feet in an area actively being excavated and previously characterized as Class I. Forty-one samples were taken at a depth of 2 feet, mainly from locations south of grid line 6 which previously had been considered uncontaminated and from where very few samples had been taken previously. Two samples were of a sludge material taken from a concrete trench uncovered at the southwest corner of the site. All samples were analyzed for TFH and TOG (CAR's 24-33 and 44-45 in Appendix C). The sludge samples were also analyzed for volatile organics and base-neutral extractable compounds (CAR's 34-43 in Appendix C).

Results of all the sampling described above, a total of 147 samples, are shown in Figures 4a and 4b and in Table 2. These do not include samples taken from depths greater than 7.5 feet, as this is below the groundwater table. A description of soil sampling methods, analytical methods used, and CAR's for these samples appear in Appendix C.

EXCAVATION PLAN

Excavation to Date

Excavation refers to excavation in the portion of the site which remains to be paved and that is described in the Augmented Site Characterization section of this report. As of June 21, 1988 the regions of the site categorized as Class I material by the soil sampling and analysis program have been excavated. Excavation of this material is referred to as "dental work" in other parts of this report. During excavation of the Class I material, a buried pipe was encountered. Because of the possibility of contamination occurring in the soil surrounding this pipe, that soil was also excavated. The soil excavated from these areas has been off-hauled to a Class I disposal site located in Button Willow, California. After excavation, a total of ten verification samples were taken to determine if excavation had proceeded either deep enough or far enough laterally to remove the identified Class I material. Locations of the verification samples are shown in Figure 5 and the analytical results are presented in Table 3. A description of sampling procedures is found in Appendix D, in addition to a listing of analytical methods used and CAR's of these samples.

The regions excavated and the verification sampling program are described in greater detail in the following sentences. (See Figure 5)

1. The trench-like excavation along the C grid column between cross coordinant lines 2 and 7 is the region from which the buried pipe was removed. (Reference to Figure 2 indicates that this pipe was a sanitary drain pipe.) The excavation was widened along both 4 and 1+ grid lines in the northern half of the site, and between 9 and 10+ grid lines in the southern half because of the presence of suspect soil. The widened parts of the trench in the vicinity of both 4 and 8 grid lines connect to larger areas of Class I material to the east of the excavated pipe trench. The trench-like region was excavated to a depth of approximately 4 feet. Three composite samples were taken along the trench line (samples 3, 4, and 5 on Figure 5). Each sample contained material from either side and the bottom of the trench. Between grid lines 3 and 4+ the excavation was extended downward to the water table.

2. The pipe described above was connected by a feeder pipe to a concrete tank-like structure located in the region enclosed by column lines AA and BB, and cross coordinate lines 10 and 11. This tank-like structure contained a

black oily looking sludge and is possibly part of the sand and debris trap identified on Figure 2. Analysis of two samples (T1 and T2) indicated that the sludge-like material contained oil and grease and only minor amounts of priority pollutants and (the acid-base extractable) napthelene (see CAR's 24, 27, 33-43 in Appendix C). Both the tank-like structure and the surrounding soil were excavated to the water table and any concrete that was not removed was steam cleaned. Verification sample 8 was composited from the four sides of the excavation.

3. Another concrete structure, a slab, was encountered during excavation of the large region of Class I material in the northern half of the site. This region of Class I excavation connects with the pipe trench on the west along grid lines 3 and 4+. At D line it extends from cross coordinate 2 to 4+ and widens out between E and G+ lines to cross coordinates 1+ and 5+. With the exception of the region beneath the concrete slab, Class I soil south of grid line 2 was excavated to the approximate top of the water table (7.5 feet) and no verification samples were needed. Presence of the concrete slab restricted excavation to a depth of 3 feet where it was encountered (see Figure 5). Verification samples 9 and 10 (see Figure 5) were taken from beneath the concrete slab. Contaminated soil north of grid line 2 was excavated to a depth of 4 feet. Composite verification sample 6 was taken from this region as shown on Figure 5.

4. In the southern half of the site, between grid lines 7 and 9+, a region of Class I material extends east of the trench-like excavation from column C to column E. Excavation in this region was carried to a depth of 4 feet. Verification samples 1 and 2 (see Figure 5) were obtained from this region.

5. The Class I material excavated from the vicinity of cross coordinates 7 and B was excavated to the water table. Verification sample 7 (see Figure 5) was composited from the walls of this pit, above the water table.

As was previously mentioned, location of the above excavated areas, location of the verification samples taken from each area, and the approximate depth of each excavated area are shown on a site map presented as Figure 5. Figure 6 shows available "spot" elevations from various parts of these excavations.

Analytical results of the verification soil samples described above are presented in Table 3. The verification samples were analyzed for TFH, TOG, BTEX, and EDB. CAR's appear in Appendix D, coded COMP. EDB and TOG results were reported verbally from ETC - Multi-Tech. Examination of this table indicates that

neither Class I material nor EDB was identified by the verification sampling and that the dental excavation performed to date has adequately removed all identified Class I material. Therefore, no additional excavation of Class I material is required. The small quantities of BTEX reported are not of concern as the region is to be paved as a parking lot which will prevent infiltration of rainwater that may possibly dissolve and transport small quantities of these compounds.

Planned Excavation

As was previously mentioned, excavation at the site is required to permit planned construction. Attainment of the required grade will require uniform removal of the upper 4 feet of material over the entire site. Excavation in the "dental work" areas of the site has already removed some of this material as shown on Figures 5 and 6. Future excavation to a depth of 4 feet is planned for those areas shown on Figures 5 and 6 in which excavation has not already taken place.

PLANNED CONSTRUCTION

After the above excavation is completed, the only construction remaining is to pave that area. Specific steps remaining are as follows:

a. Fill the excavations left from removing the Class I contaminated soils to the top of the new subgrade with imported borrow material.

b. Compact the subgrade.

c. Install the storm water trench drain along column E (see Figure 4) from the northern edge of the work area to line 10.

d. Install paving in the following sequence from bottom to top: geotextile fabric, 12 inches of aggregate base, and 8 inches of Portland cement concrete.

e. After the concrete has been water cured, seal the joints with an epoxy compound.

REMEDIATION PLAN FOR EXCAVATED SOIL

As was mentioned above, about 1,500 cubic yards of mixed Class I and Class II soils have already been excavated, stockpiled on a concrete slab, and covered with a layer of plastic. The remaining excavation will require removal of an additional approximately 1,500 cubic yards of predominately Class II material but which also contains some Class III. This material will also be stockpiled on the existing slab. A permit is currently being sought from the appropriate regulatory agencies to remediate this material using enhanced bioremediation. California DOHS has designated their Sacramento Office as the lead agency in handling this request. Kaiser Engineers is working with Mr. John Wesnousky of that office in this regard.

Enhanced bioremediation is a remediation technique wherein microorganisms isolated from the contaminated substrate are used to metabolically destroy the contaminated parts of the soil. The micro-organisms literally decompose the contamination and render it non-toxic. The technology is simply the enhancement of the microbial environment to optimize the natural degradation process. The steps planned during enhanced bioremediation at the site are: parameter estimation, optimization, determination of design/operations specifications, materials procurement, installation, operation of the active

pile, and monitoring. A discussion of each of these various steps is presented in Appendix E. The Alameda County Health Agency specifically requested that the topics of metals and halogenated hydrocarbon sampling and analyses and verification sampling and analyses be discussed. Therefore, a discussion of these topics is presented in the paragraphs that follow. For details on the other steps or topics see the attached Appendix.

The occurrence of metals and halogenated hydrocarbons at the site is important as neither is rendered nontoxic or nonhazardous by enhanced bioremediation. Halogenated hydrocarbons are anaerobically decomposed, but inefficiently metabolized by aerobic processes. Metals may be chelated and even mobilized by microbial by-products, increasing ground-water contamination. To determine whether or not metals and halogenated hydrocarbons were present at the site, the soil samples collected as part of the parameter estimation step were analyzed for these materials. In this step, representative and composite soil samples were obtained from the contaminated soil at the site. Sample locations are shown on Figure 7. Examination of the Figure reveals that composite soil samples were taken from six regions of the site. These six regions were selected, based on data available, to be the six most heterogeneous in the area. Results of chemical analyses for Sb, As, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Ag, Ti, V, and Zn for these regions are presented in Table 5 (reported verbally from ETC - Multi-Tech Laboratories). Examination of this Table indicates that metals are present in normal concentrations for soils/sediments of this region. Negligible biomagnification or chelation is expected. An EPA 8240 priority pollutant scan was performed on all six samples -- all constituents were non-detectable in every case (verbal report from ETC-Multitech Laboratories). Therefore, neither metals nor halogenated hydrocarbons are expected to present a problem to the planned enhanced bioremediation.

With respect to verification sampling, the enhanced bioremediation procedure for the site calls for spreading the soil out on a 360-foot-long and 60-foot-wide portion of the cement slab as shown on Figure 8. Any leachate that may develop will be caught by damming up the surface drains as shown on the figure. Any leachate caught in this manner will be pumped to a tank for later characterization and disposal. Soil samples to determine microbial metabolic rates will be taken on a weekly basis at the locations shown. When analyses of these samples show that degradation of the contaminant has been essentially completed, soil samples to verify the effectiveness of the enhanced bioremediation will be taken at the same sample locations from a depth of 1 to 3 feet (total soil thickness is estimated to be between 2 and 4 feet). Samples from these locations will be analyzed for TOG, TPH, and BTEX to verify that the desired level of remediation has been achieved.

The Figures, Tables, and Appendices that follow complete this report.

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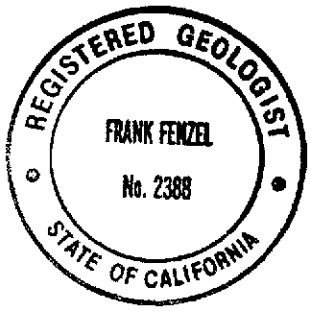
California Registration Number 2388



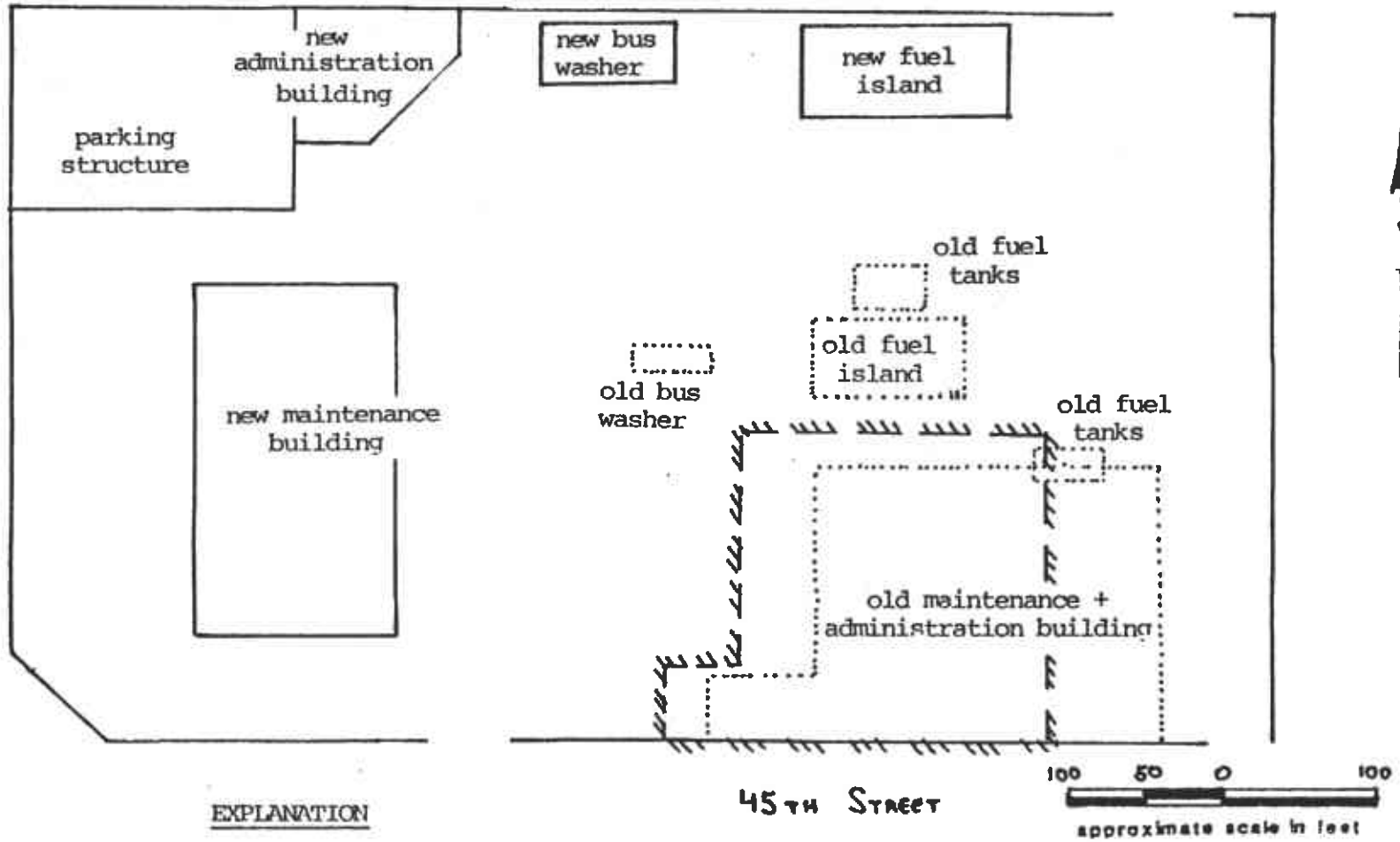


Figure 1 : GENERAL SITE PLAN

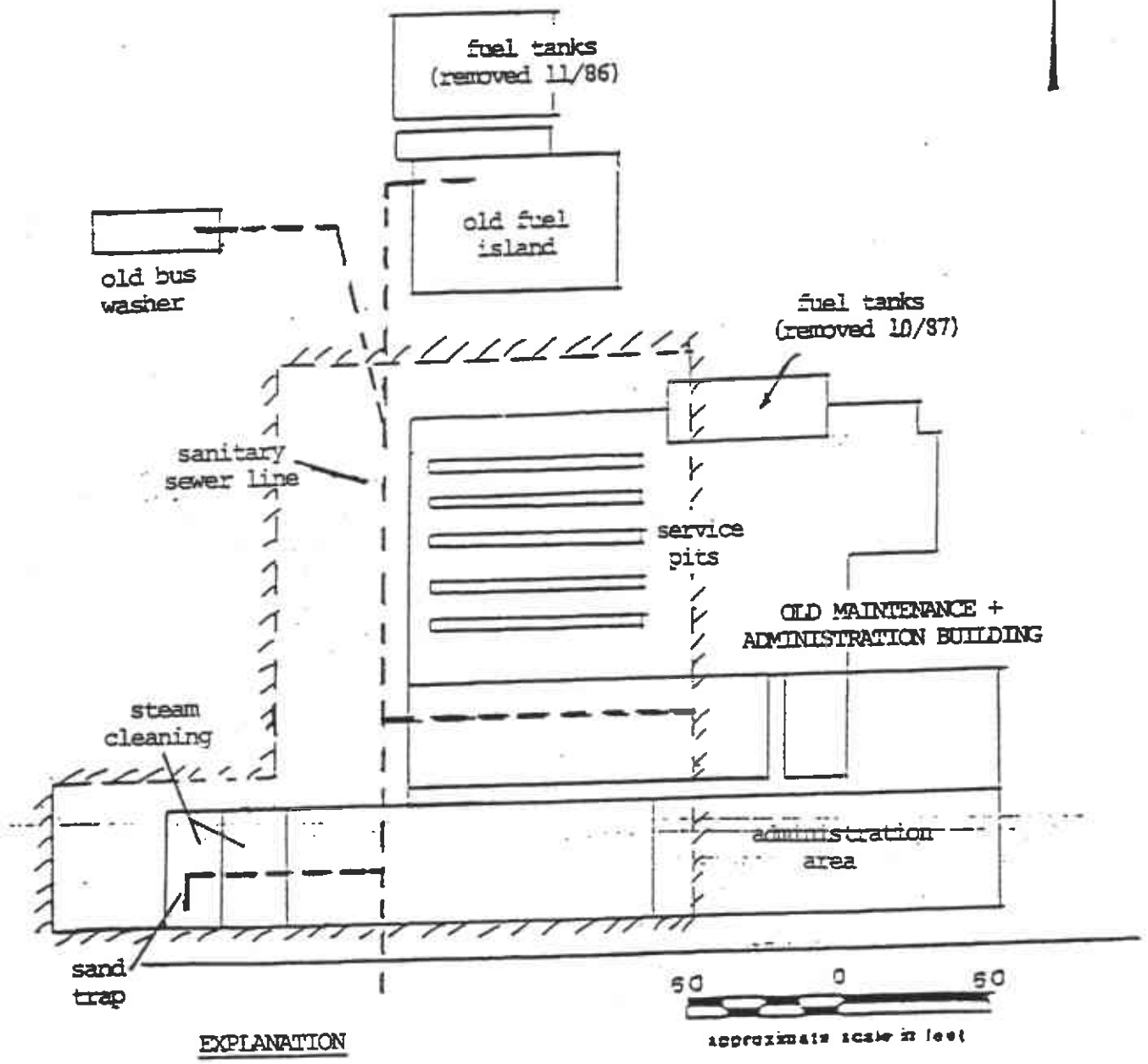


Figure 2 : DETAILED SITE PLAN

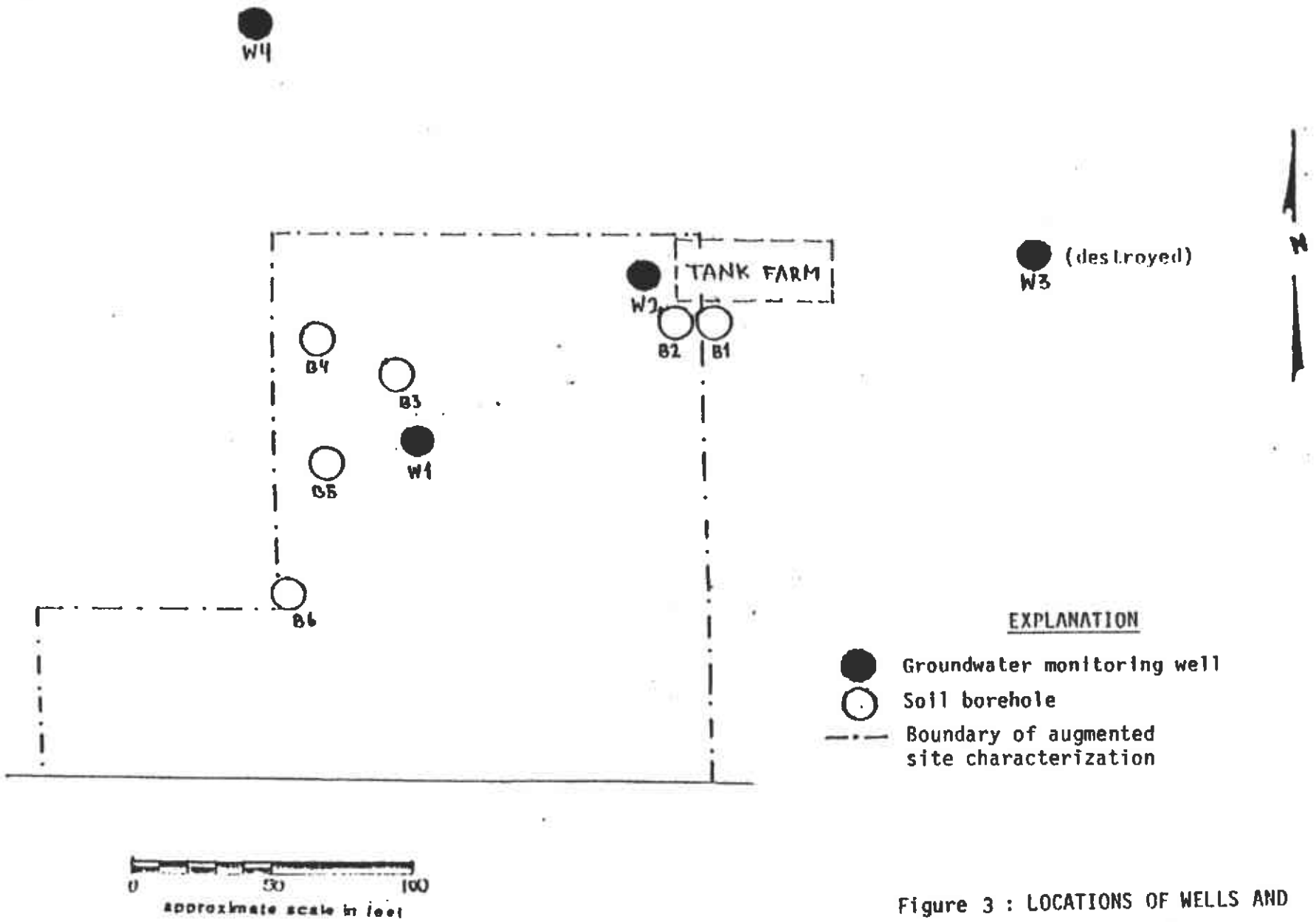


Figure 3 : LOCATIONS OF WELLS AND BOREHOLES - INITIAL CHARACTERIZATION

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

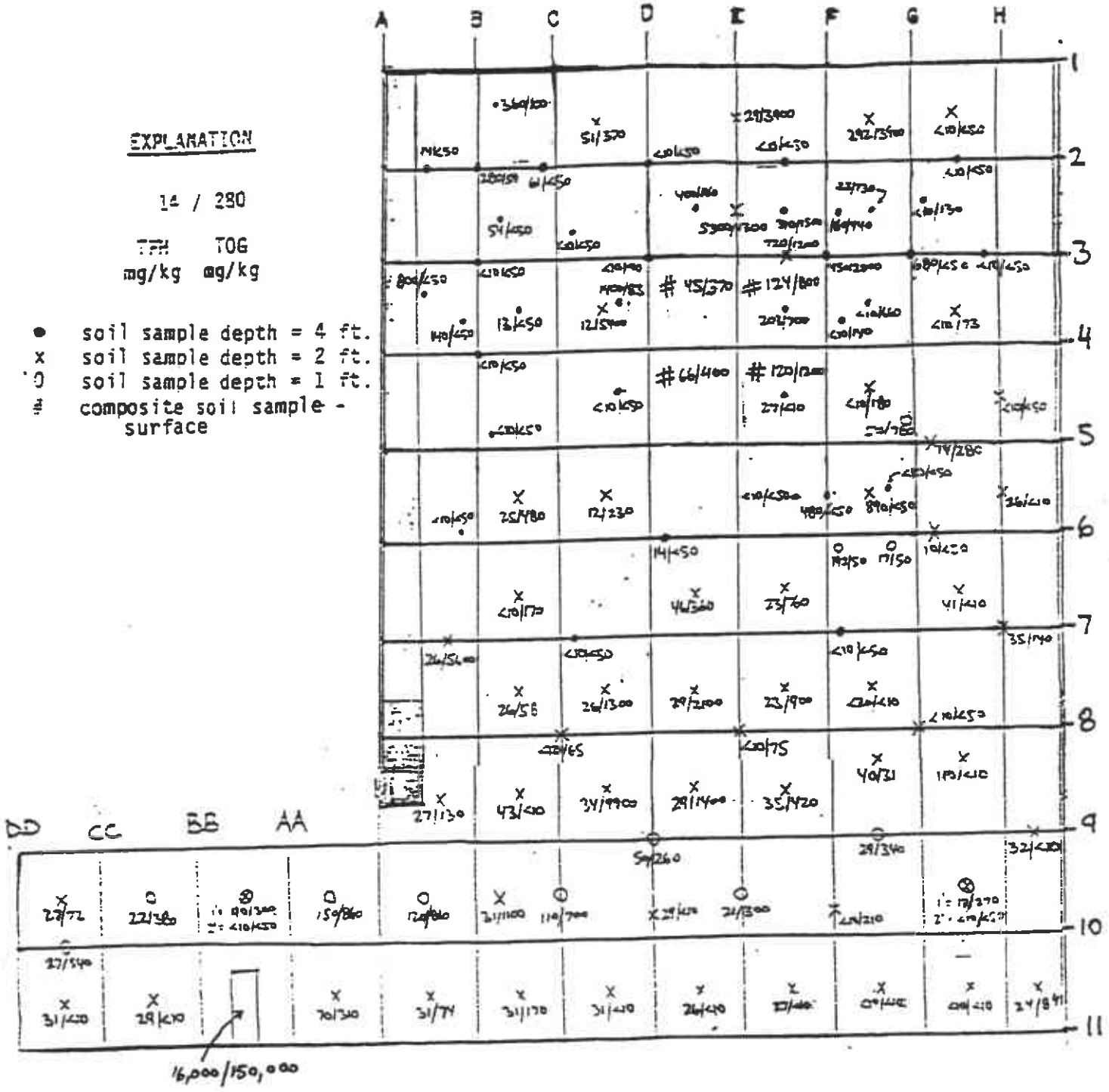


Figure 4a : SOIL SAMPLE ANALYSES - AUGMENTED CHARACTERIZATION
Sample Depth up to 4 feet

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

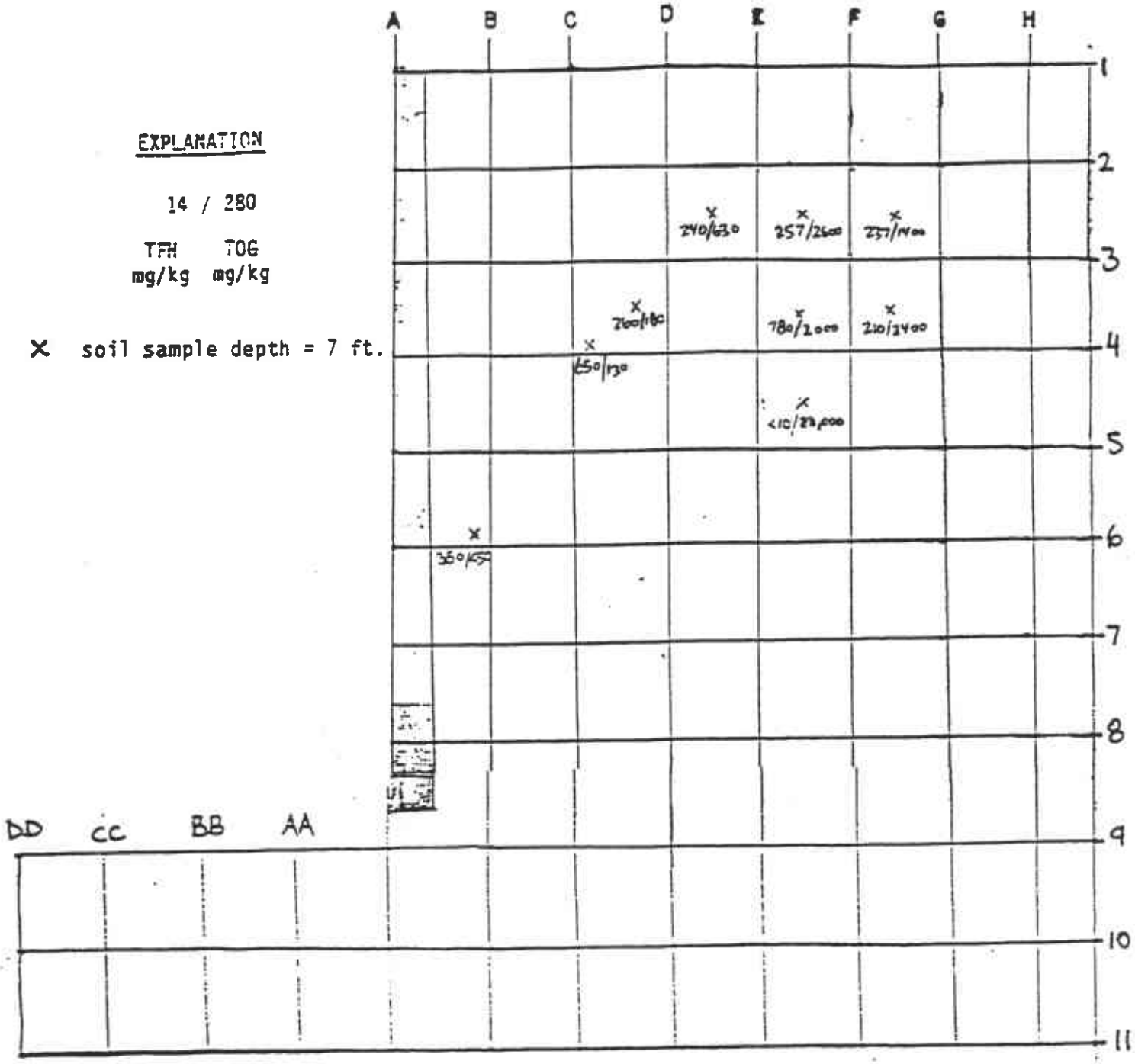


Figure 4b : SOIL SAMPLE ANALYSES -
AUGMENTED CHARACTERIZATION
Sample Depth of 7 feet

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

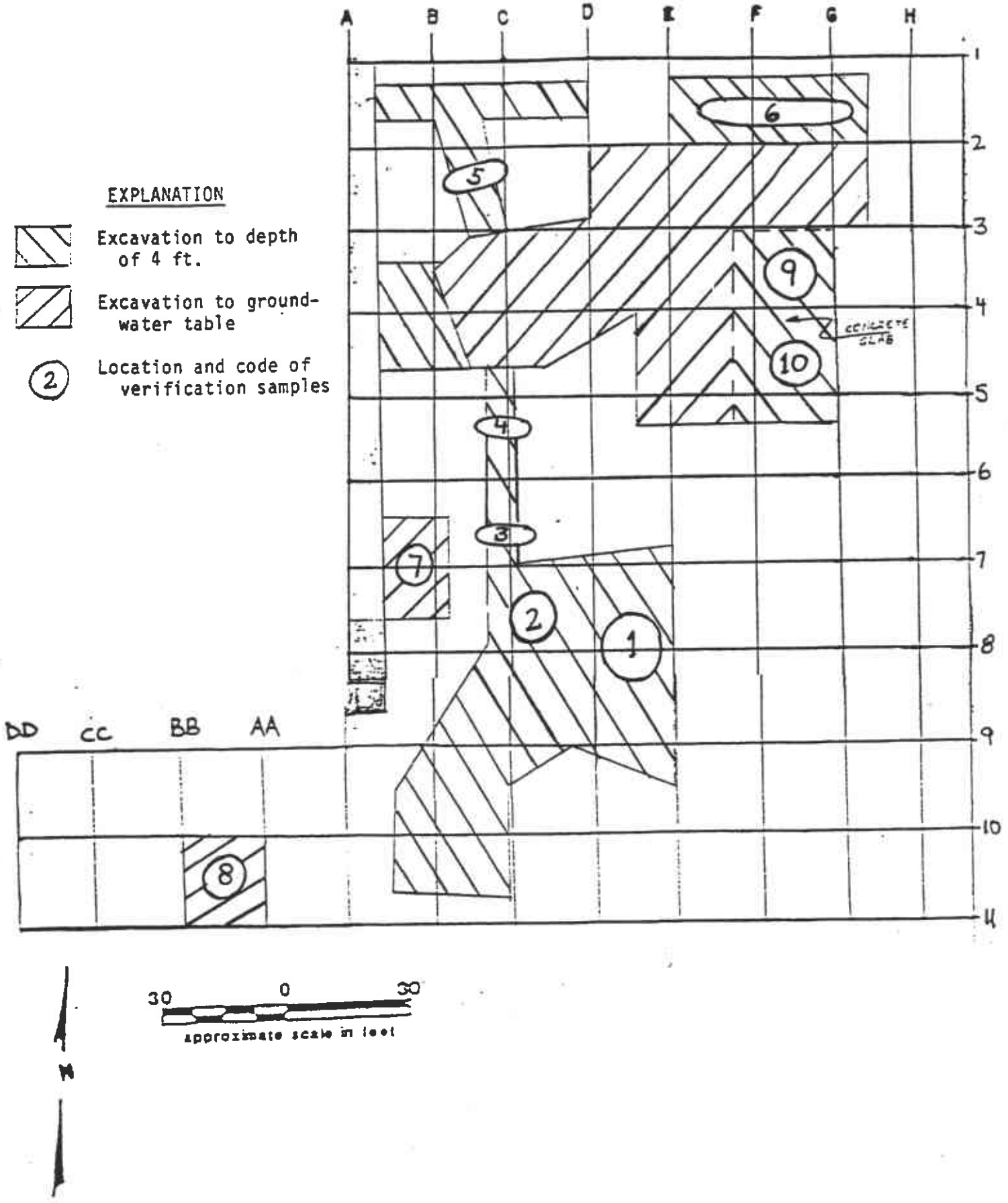


Figure 5 : EXCAVATION MAP +LOCATION OF VERIFICATION SAMPLING

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

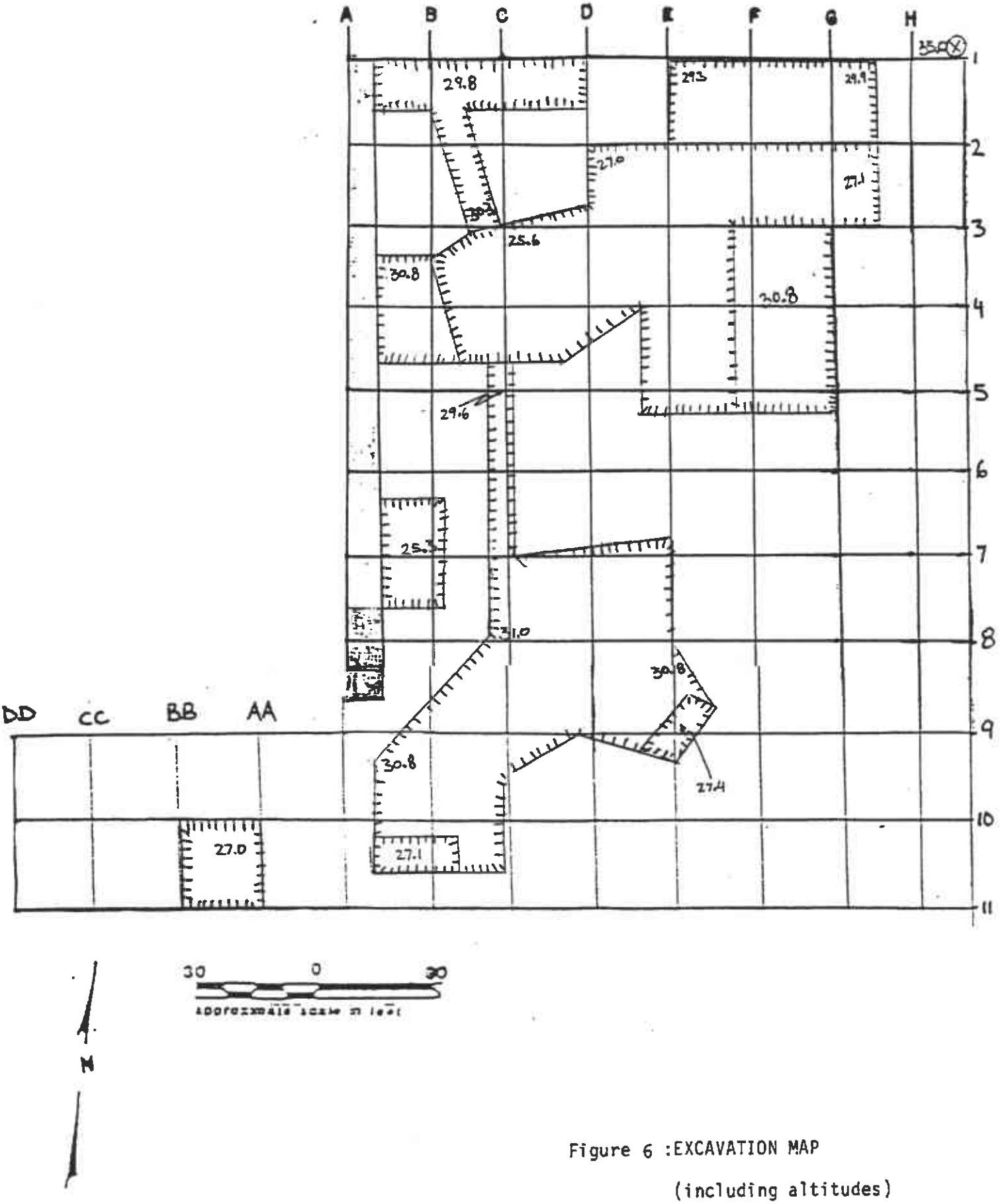


Figure 6 :EXCAVATION MAP

(including altitudes)

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

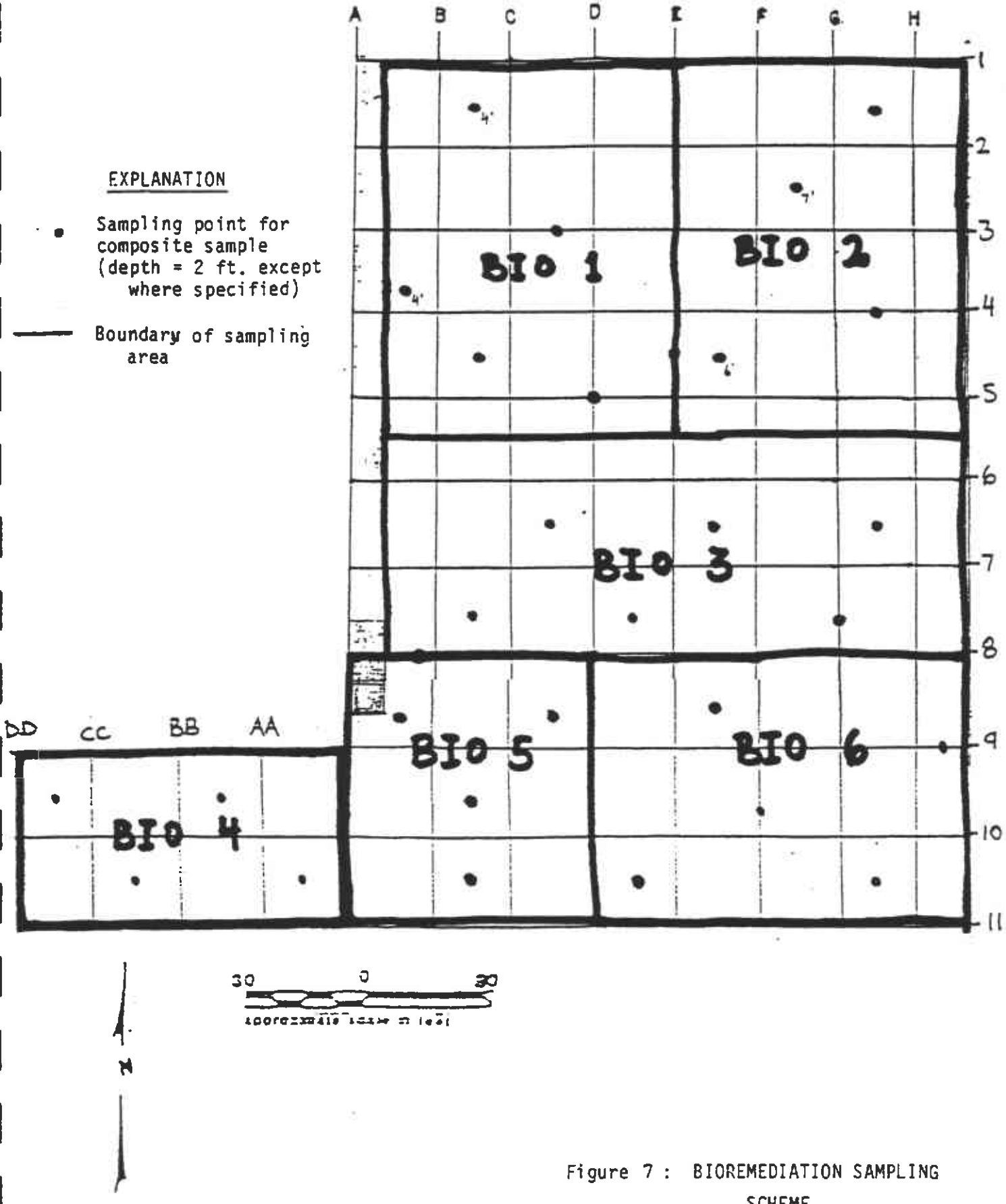
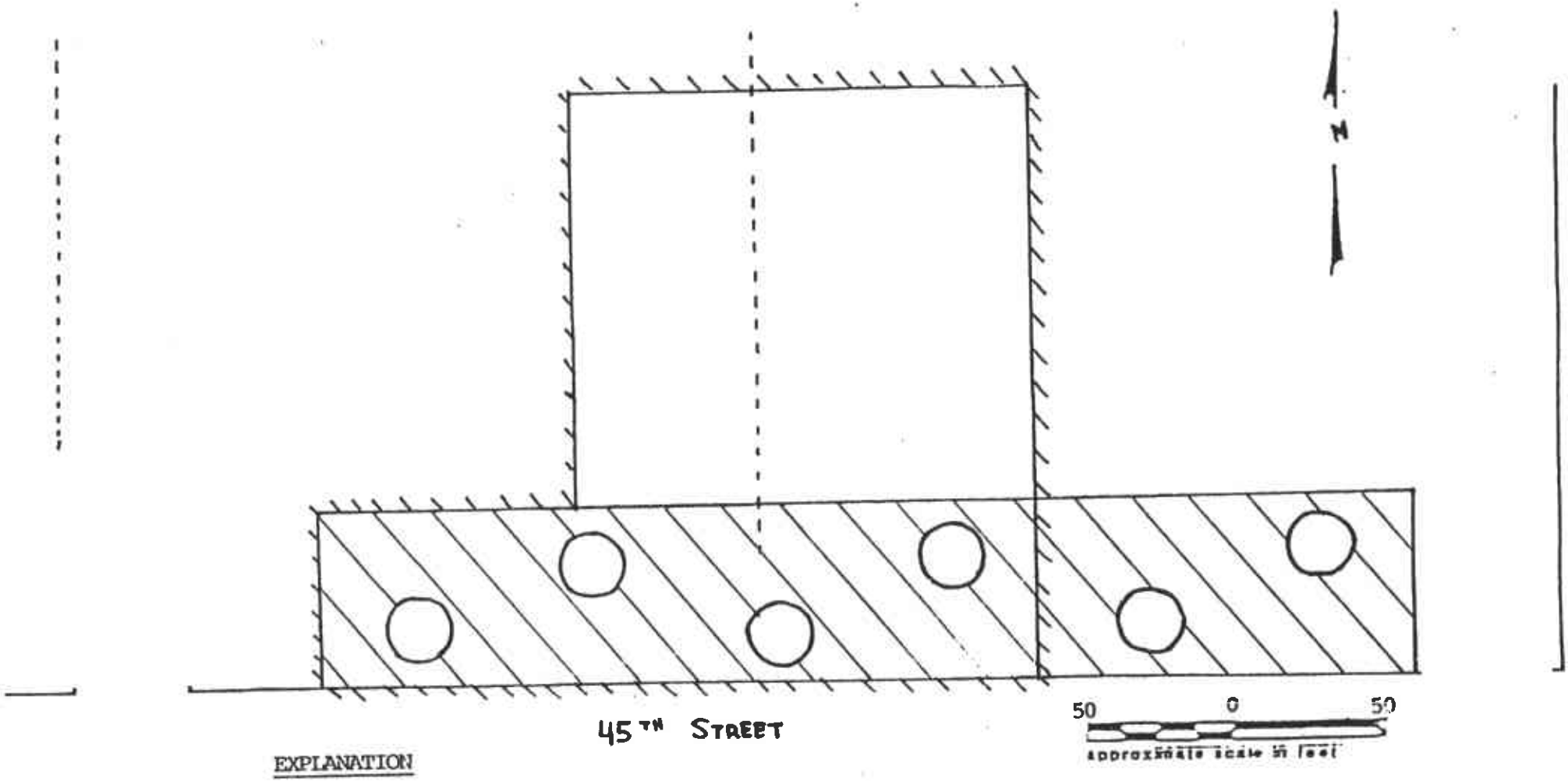


Figure 7 : BIOREMEDIATION SAMPLING SCHEME



EXPLANATION

Boundary of augmented site characterization

Area designated for Bioremediation

Surface drainage trenches

Sampling location

Figure 8 : BIOREMEDIATION AREA + SAMPLING LOCATIONS

AC TRANSIT EMERYVILLE CA
SITE CHARACTERIZATION

Table 1: Soil Sample Analyses - Initial Site Characterization

Location	Depth (ft)	TFH (mg/kg)	TOG (mg/kg)
W1-1	5'	<10	<50
W1-2	10'	140	<50
W1-3	15'	<10	<50
W1-4	20'	<10	<50
W1-5	25'	<10	<50
W1-6	30'	<10	<50
W1-7	35'	<10	<50
W1-8	40'	<10	<50
W2-1	5'	<10	<50
W2-2	10'	2900	<50
W2-3	15'	<10	<50
W2-4	20'	<10	<50
W2-5	25'	<10	<50
W2-6	30'	<10	<50
W3-1	5'	<10	<50
W3-2	10'	<10	<50
W3-3	15'	<10	<50
W3-4	20'	<10	<50
W3-5	25'	<10	<50
W3-6	30'	<10	<50
B1-2	10'	890	85
B1-3	15'	<10	<50
B2-2	10'	540	<50
B2-3	15'	<10	<50
B3-2	10'	1200	190
B3-3	15'	<10	<50
B4-2	10'	150	<50
B4-3	15'	<10	<50
B5-2	10'	89	<50
B5-3	15'	<10	<50
B6-2	10'	68	<50
B6-3	15'	<10	<50

Table 2: Soil Sample Analyses - Augmented Site Characterization

Location	Depth (ft)	TFH (mg/kg)	TOG (mg/kg)
A.3-2.0	4	44	< 50
A.3-3.3	3	800	< 50
A.8-3.6	4	140	< 50
A.8-5.9	4	< 10	< 50
A.8-5.9	7.5	350	< 50
A.5-7.0	2	26	5600
A.5-8.5	2	27	130
A.5-9.5	0.5	120	810
A.5-10.5	2	31	74
B.2-1.3	4	360	100
B.0-2.0	4	280	59
B.8-2.0	4	61	< 50
B.3-2.5	4	54	< 50
B.0-3.0	4	< 10	< 50
B.5-3.5	4	13	< 50
B.0-4.0	4	< 10	< 50
B.2-4.8	4	< 10	< 50
B.5-5.5	2	25	480
B.5-6.5	2	< 10	170
B.5-7.5	2	26	58
B.5-8.5	2	43	< 10
B.2-9.5	2	31	1100
B.5-10.5	2	31	170
C.5-1.5	2	51	370
C.2-2.7	4	< 10	< 50
C.5-3.5	2	12	5400
C.7-3.4	4	1400	83
C.7-3.4	7.5	260	180
C.2-3.9	7.5	650	120
C.7-4.4	4	< 10	< 50
C.5-5.5	2	12	230
C.2-7.0	4	< 10	< 50
C.5-7.5	2	26	1300
C.0-8.0	2	< 10	65
C.5-8.5	2	34	9900
C.0-9.5	0.5	110	700
C.5-10.5	2	31	< 10
D.0-2.0	4	< 10	< 50
D.5-2.5	4.5	400	160
D.5-2.5	7	240	630
D.0-3.0	4	< 10	90
D.2-6.0	4	14	< 50
D.5-6.5	2	46	360
D.5-7.5	2	29	2100
D.5-8.5	2	29	1400
D.0-9.0	0.5	50	260
D.0-9.8	2	29	< 10
D.5-10.5	2	26	< 10

Table 2: Soil Sample Analyses - Augmented Site Characterization

Location	Depth (ft)	TFH (mg/kg)	TOG (mg/kg)
E.0-1.5	2	29	3900
E.5-2.0	4	<10	<50
E.0-2.5	2	5300	1300
E.5-2.5	4.5	370*	1500*
E.5-2.5	7	257	2600
E.5-3.0	2	720	1200
E.5-3.5	4	203	700
E.5-3.5	7	780	2000
E.5-4.5	3	27	<10
E.5-4.5	6	<10	23000
E.6-5.5	4	<10	<50
E.5-6.5	2	23	760
E.5-7.5	2	23	900
E.0-8.0	2	<10	75
E.5-8.5	2	35	420
E.0-9.5	0.5	21	300
E.5-10.5	2	27	< 10
F.5-1.5	2	292	3900
F.2-2.5	4	160	440
F.5-2.5	4	33	730
F.5-2.5	7	237	1400
F.0-3.0	4	450	2000
F.5-3.5	4	<10	660
F.5-3.5	7	210	2400
F.2-3.7	3	<10	140
F.5-4.4	2	<10	180
F.9-4.8	1	510	780
F.0-5.5	4	480	< 50
F.5-5.5	2	890	<50
F.7-5.5	4	<10	<50
F.1-6.1	1	192	50
F.7-6.1	1	17	50
F.2-7.0	4	<10	<50
F.5-7.5	2	<20	<10
F.5-8.3	2	40	31
F.5-9.0	0.5	29	340
F.0-9.8	2	<10	210
F.5-10.5	2	<10	<10

*Average of two samples

Table 2: Soil Sample Analyses - Augmented Site Characterization

Location	Depth (ft)	TFH (mg/kg)	TOG (mg/kg)
G.5-1.5	2	<10	<50
G.5-2.0	4	<10	<50
G.2-2.4	4	<10	130
G.0-3.0	4	680	<50
G.9-3.0	4	<10	<50
G.5-3.6	2	<10	73
G.2-5.0	1.5	14	280
G.2-6.0	1.5	10	<50
G.5-6.7	2	41	<10
G.0-8.0	2	<10	<50
G.5-8.3	2	110	<10
G.5-9.5	0.5	17	270
G.5-9.5	2	<10	<50
G.5-10.5	2	<10	<10
H.0-4.5	2	<10	<50
H.0-5.5	2	26	<10
H.0-7.0	2	35	140
H.3-9.0	2	32	<10
H.3-10.5	2	24	84
A/AA-9.5	0.5	150	860
A/AA-10.5	2	70	310
AA.5-9.5	0.5	190	300
AA.5-9.5	2	<10	<50
AA.5-10.5	Concrete trench	16,000*	150,000*
BB.5-9.5	0.5	22	380
BB.5-10.5	2	29	<10
CC.5-9.5	2	27	72
CC.5-10.0	0.5	27	540
CC.5-10.5	2	31	<10
D/E-3/4	Surface (composite)	45	370
D/E-4/5	Surface (composite)	66	400
E/F-3/4	Surface (composite)	124	800
E/F-4/5	Surface (composite)	120	1200
DD/CC-11	1	<10	<50
BB/AA-11	1	<10	<50
B/C-11	1	<10	<50
D-11	1	<10	62
F/G-11	1	<10	100
H/I-11	1	<10	<50

*Average of two samples

Table 3: Soil Sample Analyses
Verification Samples

Sample*	TFH (mg/kg)	TOG (mg/kg)	B	T	E	X	EDB
				(all µg/kg)			(µg/kg)
COMP 1	<10	12	<10	20	<10	55	<1
COMP 2	14	130	<10	30	18	79	<1
COMP 3	<10	79	<10	23	<10	50	
COMP 4	<10	36	<10	26	<10	56	<1
COMP 5	15	110	<10	58	43	150	<1
COMP 6	36	220	<10	<10	370	920	<1
COMP 7	<10	95	<10	26	<10	57	<1
COMP 8**	130	460	18	30	110	330	<1
COMP 9	33	320	<10	54	210	560	<1
COMP 10	39	130	<10	18	16	67	<1

*For locations see Figure 5.
**Also analyzed for priority pollutants (EPA Method 8240).
All had non-detectable concentrations.

Table 4: Soil Sample Analyses
Bioremediation Samples

Sample*	TFH (mg/kg)	TOG (mg/kg)
BIO 1	27	54
BIO 2	<10	180
BIO 3	40	240
BIO 4	37	110
BIO 5	20	89
BIO 6	27	99

*for locations see Figure 7.

Table 5: Soil Sample Analyses
Heavy Metals

Metal	BIO 1	BIO 2	BIO 3	BIO 4	BIO 5	BIO 6
Sb	<100	<100	<100	<100	<100	<100
As	4.7	3.4	3.6	8.5	7.2	7.2
Ba	150	160	200	190	50	140
Be	<1	<1	<1	<1	<1	<1
Cd	<10	<10	<10	<10	<10	<10
Cr	60	60	60	60	<10	50
Co	10	10	20	10	<10	10
Cu	30	20	30	20	80	10
Pb	10	20	30	20	20	20
Hg	0.2	0.2	0.3	0.1	0.2	0.2
Mo	10	10	10	10	<10	<10
Ni	60	50	60	60	<10	60
Se						
Ag	<5	<5	<5	<5	<5	<5
Tl	<50	<50	<50	<50	<50	<50
V	50	50	40	40	<10	40
Zn	70	60	100	70	80	60

NOTE:
1) All results: mg/kg.
2) For sample locations see Figure 7.

Appendix A

o CAR's related to tank removal, October, 1987.

Invoice E18022-2640 (Oct 26)
50% Premium

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-10-336

Received: 15 OCT 87
Reported: 23 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
10-336-1	E1BA	15 OCT 87
10-336-2	E1BB	15 OCT 87
10-336-3	E2BA	15 OCT 87
10-336-4	E2BB	15 OCT 87
10-336-5	E1JA	15 OCT 87

PARAMETER	10-336-1	10-336-2	10-336-3	10-336-4	10-336-5
Sample Held, Not Analyzed	---	---	---	---	HELD
Oil & Grease by Infrared, mg/kg	220	220	140	240	---
Total Fuel Hydrocarbons, mg/kg	820	1100	1100	2700	---

BROWN AND CALDWELL LABORATORIES
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10-336-2	E1BB	15 OCT 87
10-336-3	E2BA	15 OCT 87
10-336-4	E2BB	15 OCT 87
10-336-5	E1JA	15 OCT 87

PARAMETER	10-336-1	10-336-2	10-336-3	10-336-4	10-336-5
Purgeable Priority Pollutants					
Extraction	10.20.87	10.20.87	10.20.87	10.20.87	---
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2		---
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
2-Chloroethylvinylether, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Acrolein, mg/kg	<2	<2	<2	<2	---
Acrylonitrile, mg/kg	<2	<2	<2	<2	---
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Bromomethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Benzene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Chloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Bromoform, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Chloroform, mg/kg	<0.2	<0.2	<0.2	<0.2	---

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REPORT OF ANALYTICAL RESULTS

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10-336-1	E1BA	15 OCT 87
10-336-2	E1BB	15 OCT 87
10-336-3	E2BA	15 OCT 87
10-336-4	E2BB	15 OCT 87
10-336-5	E1JA	15 OCT 87

PARAMETER	10-336-1	10-336-2	10-336-3	10-336-4	10-336-5
Chloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Ethylbenzene, mg/kg	0.4	7.0	2.7	22	---
Methylene chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Toluene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	---
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	---
Semi-Quantified Results **					
C10H20, mg/kg	---	---	---	40	---
C6H10 Hydrocarbon, mg/kg	---	---	6	10	---
C6H12 Hydrocarbon, mg/kg	2	8	7	---	---
C6H12 Hydrocarbon, mg/kg	---	---	---	20	---
C7H12, mg/kg	---	7	---	20	---
C7H14 Hydrocarbon, mg/kg	20	30	50	100	---
C8H16, mg/kg	6	80	30	200	---
C8H18 Hydrocarbon, mg/kg	---	---	---	100	---

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-10-336

Received: 15 OCT 87
Reported: 23 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
10-336-1	E1BA	15 OCT 87
10-336-2	E1BB	15 OCT 87
10-336-3	E2BA	15 OCT 87
10-336-4	E2BB	15 OCT 87
10-336-5	E1JA	15 OCT 87

PARAMETER	10-336-1	10-336-2	10-336-3	10-336-4	10-336-5
C9H18 Hydrocarbon, mg/kg	4	100	30	100	---
Total Xylene Isomers, mg/kg	0.2	5.4	2.2	28	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

Invoice E19383-990 (1/20)
100% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-01-239

Received: 13 JAN 88
Reported: 19 JAN 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097 D2-5

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
01-239-1	FTL #1	13 JAN 88
01-239-2	FTL #2	13 JAN 88
01-239-3	FTL #3	13 JAN 88

PARAMETER	01-239-1	01-239-2	01-239-3
Oil & Grease by Infrared, mg/kg	160	130	<50
Total Fuel Hydrocarbons, mg/kg	1000	1400	88

Linda Brack KBK
Steve Fisher, Laboratory Director

Invoice E19456-330(1/22)
100% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-01-252

Received: 14 JAN 88
Reported: 21 JAN 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: D2-5

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
01-252-1	FTL #4 Brown Clay	14 JAN 88

PARAMETER	01-252-1
Oil & Grease by Infrared, mg/kg	<50
Total Fuel Hydrocarbons, mg/kg	49

Steve Fisher, Laboratory Director

Appendix B

Initial Characterization

- o Geologic logs of wells and soil borings
- o Sampling procedure
- o Analytical methods
- o Certified Analytical Results

Sampling Procedures

Soil samples were obtained using brass liners. The lower-most sample liner (next to the shoe) was used, if possible, for any required chemical analysis. The soil exposed in the ends of the tube was quickly noted, and the ends were then sealed with teflon tape and new snug-fitting plastic caps. The edges of the caps were sealed with plastic tape. The cap was labeled with the sample number, depth, date, and project name. A second sample was taken from each 5-foot interval to be reserved for inspection if needed at a later date. The soil samples were placed in a chilled ice chest as they were collected, and selected soil samples were marked to be sent to a State Certified Laboratory for analysis. The third sample was inspected and used for the sample description.

Analytical Methods

TPH: EPA Method 8015
TOG: EPA Method 418.1
Priority Pollutants: EPA Method 8240

BORING LOCATION: Well 1		ELEVATION AND DATUM	
DRILLING CONTRACTOR: Carver	DRILLER: Ken Lenk	DATE STARTED: 9/14/87	DATE FINISHED: 9/14/87
DRILLING EQUIPMENT: CME 45		COMPLETION DEPTH (FT): 40'	ROCK DEPTH (FT): NA
DIAMETER OF BORING: 8" auger		NO. OF SAMPLES: DIST.	UNDIST.: CORE
PURPOSE OF BORING: groundwater monitoring		WATER DEPTH(FT): FIRST	COMPL.: 24 HRS.
SAMPLING EQUIPMENT: 18" standard split barrel sampler		LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS:			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/TIME	REMARKS
5	Silt, brown, dry, loose; grading between 5-1/2' & 6' to clay, dark gray with rust brown mottling from decomposed rock; 1% gravel up to 1/4", subangular; mod.plastic; moist; (ML-CL)				7 12 13	9:45	no odor, sample fell out of top tube
10	Clay, dark brown; grading between 10' & 10-1/4' to clay, brownish gray with rust mottling; both mod.plasticity, moist. Grades between 11' & 11-1/2' to clay, grayish blue-green with rust mottling; mod.plastic, moist; (CL)				6 11 13	10:00	strong odor
15	Clay, dark brown; grading between 15-1/2' & 16' to silty clay, grayish blue-green with rust mottling, 10-15% gravel up to 3/4" diam., angular. All mod.plastic, moist; (CL)				8 14 16	10:10	top tube empty slight odor 16'- hit water per driller
20	Clay, brownish gray with rust and black mottling; fine root holes, some silt, mod.plastic; moist; (CL)				4 10 11	10:20	no odor
25	Clayey sand, very fine, gray with rust mottling, and pockets of grayish blue-green clay; moist to wet; (SC)				5 8 10	10:35	slight odor
30							

Project: Kaiser Engineers
Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOW COUNT	SAMPLES DRILLING RATE/TIME	REMARKS
30	Gravelly sand, sand is very coarse, subangular; gravel up to 1/4" diam.; wet; grading between 30-1/2' & 31' to clay, brownish gray with rust mottling; mod.plastic; moist; (SP-CL)				8 11 6	10:50	slight odor
35	Gravelly sand, same as at 30', interbedded at 35-1/4' with silty sand, brown, with some clay. Grades to clayey silt, brown, between 36' & 36-1/2'. All moist. (SP-ML)				8 8 11	11:35	no odor
40	Sandy clay, grayish brown with rust mottling; contains gravel lens with gravel up to 1/2" diam., subrounded. Grades between 40-1/2' & 41' to clay with some sand, brownish gray. All mod.plastic, moist. (CL)				7 11 16	11:50	no odor
45							
50							
55							
60							
65							
70							

Project Kaiser Engineers
Project No. 87152.1

CONT. LOG OF BORING W-1

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	Well 2		ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Ken Lenk	DATE STARTED 9/14/87	DATE FINISHED 9/14/87
DRILLING EQUIPMENT	CME 45		COMPLETION DEPTH (FT) 30'	ROCK DEPTH (FT) NA
DIAMETER OF BORING	8" auger		NO. OF DIST. SAMPLES	UNDIST. CORE
PURPOSE OF BORING	groundwater monitoring		WATER FIRST DEPTH(FT)	COMPL. 24 HRS.
SAMPLING EQUIPMENT	18" standard split barrel sampler		LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS				

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/ TIME	REMARKS
5	Silt, medium brown, 3% gravel up to 1/4", angular; grades at approx. 5-1/4' to clay, dark gray, mod.plastic; moist; (ML-CL)				5 8 12	1:20	no odor
10	Clay, medium brown, mod.plastic; moist; grading between 10-1/2' & 11'to silty clay, grayish blue-green with brown mottling, slightly plastic, moist; (CL)				8 10 11	1:30	top tube empty strong odor
15	Clay, grayish blue-green with rust mottling, 15% gravel up to 1/2", subangular to subrounded; mod.plastic, moist; (CL)				6 9 11	1:40	bottom of sample lost no odor 17'-hit water per driller
20	Clay, gray with rust mottling; 1% gravel to 1/4" diam., subangular; mod.plastic, moist; (CL)				6 9 10	2:00	all of sample lost, used same blow count for second try no odor
25	Clay, brownish gray with rust mottling; gravel up to 1" diam.; subangular to subrounded; some silt; fine root holes with gray clay encircling holes; highly plastic; moist; grading between 25-1/2' & 26' to same clay but without gravel or silt; (CH)				6 9 12	2:20	top and bottom tubes half empty, middle tube preserved for possible analysis no odor
30							

Project Kaiser Engineers

Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOW COUNT	DRILLING RATE/TIME	REMARKS
30	Clayey sand with gravel up to 1-1/2" diam.; sand is angular, gravel is subangular to subrounded; interbedded with silty clay, gray, with gravel up to 1/2'; mod.plastic; (SP-CL)				10 35 25	2:35	top & bottom tubes half empty, middle tube preserved for possible analysis no odor
35							
40							
45							
50							
55							
60							
65							
70							

Project Kaiser Engineers
Project No. 87152.1

CONT. LOG OF BORING W-2

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION: Well 3		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Carver	DRILLER: Ken Lenk	DATE STARTED: 9/15/87	DATE FINISHED: 9/15/87
DRILLING EQUIPMENT: CME 45		COMPLETION DEPTH (FT): 30'	ROCK DEPTH (FT): NA
DIAMETER OF BORING: 8" auger		NO. OF DIST. SAMPLES:	UNDIST.: CORE
PURPOSE OF BORING: groundwater monitoring		WATER FIRST DEPTH(FT):	COMPL.: 24 HRS.
SAMPLING EQUIPMENT: 18" standard split barrel sampler		LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS:			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/TIME	REMARKS
5	Clayey silt, with angular gravel up to 1/2"; dry; (fill); grading between 5-1/4' & 5-1/2' to clay, dark gray; mod.plastic; moist; (ML-CL)				4 10 13	9:05	no odor
10	Clay, tan with rust mottling and dark brown decomposed rock; mod.plastic, moist; (CL)				5 9 10	9:15	no odor
15	Clay, same as at 10', but containing 15% gravel up to 2" diam., angular; moist. 3" thick lens of broken gravel at 15-1/2'. (CL-GC)				13 14 13	9:25	no odor
20	Clay, tan with rust mottling; 15% gravel up to 1", broken and decomposed; also contains some silt; slightly plastic, moist; grading between 21' & 21-1/2' to silt, tan; (CL-ML)				11 14 16	9:35	no odor
25	Clay, same as at 20'; grading between 25-1/2' & 26' to silt, tan; grading between 26' & 26-1/2' to coarse sand; wet. (CL-ML-SP)				10 23 24	9:50	very slight odor
30							

Project: Kaiser Engineers
Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOW COUNT	SAMPLES DRILLING RATE/TIME	REMARKS
30	Gravelly sand, gravel up to 1', subrounded to subangular; loose, wet; (SW)				11 14 15	10:10	no odor, part of bottom tube lost, middle tube preserved for possible analysis
35							
40							
45							
50							
55							
60							
65							
70							

Project Kaiser Engineer
Project No. 87152.I

CONT. LOG OF BORING W-3

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	B-1	ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Ken Lenk	DATE STARTED 9/15/87 / DATE FINISHED 9/15/87
DRILLING EQUIPMENT	CME 45	COMPLETION DEPTH (FT) 20'	ROCK DEPTH (FT) N/A
DIAMETER OF BORING	8" auger	NO. OF SAMPLES / DIST.	UNDIST. / CORE
PURPOSE OF BORING	Soil sampling	WATER DEPTH(FT) FIRST	COMPL. / 24 HRS.
SAMPLING EQUIPMENT	18" standard split barrel sampler	LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG / LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/TIME	REMARKS
5	Silt, brown; 5% gravel up to 1" diam.; loose, dry; grading between 5' & 5-1/2' to clay, dark gray with brown mottling; 1% gravel up to 1/8" diam., mod.plastic; moist; (ML-CL)				8 11 12	11:55	moderate odor
10	Clay, same as at 6-1/2' but includes some decomposed gravel; (CL)				5 8 12	12:05	moderate to strong odor
15	Clay, same as at 10', grades between 15' & 15-1/2' to clay, bluish gray with brown mottling. Grades between 16' & 16-1/2' to silt, brown, subangular gravel up to 1/4" diam.; moist; (CL-ML)				8 14 52	12:25	no odor
20	Clay, interbedded layers of blackish gray, green, and blue-green, some rust-colored decomposed rock; mod.plastic; moist; grading at 15-1/4' to clayey silt, gray with rust mottling; 15% gravel up to 1/2" diam., subangular; some fine sand; moist; (CL-ML)				7 9 11	12:40	no odor
25							
30							

Project: Kaiser Engineers
Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	B-2	ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Ken Lenk	DATE STARTED 9/15/87
DRILLING EQUIPMENT	CME 45	COMPLETION DEPTH (FT) 20'	DATE FINISHED 9/15/87
DIAMETER OF BORING	8" auger	NO. OF SAMPLES DIST.	ROCK DEPTH (FT) N/A
PURPOSE OF BORING	soil sampling	WATER DEPTH(FT) FIRST	UNDIST. CORE
SAMPLING EQUIPMENT	18" standard split barrel sampler	LOGGED BY: P. Rodgers	COMPL. 24 HRS.
COMMENTS			CHECKED BY: J. Alt

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOW COUNT	DRILLING RATE/ TIME	REMARKS
5	Clay, blackish gray, <1% decomposed rock; mod.plastic; moist; (CL)				4 7 12	1:40	slight to moderate odor
10	Clay, same as at 5'; grades at 10-1/4' to clay, bluish gray with rust mottling; 1% gravel up to 1/8" diam., some decomposed; mod.plastic; moist; (CL)				7 13 13	1:50	slight odor
15	Clay, gray with extensive brown mottling, fine root holes; <1% decomposed rock; mod.plastic; moist; (CL)				7 19 13	2:05	15'-hit water per driller, no odor
20	Gravelly silty clay, brown; 25-30% gravel up to 1/2" diam., subangular; also 2% decomposed rock and some sand; wet. Grades between 20-1/2' & 21' to clay, tan with rust mottling; <1% decomposed rock; mod.plastic; moist; (CL)				12 10 11	2:15	no odor
25							
30							

Project Kaiser Engineers

Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	B-3	ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Ken Lenk	DATE STARTED 9/15/87 / DATE FINISHED 9/15/87
DRILLING EQUIPMENT	CME 45	COMPLETION DEPTH (FT) 20'	ROCK DEPTH (FT) n/a
DIAMETER OF BORING	8" auger	NO. OF DIST. SAMPLES	UNDIST. / CORE
PURPOSE OF BORING	soil sampling	WATER FIRST DEPTH(FT)	COMPL. / 24 HRS.
SAMPLING EQUIPMENT	18" standard split barrel sampler	LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/ TIME	REMARKS
5	Clay; blackish gray; <1% decomposed rock; mod.plastic; moist; (CL)				6 11 12	3:15	moderate odor
10	Clay, same as at 5', grading at 10-1/4' to clay, bluish gray with rust mottling, 2% decomposed rock; mod.plastic; moist; (CL)				7 9 11	3:25	moderate odor
15	Clay, tan with rust and black mottling and some pockets of blue-gray clay; slightly plastic; moist; grading between 15-1/2' & 16' to clay, bluish gray with 1% rust-colored decomposed rock; mod.plastic; moist; (CL)				6 9 13	3:40	driller said hit water between 13' and 15', slight odor
20	Clayey silt with some fine sand, tan with rust mottling; slightly plastic; moist; (ML)				9 15 17	3:55	no odor
25							
30							

Project: Kaiser Engineers Project No. 87152.1	LOG OF BORING	Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	B-4	ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Sergio	DATE STARTED 9/16/87	DATE FINISHED 9/16/87
DRILLING EQUIPMENT	CME 45	COMPLETION DEPTH (FT) 20'	ROCK DEPTH (FT) N/A
DIAMETER OF BORING	8" auger	NO. OF DIST. SAMPLES	UNDIST. CORE
PURPOSE OF BORING	soil sampling	WATER FIRST DEPTH(FT)	COMPL. 24 HRS.
SAMPLING EQUIPMENT	18" standard split barrel sampler	LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/TIME	REMARKS
5	Clay, blackish gray; <1% gravel up to 1/4" diam., angular; mod.plastic; moist; (CL)				6 15 22	9:10	top tube & half of middle tube empty, slight odor
10	Clay, gray with rust mottling; 1% decomposed rock; mod.plastic; moist; (CL)				4 14 17	9:25	part of bottom tube lost, middle tube preserved for analysis, slight odor
15	Clay, tan with rust mottling and pockets of grayish blue-green clay; mod.plastic; moist; (CL)				7 11 12	9:40	very slight odor
20	Clay, tan with rust mottling, some silt; mod.plastic; moist; (CL)				6 12 14	9:55	very slight odor did not hit water
25							
30							

Project Kaiser Engineers

Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION: B-5		ELEVATION AND DATUM	
DRILLING CONTRACTOR: Carver	DRILLER: Sergio	DATE STARTED: 9/16/87	DATE FINISHED: 9/16/87
DRILLING EQUIPMENT: CME 45		COMPLETION DEPTH (FT): 20'	ROCK DEPTH (FT): N/A
DIAMETER OF BORING: 8" auger		NO. OF SAMPLES: DIST.	UNDIST.: CORE
PURPOSE OF BORING: soil sampling		WATER DEPTH(FT): FIRST	COMPL.: 24 HRS.
SAMPLING EQUIPMENT: 18" standard split barrel sampler		LOGGED BY: P. Rodgers	CHECKED BY: J. Alt
COMMENTS:			

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/TIME	REMARKS
5	Clay, dark gray with some rust mottling; <1% gravel up to 1/4", rounded; mod.plastic; moist; (CL)				6 11 13	10:30	no odor
10	Clay, tan intermingled with bluish gray, some rust mottling; some silt; mod.plastic; moist; (Cl)				7 12 14	10:45	slight odor
15	Clay, same as at 10'; (CL)				4 11 11	11:00	no odor
20	Silty clay, tan with rust mottling; <1% decomposed rock up to 1/2" diam.; slightly plastic; moist; (CL)				7 15 18	11:15	no odor
25							
30							

Project: Kaiser Engineers
Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

BORING LOCATION	B-6	ELEVATION AND DATUM	
DRILLING CONTRACTOR	Carver	DRILLER Sergio	DATE STARTED 9/16/87
DRILLING EQUIPMENT	CME 45	COMPLETION DEPTH (FT) 20'	DATE FINISHED 9/16/87
DIAMETER OF BORING	8" auger	NO. OF DIST. SAMPLES	ROCK DEPTH (FT) N/A
PURPOSE OF BORING	soil sampling	WATER FIRST DEPTH(FT)	UNDIST. CORE
SAMPLING EQUIPMENT	18" standard split barrel sampler	LOGGED BY: P. Rodgers	COMPL. 24 HRS.
COMMENTS			CHECKED BY: J. Alt

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG LITHOLOGY	SAMPLES NO.	SAMPLES TYPE	BLOW COUNT	DRILLING RATE/ TIME	REMARKS
5	Clay, dark brown with rust mottling; 2% gravel up to 1/4" diam., angular; mod.plastic; moist; (CL)				4 8 12	11:45	no odor
10	Gravelly sandy clay, dark gray, approx. 25% gravel up to 1/2" diam., subangular; slightly plastic; wet. Lens of silty clay, gray, at approx. 11'; 15% gravel up to 1/4" diam., subangular to subrounded; mod.plastic; moist; (CL)				1 8 11	12:00	10'-hit water per driller, top tube empty slight odor
15	Clay, tan with rust mottling; <1% gravel up to 1/4", subangular; moderately to highly plastic; moist; (CL/CH)				6 13 13	12:15	slight odor
20	Clay, tan with extensive rust mottling; fine root holes; <1% gravel up to 1/2", subangular; moderately to highly plastic; moist; (CL/CH)				4 5 7	12:30	no odor
25							
30							

Project Kaiser Engineers
Project No. 87152.1

LOG OF BORING

Fig.

AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

Invoice E17633 – #3520 (Oct 2)
(No premium)

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-404

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-1	W1-1	14 SEP 87
09-404-2	W1-2	14 SEP 87
09-404-3	W1-3	14 SEP 87
09-404-4	W1-4	14 SEP 87
09-404-5	W1-5	14 SEP 87

PARAMETER	09-404-1	09-404-2	09-404-3	09-404-4	09-404-5
Oil & Grease by Infrared, mg/kg	<50	<50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	140	<10	<10	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-404

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-1	W1-1	14 SEP 87
09-404-2	W1-2	14 SEP 87
09-404-3	W1-3	14 SEP 87
09-404-4	W1-4	14 SEP 87
09-404-5	W1-5	14 SEP 87

PARAMETER	09-404-1	09-404-2	09-404-3	09-404-4	09-404-5
Purgeable Priority Pollutants					
Extraction	09.22.87	09.22.87	09.22.87	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<20	<2	<2	<2
Acrylonitrile, mg/kg	<2	<20	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<2	<0.2	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-404

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-1	W1-1	14 SEP 87
09-404-2	W1-2	14 SEP 87
09-404-3	W1-3	14 SEP 87
09-404-4	W1-4	14 SEP 87
09-404-5	W1-5	14 SEP 87

PARAMETER	09-404-1	09-404-2	09-404-3	09-404-4	09-404-5
Chloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Ethylbenzene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Semi-Quantified Results **					
C5H12 Hydrocarbon, mg/kg	---	10	---	---	---
C7H14 Hydrocarbon, mg/kg	---	30	---	---	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

BROWN AND CALDWELL LABORATORIES
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ANALYTICAL REPORT

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Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-6	W1-6	14 SEP 87
09-404-7	W1-7	14 SEP 87
09-404-8	W1-8	14 SEP 87

PARAMETER	09-404-6	09-404-7	09-404-8
Oil & Grease by Infrared, mg/kg	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10

BROWN AND CALDWELL LABORATORIES
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ANALYTICAL REPORT

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Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-6	W1-6	14 SEP 87
09-404-7	W1-7	14 SEP 87
09-404-8	W1-8	14 SEP 87

PARAMETER	09-404-6	09-404-7	09-404-8
Purgeable Priority Pollutants			
Extraction	09.22.87	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<2	<2
Acrylonitrile, mg/kg	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<0.2	<0.2
Chloromethane, mg/kg	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-404

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-404-6	W1-6	14 SEP 87
09-404-7	W1-7	14 SEP 87
09-404-8	W1-8	14 SEP 87

PARAMETER	09-404-6	09-404-7	09-404-8
Ethylbenzene, mg/kg	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2

D. A. McLean, Laboratory Director

Invoice E17632 - $2640 (Oct 2)
(No premium)

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-403

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-1	W2-1	14 SEP 87
09-403-2	W2-2	14 SEP 87
09-403-3	W2-3	14 SEP 87
09-403-4	W2-4	14 SEP 87
09-403-5	W2-5	14 SEP 87

PARAMETER	09-403-1	09-403-2	09-403-3	09-403-4	09-403-5
Oil & Grease by Infrared, mg/kg	<50	50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	2900	<10	<10	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-403

Received: 14 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-1	W2-1	14 SEP 87
09-403-2	W2-2	14 SEP 87
09-403-3	W2-3	14 SEP 87
09-403-4	W2-4	14 SEP 87
09-403-5	W2-5	14 SEP 87

PARAMETER	09-403-1	09-403-2	09-403-3	09-403-4	09-403-5
Purgeable Priority Pollutants					
Extraction	09.22.87	09.22.87	09.22.87	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<2	<0.2	0.3	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<20	<2	<2	<2
Acrylonitrile, mg/kg	<2	<20	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<2	<0.2	0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<2	<0.2	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES
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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-1	W2-1	14 SEP 87
09-403-2	W2-2	14 SEP 87
09-403-3	W2-3	14 SEP 87
09-403-4	W2-4	14 SEP 87
09-403-5	W2-5	14 SEP 87

PARAMETER	09-403-1	09-403-2	09-403-3	09-403-4	09-403-5
Chloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Ethylbenzene, mg/kg	<0.2	8	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<2	<0.2	0.3	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<2	<0.2	<0.2	<0.2
Semi-Quantified Results **					
C6H12 Hydrocarbon, mg/kg	---	20	---	---	---
C7H14 Hydrocarbon, mg/kg	4	100	---	---	---
C8H10, mg/kg	4	---	---	---	---
C8H16, mg/kg	---	10	---	---	---
C9H18 Hydrocarbon, mg/kg	3	30	---	---	---
Total Xylene Isomers, mg/kg	---	4	---	---	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

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1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

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1800 Harrison Street
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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-6	W2-6	14 SEP 87

PARAMETER	09-403-6
Oil & Grease by Infrared, mg/kg	<50
Total Fuel Hydrocarbons, mg/kg	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-6	W2-6	14 SEP 87

PARAMETER	09-403-6
Purgeable Priority Pollutants	
Extraction	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2
1,1-Dichloroethane, mg/kg	<0.2
1,1-Dichloroethylene, mg/kg	<0.2
1,2-Dichloroethane, mg/kg	<0.2
1,2-Dichloropropane, mg/kg	<0.2
1,3-Dichloropropene, mg/kg	<0.2
2-Chloroethylvinylether, mg/kg	<2
Acrolein, mg/kg	<2
Acrylonitrile, mg/kg	<0.2
Bromodichloromethane, mg/kg	<0.2
Bromomethane, mg/kg	<0.2
Benzene, mg/kg	<0.2
Chlorobenzene, mg/kg	<0.2
Carbon Tetrachloride, mg/kg	<0.2
Chloroethane, mg/kg	<0.2
Bromoform, mg/kg	4
Chloroform, mg/kg	<0.2
Chloromethane, mg/kg	<0.2
Dibromochloromethane, mg/kg	<0.2
Ethylbenzene, mg/kg	<0.2
Methylene chloride, mg/kg	

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-403-6	W2-6	14 SEP 87

PARAMETER	09-403-6
Tetrachloroethylene, mg/kg	<0.2
Trichloroethylene, mg/kg	<0.2
Trichlorofluoromethane, mg/kg	<0.2
Toluene, mg/kg	<0.2
Vinyl chloride, mg/kg	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2
Semi-Quantified Results **	
Methyl Acetate, mg/kg	40

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

D. A. McLean, Laboratory Director

Invoice E17634 - $ 5280 (Oct 2)
(No premium)

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-489

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1800 Harrison Street
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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-1	B1-2	15 SEP 87
09-489-2	B1-3	15 SEP 87
09-489-3	B2-2	15 SEP 87
09-489-4	B2-3	15 SEP 87
09-489-5	B3-2	15 SEP 87

PARAMETER	09-489-1	09-489-2	09-489-3	09-489-4	09-489-5
Oil & Grease by Infrared, mg/kg	85	<50	<50	<50	190
Total Fuel Hydrocarbons, mg/kg	890	<10	540	<10	1200

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-1	B1-2	15 SEP 87
09-489-2	B1-3	15 SEP 87
09-489-3	B2-2	15 SEP 87
09-489-4	B2-3	15 SEP 87
09-489-5	B3-2	15 SEP 87

PARAMETER	09-489-1	09-489-2	09-489-3	09-489-4	09-489-5
Purgeable Priority Pollutants					
Extraction	09.28.87	09.22.87	09.22.87	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<2	<2	<2	<2	<2
Acrolein, mg/kg	<2	<2	<2	<2	<2
Acrylonitrile, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES
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ANALYTICAL REPORT

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-1	B1-2	15 SEP 87
09-489-2	B1-3	15 SEP 87
09-489-3	B2-2	15 SEP 87
09-489-4	B2-3	15 SEP 87
09-489-5	B3-2	15 SEP 87

PARAMETER	09-489-1	09-489-2	09-489-3	09-489-4	09-489-5
Chloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<0.2	<0.2	0.3	<0.2
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Semi-Quantified Results **					
C5H12 Hydrocarbon, mg/kg	---	---	10	---	---
C6H12 Hydrocarbon, mg/kg	---	---	10	---	---
C7H14 Hydrocarbon, mg/kg	200	---	90	---	10
C7H16 Hydrocarbon, mg/kg	90	---	---	---	---
C8H16, mg/kg	---	---	---	---	6
C8H18 Hydrocarbon, mg/kg	---	---	---	---	6
C9H18 Hydrocarbon, mg/kg	80	---	10	---	9
C9H20 Hydrocarbon, mg/kg	60	---	---	---	8

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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-1	B1-2	15 SEP 87
09-489-2	B1-3	15 SEP 87
09-489-3	B2-2	15 SEP 87
09-489-4	B2-3	15 SEP 87
09-489-5	B3-2	15 SEP 87

PARAMETER	09-489-1	09-489-2	09-489-3	09-489-4	09-489-5
Total Xylene Isomers, mg/kg	---	---	2	---	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

BROWN AND CALDWELL LABORATORIES
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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-6	B3-3	15 SEP 87
09-489-7	W3-1	15 SEP 87
09-489-8	W3-2	15 SEP 87
09-489-9	W3-3	15 SEP 87
09-489-10	W3-4	15 SEP 87

PARAMETER	09-489-6	09-489-7	09-489-8	09-489-9	09-489-10
Oil & Grease by Infrared, mg/kg	<50	<50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10	<10	<10

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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-6	B3-3	15 SEP 87
09-489-7	W3-1	15 SEP 87
09-489-8	W3-2	15 SEP 87
09-489-9	W3-3	15 SEP 87
09-489-10	W3-4	15 SEP 87

PARAMETER	09-489-6	09-489-7	09-489-8	09-489-9	09-489-10
Purgeable Priority Pollutants					
Extraction	09.22.87	09.22.87	09.22.87	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<2	<2	<2	<2
Acrylonitrile, mg/kg	<2	<2	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2

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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-6	B3-3	15 SEP 87
09-489-7	W3-1	15 SEP 87
09-489-8	W3-2	15 SEP 87
09-489-9	W3-3	15 SEP 87
09-489-10	W3-4	15 SEP 87

PARAMETER	09-489-6	09-489-7	09-489-8	09-489-9	09-489-10
Chloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Semi-Quantified Results **					
C7H14 Hydrocarbon, mg/kg	3	---	---	---	---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-11	W3-5	15 SEP 87
09-489-12	W3-6	15 SEP 87

PARAMETER	09-489-11	09-489-12
Oil & Grease by Infrared, mg/kg	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	<10

BROWN AND CALDWELL LABORATORIES
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REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-11	W3-5	15 SEP 87
09-489-12	W3-6	15 SEP 87

PARAMETER	09-489-11	09-489-12
Purgeable Priority Pollutants		
Extraction	09.22.87	09.22.87
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<2	<2
Acrolein, mg/kg	<2	<2
Acrylonitrile, mg/kg	<0.2	<0.2
Bromodichloromethane, mg/kg	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2
Chloroform, mg/kg	<0.2	<0.2
Chloromethane, mg/kg	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<0.2
Ethylbenzene, mg/kg	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-489

Received: 15 SEP 87
Reported: 01 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-489-11	W3-5	15 SEP 87
09-489-12	W3-6	15 SEP 87

PARAMETER	09-489-11	09-489-12
Methylene chloride, mg/kg	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<0.2
Toluene, mg/kg	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2

D. A. McLean, Laboratory Director

Invoice E17698-2640 (Oct 8)
No premium

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 * (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
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Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-1	B4-2	16 SEP 87
09-488-2	B4-3	16 SEP 87
09-488-3	B5-2	16 SEP 87
09-488-4	B5-3	16 SEP 87
09-488-5	B6-2	16 SEP 87

ARAMETER	09-488-1	09-488-2	09-488-3	09-488-4	09-488-5
Oil & Grease by Infrared, mg/kg	<50	<50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	150	<10	89	<10	68

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-1	B4-2	16 SEP 87
09-488-2	B4-3	16 SEP 87
09-488-3	B5-2	16 SEP 87
09-488-4	B5-3	16 SEP 87
09-488-5	B6-2	16 SEP 87

ARAMETER	09-488-1	09-488-2	09-488-3	09-488-4	09-488-5
Purgeable Priority Pollutants					
Extraction	100.01.87	10.01.87	10.04.87	10.04.87	10.05.87
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<2	<2	<2	<2
Acrylonitrile, mg/kg	<2	<2	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-1	B4-2	16 SEP 87
09-488-2	B4-3	16 SEP 87
09-488-3	B5-2	16 SEP 87
09-488-4	B5-3	16 SEP 87
09-488-5	B6-2	16 SEP 87

ARAMETER	09-488-1	09-488-2	09-488-3	09-488-4	09-488-5
Chloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene, mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Methylene chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Semi-Quantified Results **					
C5H12 Hydrocarbon, mg/kg	---	---	4	---	---
C6H12 Hydrocarbon, mg/kg	2	---	4	---	---
C6H14 Hydrocarbon, mg/kg	2	---	4	---	---
C7H14 Hydrocarbon, mg/kg	10	---	16	---	---
C8H16 Hydrocarbon Isomers, mg/kg	---	---	3	---	---
C9H18 Hydrocarbon, mg/kg	2	---	2	---	---
C9H20 Hydrocarbon Isomers, mg/kg	2	---	---	---	---

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-1	B4-2	16 SEP 87
09-488-2	B4-3	16 SEP 87
09-488-3	B5-2	16 SEP 87
09-488-4	B5-3	16 SEP 87
09-488-5	B6-2	16 SEP 87

PARAMETER	09-488-1	09-488-2	09-488-3	09-488-4	09-488-5

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-6	B6-3	16 SEP 87

PARAMETER	09-488-6
Oil & Grease by Infrared, mg/kg	<50
Total Fuel Hydrocarbons, mg/kg	<10

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-6	B6-3	16 SEP 87

PARAMETER	09-488-6
Purgeable Priority Pollutants	
Extraction	10.05.87
1,1,1-Trichloroethane, mg/kg	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2
1,1-Dichloroethane, mg/kg	<0.2
1,1-Dichloroethylene, mg/kg	<0.2
1,2-Dichloroethane, mg/kg	<0.2
1,2-Dichloropropane, mg/kg	<0.2
1,3-Dichloropropene, mg/kg	<0.2
2-Chloroethylvinylether, mg/kg	<0.2
Acrolein, mg/kg	<2
Acrylonitrile, mg/kg	<2
Bromodichloromethane, mg/kg	<0.2
Bromomethane, mg/kg	<0.2
Benzene, mg/kg	<0.2
Chlorobenzene, mg/kg	<0.2
Carbon Tetrachloride, mg/kg	<0.2
Chloroethane, mg/kg	<0.2
Bromoform, mg/kg	<0.2
Chloroform, mg/kg	<0.2
Chloromethane, mg/kg	<0.2
Dibromochloromethane, mg/kg	<0.2
Ethylbenzene, mg/kg	<0.2
Methylene chloride, mg/kg	<0.2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-09-488

Received: 16 SEP 87
Reported: 05 OCT 87

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
09-488-6	B6-3	16 SEP 87

PARAMETER	09-488-6
Tetrachloroethylene, mg/kg	<0.2
Trichloroethylene, mg/kg	<0.2
Trichlorofluoromethane, mg/kg	<0.2
Toluene, mg/kg	<0.2
Vinyl chloride, mg/kg	<0.2
trans-1,2-Dichloroethylene, mg/kg	<0.2
trans-1,3-Dichloropropene, mg/kg	<0.2

D. A. McLean, Laboratory Director

Appendix C

Augmented Characterization

- Sampling Procedures
- Analytical Methods
- Certified Analytical Results

Sampling Procedures

Samples taken before May 11, 1988, were taken in glass sediment jars with teflon caps sealed with electric tape. Since that date, samples were taken in a brass tube sealed with aluminum foil, covered with plastic caps, and then sealed with electric tape. Whenever possible, samples were taken in-situ using a hammer to drive the brass tube into the soil. If not, due to depth, samples were taken from material removed by backhoe.

Samples were kept in refrigeration on site until taken to, or picked up by, lab for analysis. Chain-of-custody forms were filled out, and are filed in the offices of Kaiser Engineers.

Analytical Methods

TFH: EPA Methods 8015, 5030, 3550
TOG: EPA Method 418.1
SMWW 503A
EPA Method 9070
AWWA 503D
Purgeable Organics: EPA Method 8240
Base-Neutral Extractables: EPA Method 8270

Invoice E20677-1980 (3/30)
100% premium

BROWN AND CALDWELL LABORATORIES

1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-03-656

Received: 28 MAR 88
Reported: 30 MAR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
03-656-1	E-D.2-3.9-10	28 MAR 88
03-656-2	E-C.7-3.4-7.5	28 MAR 88
03-656-3	E-F.0-3.0-10	28 MAR 88
03-656-4	E-F.0-5.5-10	28 MAR 88
03-656-5	E-D.0-2.0-4	28 MAR 88

PARAMETER	03-656-1	03-656-2	03-656-3	03-656-4	03-656-5
Oil & Grease by Infrared, mg/kg	<50	180	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	30	260	160	<10	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: B88-03-656
Received: 28 MAR 88
Reported: 30 MAR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
03-656-6	E-A.8-3.6-4	28 MAR 88
03-656-7	E-D.0-2.0-10	28 MAR 88
03-656-8	E-D.0-2.0-15	28 MAR 88
03-656-9	E-D.2-3.9-4	28 MAR 88
03-656-10	E-D.2-3.9-7.5	28 MAR 88

PARAMETER	03-656-6	03-656-7	03-656-8	03-656-9	03-656-10
Sample Held, Not Analyzed	---	HELD	HELD	HELD	HELD
Oil & Grease by Infrared, mg/kg	<50	---	---	---	---
Total Fuel Hydrocarbons, mg/kg	140	---	---	---	---

Invoice E20793-2970(4/7)
100% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-04-046

Received: 29 MAR 88
Reported: 06 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-109

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-046-1	E-B.0-2.0-4 (8803676-3)	29 MAR 88
04-046-2	E-E.5-2.0-4 (8803676-7)	29 MAR 88
04-046-3	E-C.7-4.4-4 (8803676-11)	29 MAR 88
04-046-4	E-A.8-5.9-4 (8803676-19)	29 MAR 88
04-046-5	E-C.7-3.4-4 (8803656-12)	28 MAR 88

PARAMETER	04-046-1	04-046-2	04-046-3	04-046-4	04-046-5
Oil & Grease by Infrared, mg/kg	59	<50	<50	<50	83
Total Fuel Hydrocarbons, mg/kg	280	<10	<10	<10	1400

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-046

Received: 29 MAR 88
Reported: 06 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-109

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-046-6	E-F.0-3.0-4 (8803656-15)	28 MAR 88
04-046-7	E-F.0-5.5-4 (8803656-18)	28 MAR 88
04-046-8	E-G.0-3.0-4 (8803629-12)	25 MAR 88
04-046-9	E-G.5-2.0-4 (8803629-16)	25 MAR 88

PARAMETER	04-046-6	04-046-7	04-046-8	04-046-9
Oil & Grease by Infrared, mg/kg	2000	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	450	480	680	<10

Steve Fisher, Laboratory Director

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-03-676
Received: 29 MAR 88
Reported: 31 MAR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Requisition: 80097-109

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
03-676-16	E-C.2-3.9-7.5	29 MAR 88
03-676-17	E-C.2-3.9-10	29 MAR 88
03-676-18	E-C.3.9-15	29 MAR 88
03-676-19	E-A.8-5.9-4	29 MAR 88
03-676-20	E-A.8-5.9-7.5	29 MAR 88

PARAMETER	03-676-16	03-676-17	03-676-18	03-676-19	03-676-20
Sample Held, Not Analyzed	---	HELD	HELD	HELD	---
Oil & Grease by Infrared, mg/kg	120	---	---	---	<50
Total Fuel Hydrocarbons, mg/kg	650	---	---	---	350

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-234

Received: 12 APR 88
Reported: 25 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321
CC: *Dave Corn

Project: 80097-D2-5

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-234-6	E-F.2-2.5-4	12 APR 88
04-234-7	E-F.2-2.5-10	12 APR 88
04-234-8	EF.2-2.5-16	12 APR 88
04-234-9	E-E.5-2.5-4	12 APR 88

PARAMETER	04-234-6	04-234-7	04-234-8	04-234-9
Oil & Grease by Infrared, mg/kg	440	340	<50	2000
Total Fuel Hydrocarbons, mg/kg	160	770	<10	430

Steve Fisher, Laboratory Director

Invoice E20927-1500(4/26)
100% premium

BROWN AND CALDWELL LABORATORIES
1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-222

Received: 12 APR 88
Reported: 26 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-D2-5

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-222-1	EB.2-1.3(4.0)	12 APR 88
04-222-2	EB.2-1.3(10)	12 APR 88
04-222-3	EA.3-2.0(10)	12 APR 88
04-222-4	EA.3-2.0(4)	12 APR 88

PARAMETER	04-222-1	04-222-2	04-222-3	04-222-4
Oil & Grease by Infrared, mg/kg	100	120	<50	<50
Total Fuel Hydrocarbons, mg/kg	360	520	450	44

Steve Fisher, Laboratory Director

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Invoice E21063-2970(4/26)
100% premium

BROWN AND CALDWELL LABORATORIES

1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-234

Received: 12 APR 88
Reported: 25 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321
CC: *Dave Corn

Project: 80097-D2-5

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-234-1	EB.3-2.5-4	12 APR 88
04-234-2	EB.3-2.5-10	12 APR 88
04-234-3	E-E.5-2.5-10	12 APR 88
04-234-4	E-B.8-2.0-4	12 APR 88
04-234-5	E-B.8-2.0-10	12 APR 88

PARAMETER	04-234-1	04-234-2	04-234-3	04-234-4	04-234-5
Oil & Grease by Infrared, mg/kg	<50	63	160	<50	<50
Total Fuel Hydrocarbons, mg/kg	54	300	990	61	270

Invoice E21135-1980(4/28)
10% premium

BROWN AND CALDWELL LABORATORIES
1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-519

Received: 13 APR 88
Reported: 28 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-519-1	E-G.3-1.5-(10)	13 APR 88
04-519-2	E-G.2-2.4-(10)	13 APR 88
04-519-3	E-G.3-1.5-(16)	13 APR 88
04-519-4	E-G.9-3.0-(4)	13 APR 88
04-519-5	E-G.9-3.0-(10)	13 APR 88

PARAMETER	04-519-1	04-519-2	04-519-3	04-519-4	04-519-5
Oil & Grease by Infrared, mg/kg	88	92	<50	<50	51
Total Fuel Hydrocarbons, mg/kg	2000	2900	<10	<10	490

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-519

Received: 13 APR 88
Reported: 28 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-519-6	E-G.2-2.4-(4)	13 APR 88

PARAMETER	04-519-6
Oil & Grease by Infrared, mg/kg	130
Total Fuel Hydrocarbons, mg/kg	<10

Linda Brackfox
Steve Fisher, Laboratory Director

11

Invoice E21146-3960 (4/29)
100% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-04-520

Received: 13 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-520-1	E-B.0-3.0(4)	13 APR 88
04-520-2	E-B-3.0(4)	13 APR 88
04-520-3	E-B.0-4.0(4)	13 APR 88
04-520-4	E-C.2-2.7(4)	13 APR 88
04-520-5	E-C.2-7.0(4)	13 APR 88

PARAMETER	04-520-1	04-520-2	04-520-3	04-520-4	04-520-5
Oil & Grease by Infrared, mg/kg	<50	<50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10	<10	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-520

Received: 13 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-520-6	E-D.5-4.4(10)	13 APR 88
04-520-7	E-B.2-4.8(4)	13 APR 88
04-520-8	E-D-5-(10)	13 APR 88
04-520-9	E-B.5-3.5(4)	13 APR 88
04-520-10	E-D.2-6.0(4)	13 APR 88

PARAMETER	04-520-6	04-520-7	04-520-8	04-520-9	04-520-10
Oil & Grease by Infrared, mg/kg	<50	<50	<50	<50	<50
Total Fuel Hydrocarbons, mg/kg	100	<10	280	13	14

13

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-520

Received: 13 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-520-11	E-D.5-4.4(10)	13 APR 88
04-520-12	E-B.8-4.3(10)	13 APR 88

PARAMETER	04-520-11	04-520-12
Oil & Grease by Infrared, mg/kg	<50	57
Total Fuel Hydrocarbons, mg/kg	51	99

Linda Brock for
Steve Fisher, Laboratory Director

04-520-6 D.5-4.4(10) TOG 50 TFH 100 SOURCE I.D. RESULTS NOT SAME

Invoice E21148-2310(4/29)
10% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1256 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-04-518

Received: 14 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-518-1	E-G.2-5.0-(1.5)	14 APR 88
04-518-2	E-G.2-6.0-(1.5)	14 APR 88
04-518-3	E-F.2-3.7-(3)	14 APR 88
04-518-4	E-G.5-3.6-(2)	14 APR 88
04-518-5	E-F.2-7.0-(4)	14 APR 88

PARAMETER	04-518-1	04-518-2	04-518-3	04-518-4	04-518-5
Oil & Grease by Infrared, mg/kg	280	<50	140	73	<50
Total Fuel Hydrocarbons, mg/kg	14	10	<10	<10	<10

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-518

Received: 14 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-518-6	E-F.7-5.5-(4)	14 APR 88
04-518-7	E-E.6-5.5-(4)	14 APR 88

PARAMETER	04-518-6	04-518-7
Oil & Grease by Infrared, mg/kg	<50	<50
Total Fuel Hydrocarbons, mg/kg	<10	<10

Linda Brack for
Steve Fisher, Laboratory Director

Invoice E21147-1320 (4/29)
100% premium

BROWN AND CALDWELL LABORATORIES
1258 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-04-533

Received: 22 APR 88
Reported: 29 APR 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Project: 80097-D25-Emeryville

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-533-1	E-E.5-3.0-2	22 APR 88
04-533-2	E-F.5-5.5-2	22 APR 88
04-533-3	E-E-2.5-2	22 APR 88
04-533-4	E-A.3-3.3-3	22 APR 88

PARAMETER	04-533-1	04-533-2	04-533-3	04-533-4
Oil & Grease by Infrared, mg/kg	1200	<50	1300	<50
Total Fuel Hydrocarbons, mg/kg	720	890	5300	800

Linda Brack Fox
Steve Fisher, Laboratory Director

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
290 Division Street, San Francisco, CA 94103, Phone (415) 861-1863

LAB NUMBER: 14629
CLIENT: KAISER ENGINEERS
PROJECT #: E0097-D2-5
SITE ID: EMERYVILLE, CA

DATE RECEIVED: 05/04/88
DATE ANALYZED: 05/04-05/88
DATE REPORTED: 05/05/88
PAGE 2 OF 2

Results of Analysis for Petroleum Hydrocarbons/Oil & Grease

Method References: O&G: Oil and Grease, SMWW 503 A
TPH: Total Petroleum Hydrocarbons, EPA 8015

LAB ID	CLIENT ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)		O&G (mg/Kg)
14629-2	E-C.0-8.0(2.0)	ND(10)	ND(10)	ND(10)		65
14629-3	E-E.0-8.0(2.0)	ND(10)	ND(10)	ND(10)		75
14629-4	E-G.0-8.0(2.0)	ND(10)	ND(10)	ND(10)		ND(50)
14629-5	E-H.0-4.5(2.0)	ND(10)	ND(10)	ND(10)		ND(50)
14629-6	E-F.5-4.4(2.0)	ND(10)	ND(10)	ND(10)		180
14629-7	E-G.5-1.5(2.0)	ND(10)	ND(10)	ND(10)		ND(50)
14629-8	E-D.0-3.0(2.0)	ND(10)	ND(10)	ND(10)	*	90

* Trace of unidentifiable oil not quanitifiable by GC.

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	O&G (mg/L)
14629-1	E-D.3-3.4-(0)	ND(50)	ND(50)	ND(50)	ND(20)

ND = Not Detected; Limit of detection indicated in parentheses.

QA/QC SUMMARY

	TPH
Duplicate: Relative % Difference	3
Spike: % Recovery	93

MULTI - TECH, A Division of
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320 Tesconi Circle, Suite G
Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

May 13, 1988

18

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date collected:	5-10-88
Date in lab:	5-10-88
Date extracted:	5-11-88
Date analyzed:	5-12-88 (except 8-3558 & 8-3559 analyzed 5-11-88)
Collected by:	Client
Matrix:	Soil
PROJECT:	#80097-825, ACT-EMERYVILLE
Analysis:	Total Light Hydrocarbons
Method:	**
Detection Limit:	10 mg/kg

Sample No.	Client ID	Total Light Hydrocarbons Result mg/kg
8-3558	E-F.1-6.1-(1)	32
8-3559	E-F.7-6.1-1	ND
8-3560	E-F.9-4.8-1	270
8-3561	ACE-1	ND
8-3562	ACE-2	ND
8-3563	ACE-3	ND
8-3564	ACE-4	ND
8-3565	ACE-5	36
8-3566	ACE-6	ND
8-3567	ACE-7	ND
8-3568	AC3-8	ND
8-3569	ACE-9	ND
8-3570	ACE-10	ND

ND = None Detected

**These Total Light hydrocarbon analyses were performed using EPA Methods 5030 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to gasoline.

Analytical Director

jmt

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707-544-5570

ETC - MULTI-TECH

May 17, 1988

19

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date collected:	5-10-88
Date in lab:	5-10-88
Date extracted:	5-11-88
Date analyzed:	5-12-88 (except 8-3562 analyzed 5-13-88)
Collected by:	Client
Matrix:	Soil
PROJECT:	#80097-825, ACT-EMERYVILLE
Analysis:	Total Heavy Hydrocarbons
Detection Limit:	10 mg/kg

Sample No.	Client ID	Total Heavy Hydrocarbons Result (mg/kg)
8-3558	E-F.1-6.1-(1)	160**
8-3559	E-F.7-6.1-1	17
8-3560	E-F.9-4.8-1	240**
8-3561	ACE-1	80*
8-3562	ACE-2	380*
8-3563	ACE-3	26
8-3564	ACE-4	59*
8-3565	ACE-5	49**
8-3566	ACE-6	39*
8-3567	ACE-7	60**
8-3568	AC3-8	13
8-3569	ACE-9	59**
8-3570	ACE-10	24

NOTE: The total extractable analysis was performed using EPA Methods 3550 and 8015 with a modification of the calibration standards as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. The sample was calibrated to diesel fuel.

**The analysis of this sample indicates the presence of petroleum hydrocarbons similar in molecular weight to those of mineral spirits and lubricating oils.

*The analysis of this sample indicates the presence of petroleum hydrocarbons similar in molecular weight to those of lubricating oils.

ND = None Detected

Analytical Director

jmt

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Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

20

May 13, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date collected: 5-10-88
Date in lab: 5-10-88
Collected by: Client
Matrix: Soil

PROJECT: #80097-825, ACT-EMERYVILLE

Analysis: Oil & Grease
Method: EPA 9070
Detection Limit: 10 mg/kg

Sample No.	Client ID	Oil & Grease Result mg/kg
8-3558	E-F.1-6.1-(1)	50
8-3559	E-F.7-6.1-1	50
8-3560	E-F.9-4.8-1	780
8-3561	ACE-1	740
8-3562	ACE-2	1900
8-3563	ACE-3	130
8-3564	ACE-4	840
8-3565	ACE-5	80
8-3566	ACE-6	200
8-3567	ACE-7	120
8-3568	AC3-8	ND
8-3569	ACE-9	650
8-3570	ACE-10	140

ND = None Detected

Cheryl M. Smith
Analytical Director

jmt

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ETC - MULTI-TECH

21

May 20, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Dates Collected:	05-11-88 (8-3632 - 8-3635); 05-12-88 (8-3636 - 8-3645)
Date in lab:	05-12-88
Date extracted:	05-18-88
Date analyzed:	05-19-88 (except 8-3636, 3637, 3638 analyzed 05-18-88)
Collected by:	Client (8-3632 - 8-3635); Jeff Harper (8-3636 - 8-3645)
Matrix:	Solid
PROJECT:	80097-825 - EMERYVILLE
Analysis:	Total Light Hydrocarbons
Detection Limit:	10 mg/kg

Sample No.	Client ID	Total Light Hydrocarbons Result mg/kg
8-3632	E-D/E 3/4-S	ND
8-3633	E-D/E 4/5-S	ND
8-3634	E-E/F 3/4-S	14
8-3635	E-E/F 4/5-S	ND
8-3636	CC 5-10-5	ND
8-3637	BB 5-9.5-5	ND
8-3638	AA 5-9.5-5	ND
8-3639	A/AA-9.5-5	ND
8-3640	A5-9.5-5	ND
8-3641	C-9.5-5	ND
8-3642	D-9-5	ND
8-3643	E-9.5-5	ND
8-3644	F5-9-5	ND
8-3645	G5-9.5-5	ND

ND = None Detected

NOTE: These total light hydrocarbon analyses were performed using EPA Methods 5030 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to gasoline.

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ETC - MULTI-TECH

22

May 20, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Dates Collected: 05-11-88 (8-3632 - 8-3635); 05-12-88 (8-3636 - 8-3645)
Date in lab: 05-12-88
Date extracted: 05-16-88
Collected by: Client (8-3632 - 8-3635); Jeff Harper (8-3636 - 8-3645)
Matrix: Solid

PROJECT: 80097-825 - EMERYVILLE

Analysis: Total Heavy Hydrocarbons
Detection Limit: 10 mg/kg

Sample No.	Client ID	Total Heavy Hydrocarbons Result	Date Analyzed
8-3632*	E-D/E 3/4-S	45 mg/kg	05-18-88
8-3633	E-D/E 4/5-S	66 mg/kg	05-18-88
8-3634*	E-E/F 3/4-S	110 mg/kg	05-18-88
8-3635**	E-E/F 4/5-S	120 mg/kg	05-19-88
8-3636	CC 5-10-5	27 mg/kg	05-18-88
8-3637	BB 5-9.5-5	22 mg/kg	05-18-88
8-3638	AA 5-9.5-5	190 mg/kg	05-18-88
8-3639	A/AA-9.5-5	150 mg/kg	05-18-88
8-3640	A5-9.5-5	120 mg/kg	05-19-88
8-3641	C-9.5-5	110 mg/kg	05-19-88
8-3642	D-9-5	50 mg/kg	05-19-88
8-3643	E-9.5-5	21 mg/kg	05-19-88
8-3644	F5-9-5	29 mg/kg	05-19-88
8-3645	G5-9.5-5	17 mg/kg	05-19-88

NOTE: The analysis of all of the above samples indicates the presence of petroleum hydrocarbons similar in molecular weight to those of lubricating oils.

*The analysis of this sample inicates the presence of light petroleum hydrocarbons similar in molecular weight to lubricating oils and gasoline.

**The analysis of this sample indicates the presence of petroleum hydrocarbons similar in molecular weight to those of lubricating oils and kerosene.

These total extractable analyses were performed using EPA Methods 3550 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to diesel fuel.

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ETC - MULTI-TECH

May 20, 1988

23

Kaiser Engineers
P.O. Box 23210
Oakland, CA 94623

Dates Collected: 05-11-88 (8-3632 - 8-3635); 05-12-88 (8-3636 - 8-3645)
Date in lab: 05-12-88
Date analyzed: 05-13-88
Collected by: Client (8-3632 - 8-3635); Jeff Harper (8-3636 - 8-3645)
Matrix: Solid

PROJECT: 80097-825 - EMERYVILLE

Analysis: Oil & Grease
Method: AWWA 503D
Detection Limit: 10 mg/kg

Oil & Grease Results

Sample No.	Client ID	As received mg/kg	Dry Matter mg/kg
8-3632	E-D/E 3/4-S	320	370
8-3633	E-D/E 4/5-S	320	400
8-3634	E-E/F 3/4-S	640	800
8-3635	E-E/F 4/5-S	850	1200
8-3636	CC 5-10-5	500	540
8-3637	BB 5-9.5-5	300	380
8-3638	AA 5-9.5-5	260	300
8-3639	A/AA-9.5-5	700	860
8-3640	A5-9.5-5	680	810
8-3641	C-9.5-5	570	700*
8-3642	D-9-5	220	260
8-3643	E-9.5-5	240	300
8-3644	F5-9-5	290	340
8-3645	G5-9.5-5	230	270

ND = None Detected

*Due to the nonhomogeneous nature of this sample, recovery on replicates is not within two standard deviations of our data base average. An average value was reported.

Analytical Director

jmt

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Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

24

June 3, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

PROJECT: ACT EMERYVILLE, PROJECT #80097-825

Collected by: Client
Matrix: Soil
Analysis: TOTAL LIGHT HYDROCARBONS
Detection Limit: 10 mg/kg

8-4120 & 8-4121: Date collected: 5-24-88; Date in lab: 5-24-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
8-4120	ACT-E-T1	5-26-88	5-26-88	14,000
8-4121	ACT-E-T2	5-26-88	5-26-88	2,500

8-4127 thru 8-4156: Date collected: 5-24-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
8-4127	E-D.5-2.5-4.5	5-26-88	5-26-88	290
8-4128	E-D.5-2.5-7	5-26-88	5-27-88	120
8-4129	E-E.5-2.5-4.5	5-26-88	5-27-88	60
8-4130	E-E.5-2.5-7	5-26-88	5-27-88	27
8-4131	E-F.5-2.5-4	5-26-88	5-27-88	19
8-4132	E-F.5-2.5-7	5-26-88	5-27-88	150
8-4133	E-F.5-3.5-4	5-26-88	5-27-88	ND
8-4134	E-F.5-3.5-7	5-26-88	5-27-88	150
8-4135	E-E.5-3.5-4	5-26-88	5-27-88	140
8-4136	E-E.5-3.5-7	5-26-88	5-27-88	290
8-4137	E-E.5-4.5-3	5-26-88	5-27-88	ND

8-4127 thru 8-4156 (con't): Date collected: 5-24-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
8-4138	E-E.5-4.5-6	5-26-88	5-27-88	ND
8-4139	E-F.5-1.5-2	5-26-88	5-27-88	22
8-4140	E-E.0-1.5-2	5-26-88	5-27-88	ND
8-4141	E-C.5-1.5-2	5-26-88	5-27-88	ND
8-4142	E-C.5-3.5-2	5-26-88	5-28-88	ND
8-4143	E-C.5-5.5-2	5-26-88	5-28-88	ND
8-4144	E-B.5-6.5-2	5-27-88	5-28-88	ND
8-4145	E.D.5-6.5-2	5-27-88	5-28-88	ND
8-4146	E-E.5-6.5-2	5-27-88	5-29-88	ND
8-4147	E-B.5-5.5-2	5-27-88	5-29-88	ND
8-4148	E-E.5-7.5.2	5-27-88	5-29-88	ND
8-4149	E-D.5-7.5-2	5-28-88	5-29-88	ND
8-4150	E-C.5-7.5-2	5-28-88	5-29-88	ND
8-4151	E-B.5-7.5-2	5-28-88	5-29-88	ND
8-4152	E-A.5-7.0-2	5-28-88	5-29-88	ND
8-4153	E-E.5-8.5-2	5-28-88	5-29-88	ND
8-4154	E-D.5-8.5-2	5-28-88	5-29-88	ND
8-4155	E-C.5-8.5-2	5-28-88	5-29-88	ND
8-4156	E-B.5-8.5-2	5-28-88	5-29-88	ND

8-4179 thru 8-4201: Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
8-4179	E-CC.5-10.5-2	5-28-88	5-29-88	ND
8-4180	E-BB.5-10.5-2	5-28-88	5-30-88	ND
8-4181	E-CC.5-9.5-2	5-28-88	5-30-88	ND
8-4182	E-A.5-8.5-2	5-28-88	5-30-88	ND
8-4183	E-A/AA-10.5-2	5-28-88	5-30-88	ND
8-4184	E-A.5-10.5-2	5-29-88	5-30-88	ND
8-4185	E-B.2-9.5-2	5-29-88	5-30-88	ND
8-4186	E-B.5-10.5-2	5-29-88	5-30-88	ND
8-4187	E-C.5-10.5-2	5-29-88	5-30-88	ND
8-4188	E-D.0-9.8-2	5-29-88	5-30-88	ND
8-4189	E-D.5-10.5-2	5-29-88	5-30-88	ND
8-4190	E-E.5-10.5-2	5-29-88	5-30-88	ND
8-4191	E-F.0-9.8-2	5-29-88	5-30-88	ND

8-4179 thru 8-4201 (con't): Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
8-4192	E-F.5-10.5-2	5-29-88	5-30-88	ND
8-4193	E-G.5-10.5-2	5-29-88	5-30-88	ND
8-4194	E-H.3-10.5-2	5-29-88	5-30-88	ND
8-4195	E-H.3-9.0-2	5-30-88	5-31-88	ND
8-4196	E-G.5-8.3-2	5-30-88	5-31-88	ND
8-4197	E-F.5-8.3-2	5-30-88	5-31-88	ND
8-4198	E-F.5-7.5-2	5-30-88	5-31-88	ND
8-4199	E-H.0-5.5-2	5-30-88	5-31-88	ND
8-4200	E-G.5-6.7-2	5-30-88	5-31-88	ND
8-4201	E-H.0-7.0-2	5-30-88	5-31-88	ND

ND = None Detected

NOTE: These total light hydrocarbon analyses were performed using EPA Methods 5030 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to gasoline.

Analytical Director

jmt

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ETC - MULTI-TECH

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June 6, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

PROJECT: ACT EMERYVILLE, PROJECT #80097-825

Collected by: Client
Matrix: Soil
Analysis: TOTAL HEAVY HYDROCARBONS
Detection Limit: 10 mg/kg -(except 8-4145 and 8-4198, detection limit is 20 mg/kg)

8-4120 & 8-4121: Date collected: 5-24-88; Date in lab: 5-24-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Heavy Hydrocarbons Result (mg/kg)
**8-4120	ACT-E-T1	5-26-88	5-30-88	15,000
*8-4121	ACT-E-T2	5-26-88	5-27-88	32,000

8-4127 thru 8-4156: Date collected: 5-24-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Light Hydrocarbons Result (mg/kg)
*8-4127	E-D.5-2.5-4.5	6-01-88	6-02-88	110
*8-4128	E-D.5-2.5-7	6-01-88	6-02-88	120
*8-4129	E-E.5-2.5-4.5	6-01-88	6-02-88	250
*8-4130	E-E.5-2.5-7	5-26-88	5-30-88	230
*8-4131	E-F.5-2.5-4	5-26-88	5-31-88	14
*8-4132	E-F.5-2.5-7	5-26-88	5-30-88	87
8-4133	E-F.5-3.5-4	5-26-88	5-28-88	ND
*8-4134	E-F.5-3.5-7	5-26-88	5-28-88	60
*8-4135	E-E.5-3.5-4	5-26-88	5-28-88	63
*8-4136	E-E.5-3.5-7	5-26-88	5-28-88	490
+8-4137	E-E.5-4.5-3	5-26-88	5-28-88	27

8-4127 thru 8-4156 (con't): Date collected: 5-24-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Heavy Hydrocarbons Result (mg/kg)
8-4138	E-E.5-4.5-6	5-26-88	5-27-88	ND
+8-4139	E-F.5-1.5-2	5-26-88	5-28-88	270
8-4140	E-E.0-1.5-2	5-26-88	5-27-88	29
*8-4141	E-C.5-1.5-2	5-26-88	5-28-88	51
8-4142	E-C.5-3.5-2	5-26-88	5-28-88	12
8-4143	E-C.5-5.5-2	5-26-88	5-28-88	12
8-4144	E-B.5-6.5-2	5-26-88	5-28-88	ND
8-4145	E.D.5-6.5-2	5-29-88	6-01-88	46-
8-4146	E-E.5-6.5-2	5-31-88	6-03-88	23
8-4147	E-B.5-5.5-2	5-29-88	6-01-88	25
8-4148	E-E.5-7.5.2	5-31-88	6-03-88	23
8-4149	E-D.5-7.5-2	5-31-88	6-03-88	29
8-4150	E-C.5-7.5-2	5-29-88	6-01-88	26
8-4151	E-B.5-7.5-2	5-29-88	6-01-88	26
8-4152	E-A.5-7.0-2	5-29-88	6-02-88	26
8-4153	E-E.5-8.5-2	5-29-88	6-02-88	35
8-4154	E-D.5-8.5-2	5-29-88	6-01-88	29
8-4155	E-C.5-8.5-2	5-31-88	6-03-88	34
8-4156	E-B.5-8.5-2	5-31-88	6-03-88	43

8-4179 thru 8-4201: Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Heavy Hydrocarbons Result (mg/kg)
8-4179	E-CC.5-10.5-2	5-29-88	6-02-88	31
8-4180	E-BB.5-10.5-2	5-29-88	6-02-88	29
8-4181	E-CC.5-9.5-2	5-29-88	6-02-88	27
8-4182	E-A.5-8.5-2	5-29-88	6-02-88	27
+8-4183	E-A/AA-10.5-2	5-29-88	6-02-88	70
8-4184	E-A.5-10.5-2	5-29-88	6-02-88	31
8-4185	E-B.2-9.5-2	5-29-88	6-02-88	31
8-4186	E-B.5-10.5-2	5-29-88	6-02-88	31
8-4187	E-C.5-10.5-2	5-31-88	6-02-88	31
8-4188	E-D.0-9.8-2	5-31-88	6-02-88	29
8-4189	E-D.5-10.5-2	5-31-88	6-02-88	26
8-4190	E-E.5-10.5-2	5-31-88	6-03-88	27
8-4191	E-F.0-9.8-2	5-31-88	6-03-88	ND

8-4179 thru 8-4201 (con't): Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Date Extracted	Date Analyzed	Total Heavy Hydrocarbons Result (mg/kg)
8-4192	E-F.5-10.5-2	5-31-88	6-03-88	ND
8-4193	E-G.5-10.5-2	5-31-88	6-03-88	ND
8-4194	E-H.3-10.5-2	5-31-88	6-02-88	24
8-4195	E-H.3-9.0-2	5-31-88	6-03-88	32
+8-4196	E-G.5-8.3-2	5-31-88	6-03-88	110
8-4197	E-F.5-8.3-2	5-31-88	6-03-88	40
8-4198	E-F.5-7.5-2	5-31-88	6-03-88	ND-
8-4199	E-H.0-5.5-2	5-31-88	6-03-88	26
+8-4200	E-G.5-6.7-2	5-31-88	6-03-88	41
8-4201	E-H.0-7.0-2	5-31-88	6-03-88	35

ND = None Detected

NOTE: These total extractable analyses was performed using EPA Methods 3550 and 8015 with a modification of the calibration standards as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to diesel fuel.

**The analysis of this sample indicates the presence of petroleum hydrocarbons similar in molecular weight to those of mineral spirits and lubricating oils.

*The analysis of this sample indicates the presence of light petroleum fuel hydrocarbons similar in molecular weight to gasoline and those of lubricating oils.

+The analysis of this sample indicates the presence of petroleum hydrocarbons similar in molecular weight to those of lubricating oils.

-Detection limit is 20 mg/kg.

Chuck Smith
Analytical Director

jmt

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ETC - MULTI-TECH

June 6, 1988

30

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

PROJECT: ACT EMERYVILLE, PROJECT #80097-825

Collected by: Client
Matrix: Soil
Analysis: OIL & GREASE ANALYSES
Method: AWWA 503D
Detection Limit: 10 mg/kg
Date analyzed: 5-26-88

8-4127 thru 8-4156: Date collected: 5-24-88; Date in lab: 5-25-88

Oil and Grease Results

Sample No.	Client ID	As-received basis mg/kg	Dry-matter basis mg/kg
8-4127	E-D.5-2.5-4.5	130	160
8-4128	E-D.5-2.5-7	490	630
8-4129	E-E.5-2.5-4.5	870	1100
8-4130	E-E.5-2.5-7	2000	2600
8-4131	E-F.5-2.5-4	610	730
8-4132	E-F.5-2.5-7	1100	1400
8-4133	E-F.5-3.5-4	530	660
8-4134	E-F.5-3.5-7	1900	2400
8-4135	E-E.5-3.5-4	570	700
8-4136	E-E.5-3.5-7	1700	2000
8-4137	E-E.5-4.5-3	ND	ND
8-4138	E-E.5-4.5-6	18,000	23,000
8-4139	E-F.5-1.5-2	3100	3900
8-4140	E-E.0-1.5-2	3100	3900
8-4141	E-C.5-1.5-2	300	370
8-4142	E-C.5-3.5-2	4400	5400
8-4143	E-C.5-5.5-2	190	230
8-4144	E-B.5-6.5-2	130	170
8-4145	E.D.5-6.5-2	300	360
8-4146	E-E.5-6.5-2	640	760
8-4147	E-B.5-5.5-2	400	480

8-4127 thru 8-4156 (con't): Date collected: 5-24-88; Date in lab: 5-25-88

Sample No.	Client ID	Oil and Grease Results: As-received basis mg/kg	Dry-matter basis mg/kg
8-4148	E-E.5-7.5.2	800	900
8-4149	E-D.5-7.5-2	1800	2100
8-4150	E-C.5-7.5-2	1100	1300
8-4151	E-B.5-7.5-2	49	58
8-4152	E-A.5-7.0-2	4700	5600
8-4153	E-E.5-8.5-2	340	420
8-4154	E-D.5-8.5-2	1200	1400
8-4155	E-C.5-8.5-2	8100	9900
8-4156	E-B.5-8.5-2	ND	ND

8-4179 thru 8-4201: Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Oil and Grease Results: As-received basis mg/kg	Dry-matter basis mg/kg
8-4179	E-CC.5-10.5-2	ND	ND
8-4180	E-BB.5-10.5-2	ND	ND
8-4181	E-CC.5-9.5-2	60	72
8-4182	E-A.5-8.5-2	110	130
8-4183	E-A/AA-10.5-2	270	310
8-4184	E-A.5-10.5-2	63	74
8-4185	E-B.2-9.5-2	900	1100
8-4186	E-B.5-10.5-2	150	170
8-4187	E-C.5-10.5-2	ND	ND
8-4188	E-D.0-9.8-2	ND	ND
8-4189	E-D.5-10.5-2	ND	ND
8-4190	E-E.5-10.5-2	ND	ND
8-4191	E-F.0-9.8-2	180	210
8-4192	E-F.5-10.5-2	ND	ND
8-4193	E-G.5-10.5-2	ND	ND
8-4194	E-H.3-10.5-2	70	84
8-4195	E-H.3-9.0-2	ND	ND
8-4196	E-G.5-8.3-2	ND	ND
8-4197	E-F.5-8.3-2	26	31

8-4179 thru 8-4201 (con't): Date collected: 5-25-88; Date in lab: 5-25-88

Sample No.	Client ID	Oil and Grease Results: As-received basis mg/kg	Dry-matter basis mg/kg
8-4198	E-F.5-7.5-2	ND	ND
8-4199	E-H.0-5.5-2	ND	ND
8-4200	E-G.5-6.7-2	ND	ND
8-4201	E-H.0-7.0-2	110	140

ND = None Detected

NOTE: The accuracy of this test drops off below 100 mg/kg. Methods blanks have been subtracted from these results.

QUALITY ASSURANCE REPORT: SAMPLES 8-4127 THRU 8-4156 & 8-4179 THRU 8-4201

Method Blank	Blank Spike Recovery	RPD of Replicates
**1.7 mg	99%	*61%
	94%	34%
	110%	*74%
	98%	14%
	77%	*58%
	85%	0%

**This is an average of four method blanks. The average method blank was subtracted from sample results.

*Replicates were run on samples that were near the 100 mg/kg level at which accuracy of this test drops off.

Analytical Director

jmt

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33

May 31, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date collected:	5-24-88
Date in lab:	5-24-88
Collected by:	Client
Matrix:	Soil
PROJECT:	ACT - EMERYVILLE, JOB #80097-825
Analysis:	Oil & Grease
Method:	AWWA 503D
Detection Limit:	10 mg/kg

Sample No.	Client ID	Oil & Grease Result mg/kg
8-4120	ACT-E-T1	120,000* 180,000**
8-4121	ACT-E-T2	170,000* 270,000**

*Processed on an As-received basis.
**Processed on a Dry-matter basis.

Cheryl A. Smith
Analytical Director

jmt

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ETC - MULTI-TECH

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Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

June 9, 1988

SAMPLE NUMBER: 8-4121
Date collected: 5-24-88
Date in lab: 5-24-88
Date in analyzed: 5-27-88
Collected by: Client
Matrix: Solid
CLIENT ID: ACT-E-T2, Project #80097-825

EPA Method 8240 Purgeable Organics

	Result (mg/kg)	Detection Limit (mg/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl Chloride	ND	10
Chloroethane	ND	10
Methylene Chloride	ND	5
Trichlorofluoromethane	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
trans-1,2-dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
1,1,1-trichloroethane	ND	5
Carbon Tetrachloride	ND	5
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
trans-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
cis-1,3-dichloropropene	ND	5
2-Chloroethylvinyl ether	ND	10
Bromoform	ND	5
1,1,2,2,-Tetrachloroethane	ND	5
Tetrachloroethene	ND	5
Chlorobenzene	ND	5
1,3-Dichlorobenzene	ND	5
1,2-Dichlorobenzene	ND	5
1,4-Dichlorobenzene	ND	5
Benzene	ND	5
Toluene	ND	5
Ethyl Benzene	ND	5
Xylene	23	5

Sample No. 8-4121, EPA Method 8240 Analysis (con't)

	Result (mg/kg)	Detection Limit (mg/kg)
Acetone	ND	10
Carbon Disulfide	ND	5
2-Butanone	ND	10
Vinyl Acetate	ND	10
4-Methyl-2-Pentanone	ND	10
2-Hexanone	ND	10
Styrene	ND	5

ND = None Detected

These detection limits are higher than usual due to the high level of oil in this sample.

Analytical Director

jmb

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ETC - MULTI-TECH

June 9, 1988

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Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

SAMPLE NUMBER: 8-4120
Date collected: 5-24-88
Date in lab: 5-24-88
Date in analyzed: 5-27-88
Collected by: Client
Matrix: Solid
CLIENT ID: ACT-E-T1, Project #80097-825

EPA Method 8240 Purgeable Organics

	Result (mg/kg)	Detection Limit (mg/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl Chloride	ND	10
Chloroethane	ND	10
Methylene Chloride	ND	5
Trichlorofluoromethane	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	6	5
trans-1,2-dichloroethene	6	5
Chloroform	6	5
1,2-Dichloroethane	ND	5
1,1,1-trichloroethane	6	5
Carbon Tetrachloride	6	5
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
trans-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
cis-1,3-dichloropropene	ND	5
2-Chloroethylvinyl ether	ND	10
Bromoform	ND	5
1,1,2,2,-Tetrachloroethane	ND	5
Tetrachloroethene	ND	5
Chlorobenzene	7	5
1,3-Dichlorobenzene	ND	5
1,2-Dichlorobenzene	ND	5
1,4-Dichlorobenzene	ND	5
Benzene	ND	5
Toluene	5	5
Ethyl Benzene	7	5
Xylene	20	5

Sample No. 8-4120, EPA Method 8240 Analysis (con't)

	Result (mg/kg)	Detection Limit (mg/kg)
Acetone	ND	10
Carbon Disulfide	ND	5
2-Butanone	ND	10
Vinyl Acetate	ND	10
4-Methyl-2-Pentanone	11	10
2-Hexanone	ND	10
Styrene	ND	5

ND = None Detected

These detection limits are higher than usual due to the high level of oil in this sample.

Cheryl A. Smith
Analytical Director

jmb

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June 22, 1988

Kaiser Engineers
Attn: Frank Fenzel
1600 Franklin Street
Oakland, CA 94612

SAMPLE NUMBER: 8-4120

Date collected: 5-24-88
Date in lab: 5-24-88
Date extracted: 6-02-88
Date analyzed: 6-15-88
Collected by: Client (Mark Krieger)
Matrix: Solid

CLIENT ID: ACT-E-T1, Project No. 80097-825

EPA METHOD 8270:BASE-NEUTRAL-ACID EXTRACTABLES

BASE-NEUTRAL EXTRACTABLES

Analyte	Result	Detection Limit
Acenaphthene	ND	10 mg/kg
Acenaphthylene	ND	"
Anthracene	ND	"
Benzo (A) Anthracene	ND	"
Benzo (B) Fluoranthene	ND	"
Benzo (K) Fluoranthene	ND	"
Benzo (A) Pyrene	ND	"
Benzo (G,H,I) Perylene	ND	"
Benzidene	ND	"
BIS (2-Chloroethyl) Ether	ND	"
BIS (2-Chloroethoxy) Methane	ND	"
BIS (2-Ethylhexyl) Phthalate	19	"
BIS (2-Chloroisopropyl) Ether	ND	"
4-Bromophenyl Phenyl Ether	ND	"
Butyl Benzene Phthalate	ND	"
2-Chloronaphthalene	ND	"
4-Chlorophenyl Phenyl Ether	ND	"
	ND	"

Kaiser Engineers
Sample No. 8-4120
June 22, 1988

BASE-NEUTRAL EXTRACTABLES (CONTINUED)

Analyte	Result	Detection Limit
Chrysene	ND	10 mg/kg
Dibenzo (A,H) Anthracene	ND	"
DI-N-Butyl Phthalate	ND	"
1,3-Dichlorobenzene	ND	"
1,4-Dichlorobenzene	ND	"
1,2-Dichlorobenzene	ND	"
3,3'-Dichlorobenzidene	ND	"
Diethyl Phthalate	ND	"
Dimethyl Phthalate	ND	"
2,4-Dinitrotoluene	ND	"
2,6-Dinitrotoluene	ND	"
Dioctyl Phthalate	ND	"
Fluoranthene	ND	"
Fluorene	ND	"
Hexachlorobenzene	ND	"
Hexchlorobutadiene	ND	"
Hexachloroethane	ND	"
Hexachlorocyclopentadiene	ND	"
Indeno (1,2,3-CD) Pyrene	ND	"
Isophorone	ND	"
Naphthalene	16	"
Nitrobenzene	ND	"
N-Nitrosodimethylamine	ND	"
N-Nitrosodi-N-Propylamine	ND	"
N-Nitrosodiphenylamine	ND	"
Phenanthrene	ND	"
Pyrene	ND	"
1,2,4-Trichlorobenzene	ND	"
2-Methyl Napthalene	ND	"

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Kaiser Engineers
Sample No. 8-4120
June 22, 1988

ACID EXTRACTABLES

Analyte	Result	Detection Limit
4-Chloro-3-Methylphenol	ND	10 mg/kg
2-Chlorophenol	ND	10 mg/kg
2,4-Dichlorophenol	ND	10 mg/kg
2,4-Dimethylphenol	ND	10 mg/kg
2,4-Dinitrophenol	ND	50 mg/kg
2-Methyl-4,6-Dinitrophenol	ND	50 mg/kg
2-Nitrophenol	ND	10 mg/kg
4-Nitrophenol	ND	50 mg/kg
Pentachlorophenol	ND	50 mg/kg
Phenol	ND	10 mg/kg
2,4,6-Trichlorophenol	ND	10 mg/kg

ND = None Detected

NOTE: These detection limits are 50 times higher than usual due to the high level of oil in this sample.

Analytical Director

jmb

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ETC - MULTI-TECH

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June 22, 1988

Kaiser Engineers
Attn: Frank Fenzel
1600 Franklin Street
Oakland, CA 94612

SAMPLE NUMBER: 8-4121

Date collected: 5-24-88
Date in lab: 5-24-88
Date extracted: 6-02-88
Date analyzed: 6-15-88
Collected by: Client (Mark Krieger)
Matrix: Solid

CLIENT ID: ACT-E-T2, Project No. 80097-825

EPA METHOD 8270:BASE-NEUTRAL-ACID EXTRACTABLES

BASE-NEUTRAL EXTRACTABLES

Analyte	Result	Detection Limit
Acenaphthene	ND	10 mg/kg
Acenaphthylene	ND	"
Anthracene	ND	"
Benzo (A) Anthracene	ND	"
Benzo (B) Fluoranthene	ND	"
Benzo (K) Fluoranthene	ND	"
Benzo (A) Pyrene	ND	"
Benzo (G,H,I) Perylene	ND	"
Benzidene	ND	"
BIS (2-Chloroethyl) Ether	ND	"
BIS (2-Chloroethoxy) Methane	ND	"
BIS (2-Ethylhexyl) Phthalate	26	"
BIS (2-Chloroisopropyl) Ether	ND	"
4-Bromophenyl Phenyl Ether	ND	"
Butyl Benzene Phthalate	ND	"
2-Chloronaphthalene	ND	"
4-Chlorophenyl Phenyl Ether	ND	"
	ND	"

Kaiser Engineers
Sample No. 8-4121
June 22, 1988

BASE-NEUTRAL EXTRACTABLES (CONTINUED)

Analyte	Result	Detection Limit
Chrysene	ND	10 mg/kg
Dibenzo (A,H) Anthracene	ND	"
DI-N-Butyl Phthalate	ND	"
1,3-Dichlorobenzene	ND	"
1,4-Dichlorobenzene	ND	"
1,2-Dichlorobenzene	ND	"
3,3'-Dichlorobenzidene	ND	"
Diethyl Phthalate	ND	"
Dimethyl Phthalate	ND	"
2,4-Dinitrotoluene	ND	"
2,6-Dinitrotoluene	ND	"
Dioctyl Phthalate	ND	"
Fluoranthene	ND	"
Fluorene	ND	"
Hexachlorobenzene	ND	"
Hexchlorobutadiene	ND	"
Hexachloroethane	ND	"
Hexachlorocyclopentadiene	ND	"
Indeno (1,2,3-CD) Pyrene	ND	"
Isophorone	ND	"
Naphthalene	ND	"
Nitrobenzene	ND	"
N-Nitrosodimethylamine	ND	"
N-Nitrosodi-N-Propylamine	ND	"
N-Nitrosodiphenylamine	ND	"
Phenanthrene	ND	"
Pyrene	ND	"
1,2,4-Trichlorobenzene	ND	"
2-Methyl Napthalene	11	"

43

Kaiser Engineers
Sample No. 8-4121
June 22, 1988

ACID EXTRACTABLES

Analyte	Result	Detection Limit
4-Chloro-3-Methylphenol	ND	10 mg/kg
2-Chlorophenol	ND	10 mg/kg
2,4-Dichlorophenol	ND	10 mg/kg
2,4-Dimethylphenol	ND	10 mg/kg
2,4-Dinitrophenol	ND	50 mg/kg
2-Methyl-4,6-Dinitrophenol	ND	50 mg/kg
2-Nitrophenol	ND	10 mg/kg
4-Nitrophenol	ND	50 mg/kg
Pentachlorophenol	ND	50 mg/kg
Phenol	ND	10 mg/kg
2,4,6-Trichlorophenol	ND	10 mg/kg

ND = None Detected

NOTE: These detection limits are 50 times higher than usual due to the high level of oil in this sample.

Cheryl A. Smith
Analytical Director

jmb

44

Invoice E21776-400(6/9)
100% premium

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E88-05-769

Received: 31 MAY 88
Reported: 08 JUN 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Purchase Order: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
05-769-1	E-G .5-9.5-2	31 MAY 88
05-769-2	E-AA .5-9.5-2	31 MAY 88

PARAMETER	05-769-1	05-769-2
Total Fuel Hydrocarbons, mg/kg	<10	<10

S. D. Lessley

Sim D. Lessley, Ph.D., Laboratory Director

45

Invoice E21613-260 (6/1)
10% premium

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-05-770

Received: 31 MAY 88
Reported: 01 JUN 88

Ms. Laura Hofman
Kaiser Engineers Inc.
1800 Harrison Street
Oakland, California 94623-2321

Purchase Order: 80097-825

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
05-770-1	E-G 5-9.5-2	31 MAY 88
05-770-2	E-AA .5-9.5-2	31 MAY 88

PARAMETER	05-770-1	05-770-2			
Oil & Grease by Infrared, mg/kg	<50	<50			

Sim D. Lessley, Ph.D., Laboratory Director

Appendix D

Verification and Bioremediation Sampling

- Sampling proceedures
- Analytical methods
- Certified Analytical Results

Sampling Procedure

The composite verification and bioremediation samples were obtained by manually mixing (with a shovel, trowel) soils taken from various locations. Equal portions were obtained from each location and mixed unitl a homogeneous composite soil was obtained.

Analytical Methods

TPH: EPA Methods 8015, 5030, 3550
TOG: AWWA 503D
BTEX: EPA Method 8020
Purgable Organics: EPA Method 8240
Priority Metals: EPA Methods 6010, 7061, 7420, 7471, 7741, 7760, 7840

MULTI - TECH, A Division of
Environmental Testing and Certification Corp.
320 Tesconi Circle, Suite G
Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

July 1, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date Collected: 6-21-88
Date in lab: 6-21-88
Date extracted: 6-23-88
Date analyzed: 6-27-88 (except 8-4819,6-28-88)
Collected by: Client
Matrix: Solid

PROJECT: ACT-Emeryville

Analysis: Total Heavy Hydrocarbons
Detection Limit: 10 mg/kg

Sample No.	Client ID	Total Heavy Hydrocarbons Result
8-4816	E-COMP 1	ND
8-4817*	E-COMP 2	14
8-4818	E-COMP 3	ND
8-4819	E-COMP 4	ND
8-4820	E-COMP 5	15
8-4821*	E-COMP 6	11
8-4822	E-COMP 7	ND
8-4823*	E-COMP 8	130

NOTE: These total extractable analyses were performed using EPA Methods 3550 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to diesel fuel.

*The analysis of this sample indicates the presence of high boiling point petroleum hydrocarbons.

Cheryl A. Smith
Analytical Director

rm

MULTI - TECH, A Division of
Environmental Testing and Certification Corp.
320 Tesconi Circle, Suite G
Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

July 5, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date Collected: 6-23-88
Date in lab: 6-23-88
Date extracted: 6-28-88
Collected by: Client
Matrix: Solid

PROJECT: ACT-Emeryville, Project #80097.825

Analysis: Total Heavy Hydrocarbons
Detection Limit: 10 mg/kg

Sample No.	Client ID	Date Analyzed	Total Heavy Hydrocarbons (mg/kg)
8-4896	E-COMP 9	7-01-88	19*
8-4897	E-COMP 10	7-01-88	39

NOTE: These total extractable analyses were performed using EPA Methods 3550 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to diesel fuel.

*The analysis of this sample indicates the presence of high boiling point petroleum hydrocarbons.

Analytical Director

jmt

MULTI - TECH, A Division of
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320 Tesconi Circle, Suite G
Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

July 5, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date Collected: 6-21-88
Date in lab: 6-21-88
Date extracted: 6-22-88
Date analyzed: 6-28-88
Collected by: Client
Matrix: Solid

PROJECT: ACT EMERYVILLE, PROJECT #80097-825

Method: EPA 8020: Purgeable Aromatics
Detection Limit: 10 ug/kg

Sample No.	Client ID E COMP:	Benzene ug/kg	Toluene ug/kg	Ethyl Benzene ug/kg	Xylene ug/kg
8-4816	#1	ND	20	ND	55
8-4817	#2	ND	30	18	79
8-4818	#3	ND	23	ND	50
8-4819	#4	ND	26	ND	56
8-4820	#5	ND	58	43	150
8-4821*	#6	ND	ND	370	920
8-4822	#7	ND	26	ND	57
8-4823*	#8	18	30	110	330

ND = None Detected

*The results for samples 8-4821 and 8-4823 could not be confirmed due to sample matrix interferences on the confirmation column.

Cheryl A. Smith
Analytical Director

jmt

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707-544-5570

ETC - MULTI-TECH

July 5, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date Collected: 6-23-88
Date in lab: 6-23-88
Date extracted: 6-29-88
Date analyzed: 6-29-88
Collected by: Client
Matrix: Solid

PROJECT: ACT EMERYVILLE, PROJECT #80097-825

Method: EPA 8020: Purgeable Aromatics
Detection Limit: 10 ug/kg

Sample No.	Client ID E COMP:	Benzene ug/kg	Toluene ug/kg	Ethyl Benzene ug/kg	Xylene ug/kg
8-4896*	#9	ND	54	210	560
8-4897	#10	ND	18	16	67

ND = None Detected

*The results for sample 8-4896 could not be confirmed due to sample matrix interferences on the confirmation column.

Analytical Director

jmt

1) Xerox to Frank Fenzel & Dan G...
2) File 02-5 Bio Remediation,

MULTI - TECH, A Division of
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320 Tesconi Circle, Suite G
Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

June 17, 1988

RECEIVED-KAISER ENGINEERS
TRANSPORTATION DIV.

JUN 20 1988

Kaiser Engineers
Attn: Frank Fenzel
1600 Franklin Street
Oakland, CA 94612

Date Collected:	6-14-88
Date in lab:	6-14-88
Date extracted:	6-15-88
Date analyzed:	6-15-88 (8-4592, 8-4593, 8-4594 & 8-4595) 6-16-88 (8-4596 & 8-4597)
Collected by:	Client
Matrix:	Solid

PROJECT: ACT EMERYVILLE, PROJECT NO. 80097-827

Analysis: Total Light Hydrocarbons
Detection Limit: 10 mg/kg

Sample No.	Client ID	Total Light Hydrocarbons Result
8-4592	E-BIO-1	ND
8-4593	E-BIO-2	ND
8-4594	E-BIO-3	ND
8-4595	E-BIO-4	ND
8-4596	E-BIO-5	ND
8-4597	E-BIO-6	ND

ND = None Detected

NOTE: These total light hydrocarbon analyses were performed using EPA Methods 5030 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to gasoline.

Cheryl A. Smith

Analytical Director

jmb

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Santa Rosa, California 95401
707-544-5570

ETC - MULTI-TECH

July 5, 1988

Kaiser Engineers
Attn: Frank Fenzel
P.O. Box 23210
Oakland, CA 94623

Date Collected: 6-14-88
Date in lab: 6-14-88
Date extracted: 6-28-88
Collected by: Client
Matrix: Solid

PROJECT: ACT-Emeryville, Project #80097.827

Analysis: Total Heavy Hydrocarbons
Detection Limit: 10 mg/kg

Sample No.	Client ID	Date Analyzed	Total Heavy Hydrocarbons (mg/kg)
8-4592	E-BIO 1	6-30-88	27
8-4593	E-BIO 2	6-30-88	ND
8-4594	E-BIO 3	7-01-88	40*
8-4595	E-BIO 4	7-01-88	37*
8-4596	E-BIO 5	6-30-88	20*
8-4597	E-BIO 6	7-01-88	27*

NOTE: These total extractable analyses were performed using EPA Methods 3550 and 8015 with a modification of the calibration standard as specified by the San Francisco Water Quality Control Board method for addressing underground fuel leaks. These samples were calibrated to diesel fuel.

*The analysis of this sample indicates the presence of high boiling point petroleum hydrocarbons.

Analytical Director

jmt

Appendix E

- Enhanced bioremediation plan

The enhanced bioremediation of contaminated soils at AC Transit Emeryville entails biodegradation of the organic contaminants, TFH and TOG, by aerobic microbes present in contaminated soils or in oil rich soils similar to that of the site. The steps in this process are discussed below.

STAGE 1: PARAMETER ESTIMATION

Stage 1 began with the subdivision of the site into six areas (see Figure 7). Composite soil samples were collected from each area and analyzed for TFH and TOG. Results for these analyses are presented in Table 4. The soil was further analyzed for the Total Organic Content, Kjeldahl Nitrogen, Nitrate, Phosphate, Potassium, Calcium, Cation Exchange Capacity, pH, Heavy Metals, and Volatile Organics (purgable and priority pollutants). Such analyses are necessary to satisfy Regulators and to characterize the plausibility of Bioremediation since halogenated hydrocarbons may not be degraded at a useful rate and metals may be chelated, and made more mobile. Furthermore, knowing the nutrient levels in the soil assists the Optimization Stage of Bioremediation.

From each of the six areas, 24 composites of approximately 1 kilogram were collected and placed in one-half gallon jars. Microbial activity analyses were performed on each of the samples. Standard soil respiration tests are being conducted on controls and amended soil (fertilizer, lime, sludge and combinations) to estimate soil microbial activity.

Stage 2: OPTIMIZATION

Optimization involves selection of one or more treatment levels for use in the field to modify soil chemistry to enhance microbial degradation. Optimization may also require use of additional "seed" microbes from other sites contaminated with similar oily waste.

STAGE 3: DESIGN/OPERATIONS SPECIFICATIONS

Stage 3 incorporates the results of Parameter Estimation and Optimization. Presently, excavated soil is stockpiled adjacent to area BIO 6. Upon completion of the cement slab, the soil will be placed on a 360 x 65 foot portion of it and optimal nutrient concentrations will be added. The pile will be moistened daily and mixed by a Roto Tiller (or other suitable implement), three times a week, to achieve proper aeration of the soil. Periodic microbial activity and TFH and TOG contaminant analyses will be conducted at six designated locations of the pile at depths of 1-3 feet--the pile will be between 2 and 4 feet deep. Operations will

continue until the TFH and TOG levels reach Class III status (<100 ppm).

STAGE 4: PROCURED MATERIALS

Stage 4 involves the purchase of the necessary on site materials for Bioremediation. The necessary equipment includes a Roto Tiller capable of mixing at depths of 2 to 4 feet; shovels; bales of hay; and sampling equipment.

STAGE 5: INSTALLATION

Cement slab installation will begin upon receiving appropriate regulatory approval. The enhanced bioremediation process will take part on a portion of this slab.

STAGE 6: OPERATIONS

On-site Bioremediation will begin upon completion of the cement slab. Samples will be collected periodically from six areas of the pile to measure the contaminant levels and the microbial activity. ETC Multitech will provide the TFH and TOG data. Soil respiration tests will be conducted regularly. Through these periodic analyses, necessary adjustments can be made to maintain optimum microbial respiration. During Operations the pile will be moistened daily and mixed three times a week by a Roto Tiller. The completion of this stage is when Class III contaminant level is achieved.

STAGE 7: MONITORING

Adjacent areas to the pile will be monitored for contaminant leachate. Steps will be taken to insure contaminants will not leave the pile during daily soil moistening. Monitoring will also include TFH, and TOG contaminant levels. Monitoring will continue through the completion of bioremediation.