UNDERGROUND TANK CLOSURE/MODIFICATION PLANS

ATTACHMENT A

SAMPLING RESULTS

Tank or Area	Contaminant	Location & Depth	Results (specify units)

INSTRUCTIONS

2. SITE ADDRESS
Address at which closure or modification is taking place.

5. EPA I.D. NO.
This number may be obtained from the State Department of Health Services, 916/324-1781.

6. CONTRACTOR
Prime contractor for the project.

7. OTHER
List professional consultants here.

12. SAMPLE COLLECTOR
Persons who are collecting samples.

13. SAMPLING INFORMATION
Historic contents - the principal product(s) used in the last 5 years.

Material sampled - i.e., water, oil, sludge, soil, etc.

16. LABORATORIES
Laboratories used for chemical and geotechnical analyses.

17. CHEMICAL METHODS:
All sample collection methods and analyses should conform to EPA or DHS methods.

Contaminant - Specify the chemical to be analyzed.

Sample Preparation Method Number - The means used to prepare the sample prior to analyses - i.e., digestion techniques, solvent extraction, etc. Specify number of method and reference if not an EPA or DHS method.

Analysis Method Number - The means used to analyze the sample - i.e., GC, GC-MS, AA, etc. Specify number of method and reference if not a DHS or EPA method.

NOTE:
Method Numbers are available from certified laboratories.

18. SITE SAFETY PLAN
A plan outlining protective equipment and additional specialized personnel in the event that significant amount of hazardous materials are found. The plan should consider the availability of respirators, respirator cartridges, self-contained breathing apparatus (SCBA) and industrial hygienists.

19. ATTACH COPY OF WORKMAN'S COMPENSATION

20. PLOT PLAN

The plan should consists of a scaled view of the facility at which the tank(s) are located and should include the following information:

a) Scale

b) North Arrow

c) Property Line

d) Location of all Structures

e) Location of all relevant existing equipment including tanks and piping to be removed

f) Streets

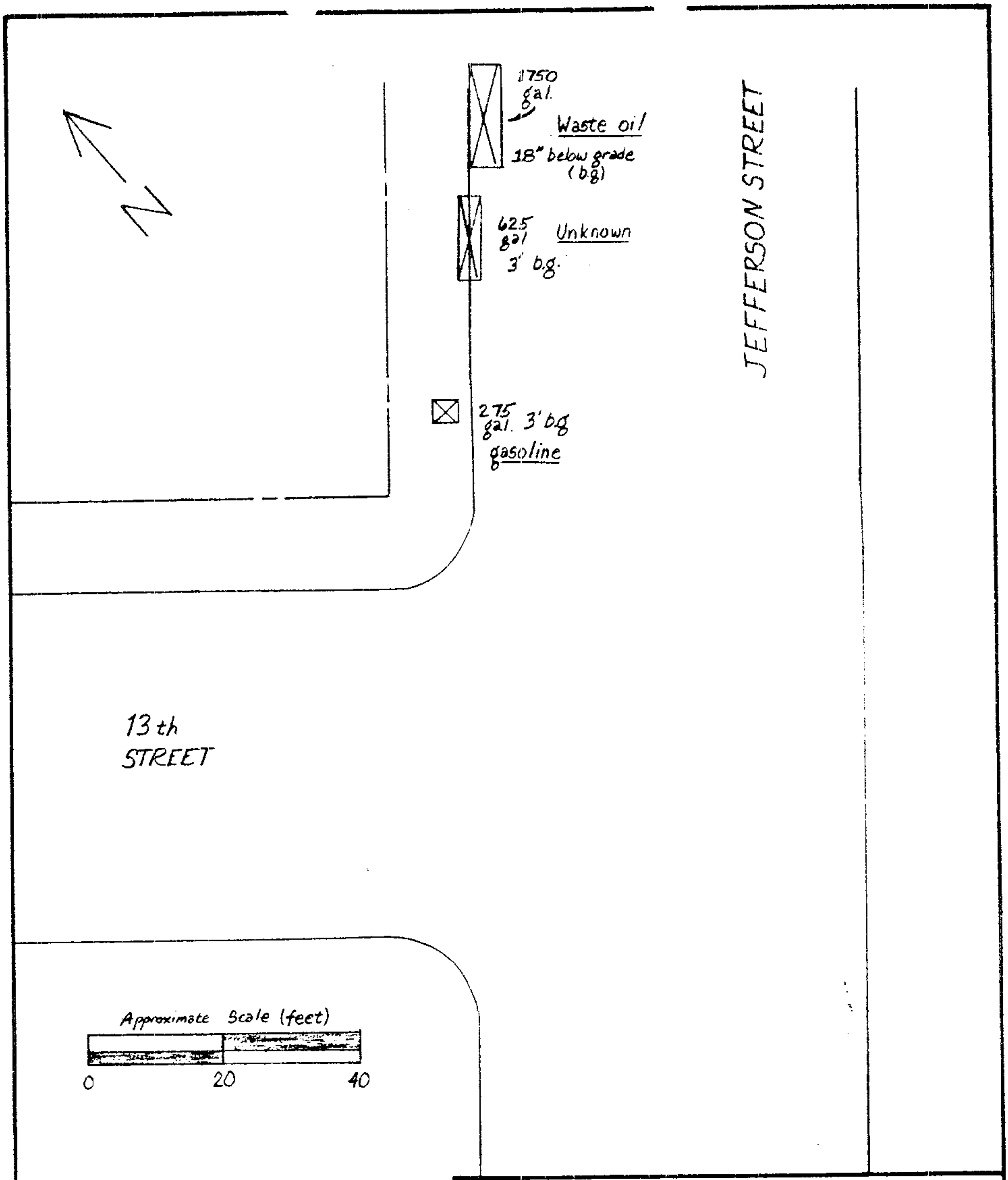
g) Underground conduits, sewers, water lines, utilities

h) Existing wells (drinking, monitoring, etc.)

i) Depth to ground water

j) All existing tanks in addition to the ones being pulled

1/88



SITE PLAN

Subsurface Consultants

JOB NUMBER	DATE	APPROVED	PLATE
430.005	8/25/89	CF	

RECEIVED AUG 1 1 198

ACORD. CERTIFICATE OF INSURANCE

ISSUE DATE (MM/DD/YY) 8/10/89

PRODUCER

ANDREINI AND COMPANY
220 WEST 20TH AVENUE
SAN MATEO, CA 94403

CODE SUB-CODE

INSURED

HSR INC.
1540 PARK MOOR, SUITE A
SAN JOSE, CA 95128

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW

COMPANIES AFFORDING COVERAGE

COMPANY LETTER A COMCO INSURANCE COMPANY
COMPANY LETTER B FAIRMONT INSURANCE COMPANY
COMPANY LETTER C
COMPANY LETTER D
COMPANY LETTER E

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	ALL LIMITS IN THOUSANDS	
	GENERAL LIABILITY				GENERAL AGGREGATE	$2,000,
A	X COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OPS AGGREGATE	$1,000,
	☐ CLAIMS MADE X OCCUR.	100808	7/21/89	7/21/90	PERSONAL & ADVERTISING INJURY	$1,000,
	X OWNER'S & CONTRACTOR'S PROT.				EACH OCCURRENCE	$1,000,
					FIRE DAMAGE (Any one fire)	$ 50,
					MEDICAL EXPENSE (Any one person)	$ 5,
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	$
	ANY AUTO					
	ALL OWNED AUTOS				BODILY INJURY (Per person)	$
	SCHEDULED AUTOS					
	HIRED AUTOS				BODILY INJURY (Per accident)	$
	NON-OWNED AUTOS					
	GARAGE LIABILITY				PROPERTY DAMAGE	$
A	EXCESS LIABILITY				EACH OCCURRENCE	AGGREGATE
	X OTHER THAN UMBRELLA FORM	900114	8/10/89	7/21/90	$ 5,000,	$ 5,000,
B	WORKER'S COMPENSATION AND EMPLOYERS' LIABILITY	TBD	8/10/89	7/21/90	STATUTORY $ 100 (EACH ACCIDENT) $ 500 (DISEASE—POLICY LIMIT) $ 100 (DISEASE—EACH EMPLOYE	
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/RESTRICTIONS/SPECIAL ITEMS

LIMITS OF LIABILITY AT TIME OF INCEPTION
*EXCEPT WITH RESPECT TO NON-PAYMENT OF PREMIUM, WHICH SHALL BE 10 DAYS NOTICE.

CERTIFICATE HOLDER

REDEVELOPMENT AGENCY,OF THE CITY OF
OAKLAND AND BRAMALEA PACIFIC
1221 BROADWAY #1800
OAKLAND, CA 94612

ATTN: JOHN ESPOSITO

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL *30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

ANDREINI AND COMPANY

11-20-89

■ Subsurface Consultants, Inc.

PROGRESS REPORT 2
OFF-SITE GASOLINE CONTAMINATION INVESTIGATION
1330 MARTIN LUTHER KING, JR. WAY
OAKLAND, CALIFORNIA
SCI 430.002

Nov 20, 1986

Prepared for:

Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

By:

R. William Rudolph

R. William Rudolph
Geotechnical Engineer 741 (expires 12/31/88)

Ross William Rudolph
No. GE 000741

James P. Bowers

James P. Bowers
Geotechnical Engineer 157 (expires 3/31/91)

James P. Bowers
No. GE 000157
Exp.

Subsurface Consultants, Inc.
171 12th Street, Suite 201
Oakland, California 94607
(415) 268-0461

November 20, 1989

James P. Bowers, PE
R. William Rudolph, Jr., PE

89 NOV 22 AM 10:52

LETTER OF TRANSMITTAL

TO:
Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

DATE: November 21, 1989
PROJECT: Martin Luther King, Jr. Way, Progress Report 2
SCI JOB NUMBER: 430.002

WE ARE SENDING YOU:

__1__ copies
X of our final report
___ a draft of our report
___ a Service Agreement
___ a proposed scope of services
___ specifications
___ grading/foundation plans
___ soil samples/groundwater samples
___ an executed contract
___

X if you have any questions, please call
___ for your review and comment
___ please return an executed copy
___ for geotechnical services
___ with our comments
___ with Chain of Custody documents
X for your use
___

REMARKS:

COPIES TO:
(1) Ms. Lois Parr, City of Oakland, Office of Economic Development & Employment, 475 14th Street, 1st Floor, Oakland, CA 94612
(1) Mr. Lester Feldman, Regional Water Quality Control Board, 1800 Harrison Street, 7th Floor, Oakland, CA 94612
✓ (2) Ms. Katherine Chesick, Alameda County Health Care Services Agency, Division of Hazardous Materials, 80 Swan Way, #200, Oakland, CA 04612
(1) Mr. Donnell Choy, City of Oakland, 505 14th Street, 8th Floor, Oakland, CA 94612
(1) Mr. Roy Ikeda, Crosby, Heafey, Roach & May, 1999 Harrison Street, Oakland, CA 94612

BY:
James P. Bowers

Subsurface Consultants, Inc.

171 12th Street • Suite 201 • Oakland, California 94607 • Telephone 415-268-0461

TABLE OF CONTENTS

I INTRODUCTION

This report records the results of an investigation of off-site soil and groundwater contamination resulting from a leaking underground fuel tank at 1330 Martin Luther King, Jr. Way in Oakland, California. The investigation was directed toward characterizing the lateral and vertical extent of soil contamination and evaluating impacts on groundwater. The location of the site is shown on Plate 1. Subsurface Consultants, Inc. (SCI) previously conducted an initial assessment of the problem; the results of this study were recorded in "Progress Report 1" dated July 21, 1988. A remediation plan was subsequently developed for the remediation of on-site contaminated soils. On-site contaminated soils have since been remediated as briefly described below.

II SUMMARY OF ON-SITE SOIL REMEDIATION

The remediation of soil contamination on site has been completed to date. Remediation consisted of excavating the gasoline contaminated soils to depths approximately 1 foot below the existing groundwater surface, which was situated approximately 27 feet below ground. The contaminated soils were subsequently aerated on site and then used to backfill the excavation.

Following contaminated soil removal, soil samples were obtained from the bottom and walls of the excavation and analyzed to check for the presence of total volatile petroleum hydrocarbons (TVH), as gasoline. Gasoline contaminated soils were removed to below detectable limits on the north, south and east sides, and the bottom of the excavation. Contaminated soils west of the excavation were left in place due to physical constraints created by Martin Luther King, Jr. Way and associated underground utilities. The contaminated soils left in place were to be remediated at a later date.

The excavated soils were stockpiled, sampled and analyzed for gasoline, and then aerated on site in accordance with the Bay Area Air Quality Management Division Guidelines. Soil aeration was monitored in the field using an organic vapor meter (OVM). The aerated soils were sampled and tested for TVH and benzene, toluene, xylene and ethylbenzene (BTXE), in accordance with the Regional Water Quality Control Board (RWQCB) guidelines. Once analytical testing indicated that the soils contained no detectable gasoline, aeration was considered complete.

Before replacing the aerated soils, a 24-inch-diameter corrugated metal pipe was placed vertically in the excavation to act as an extraction well for future groundwater remediation. A layer of pea gravel was placed in the bottom of the excavation; the corrugated metal pipe was terminated in the gravel. A geotextile fabric was placed over the pea gravel to limit the migration of fine-grained soils into the pea gravel. The corrugated metal pipe was fitted with a locking cover (Plate 29).

III FIELD INVESTIGATION

A. Test Borings and Soil Sampling

Subsurface conditions near the previous tank were explored by drilling 23 test borings. The borings ranged from 25 to 44 feet deep. Boring locations are shown on Plate 1. Test Borings 8, 11, 16, 28 thru 31, 39, 42 and 43 were converted to groundwater monitoring wells. Test Borings 9 and 10 were unsampled probes and were utilized to install piezometer standpipes. The piezometers were used to establish groundwater elevations in areas away from the tank and evaluate the direction of groundwater flow. Borings 5 and 12, 17 thru 27 and 33 thru 38 were drilled in nearby areas for another investigation; the logs of these borings have been omitted from this report. The test borings were drilled with a truck-mounted rig equipped with 8-inch-diameter, hollow-stem augers, except for Boring 28 which was drilled with 10-inch-diameter hollow-stem auger drilling equipment to allow installation of a 4-inch-diameter monitoring well.

Our geologist observed drilling operations and prepared logs of the borings. Soil samples were obtained using a California Drive sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches. The sampler was driven with a 140-pound hammer having a drop of approximately 30 inches. The blow counts required to drive the sampler the final 12 inches of an 18-inch penetration were recorded and are shown on the Boring Logs, Plates 2 thru 24. Soils are classified in accordance with the Unified Soil Classification System, described on Plate 25.

Soil samples were retained in brass sample liners. Samples for environmental analysis were capped and sealed with plastic tape. Teflon sheeting was placed between the caps and the soil sample. Upon sealing and labeling, the samples were promptly refrigerated on-site in ice chests.

All augers, drill rods, samplers, well casing, etc., that were placed into the test borings were steam-cleaned prior to their initial use and before each subsequent use to reduce the likelihood of cross contamination between borings.

B. Monitoring Wells

The groundwater monitoring wells are constructed of 2-inch-diameter Schedule 40 PVC pipe having flush threaded joints, with the exception of the well in Boring 28, which consists of 4-inch-diameter PVC pipe. The lower portion of each well consists of machine-slotted well screen having 0.020 inch slots. The annular space around the screened section was backfilled with Lone Star #3 sand. A bentonite plug, approximately 12 inches thick, was placed above the sand. The annulus above the plug was backfilled with bentonite grout. The wells were finished flush with the groundsurface. The wellheads are secured by locking covers. Specific details of the wells are shown on the appropriate boring logs.

The wells were developed by removing water with a Teflon bailer until the water became relatively free of turbidity. After development, each well was sampled with a Teflon sampling device. The bailer and sampler were steam-cleaned prior to their initial use and each subsequent use to limit the likelihood of cross contamination between wells. The water samples were promptly refrigerated on-site in ice chests. All soil and water samples remained refrigerated until delivered to the analytical laboratory. Chain-of-custody documents accompanied all samples delivered to the laboratory.

The piezometers consist of 1.25 inch steel pipe fitted with a prefabricated steel well point tip. The piezometer pipes extend approxiamtely 32 feet below the groundsurface. A bentonite pellet seal was placed in the piezometer boreholes at about mid-depth. The annulus above the bentonite pellet seal was backfilled with bentonite grout.

Exploratory borings that were not converted to piezometers or monitoring wells were backfilled with cement/bentonite grout.

C. Groundwater Level Measurements

Groundwater levels were measured at frequent intervals to evaluate groundwater flow direction, gradient and seasonal variations. The groundwater levels were measured from the top of the well casing using a Solinst well sounder. The water level measurements were related to elevation by surveying the tops of all well casings. Elevations are based on an assumed datum; the PG&E manhole in Martin Luther King, Jr. Way was assumed to have an elevation of 100 feet. Water levels in wells that contained free product were measured by using a steel tape with water and gasoline sensitive pastes. Groundwater levels were measured to the nearest 0.01 foot.

D. Slug Tests

The permeability of the soils was evaluated using slug tests in four wells. Slug testing consisted of bailing water from the well until the water level was significantly drawn down, and then recording the rate at which recharge occurs. Approximately 15 to 20 gallons of water were removed during drawdown. The results of the slug tests are presented below.

Well	**Permeability k (cm/sec)**
11	3.5×10^{-3}
28	5.0×10^{-3}
29	7.9×10^{-3}
31	1.3×10^{-2}

IV SITE CONDITIONS

A. Soil Conditions

The test borings indicate that soil conditions in the area are relatively uniform. The upper 9 to 20 feet of soil consists of a clayey sand. These materials are dense and are estimated to contain between 30 and 50 percent silt and clay. Below the clayey sands, the silt and clay content in the sand decreases. Relatively clean, fine grained silty sand exists below depths near the groundwater surface. These lower sands contain between 5 and 25 percent silt and clay size particles.

B. Groundwater Hydrology

Groundwater was encountered approximately 26.5 feet below the groundsurface. This depth corresponds to an elevation[1] of about 73 feet. Groundwater level data from the wells indicates that groundwater is flowing toward the northwest at a gradient of approximately 0.8 percent. Groundwater level data recorded in the wells and piezometers is summarized in Table 1. Seasonal variations in groundwater elevation of several tenths of a foot were observed.

---

[1] Assumed datum: The elevation of the PG&E manhole in Martin Luther King, Jr. Way, west of the tank, was assumed to have an elevation of 100 feet.

Table 1. GROUNDWATER ELEVATION DATA (feet)

WELL TOC ELEV [2] DATE	11 99.66	16	28 98.99	29 97.95	30 99.30	31 98.90	32	39 99.00	42 99.12	43 98.87
1/10/89			73.03	71.89	72.18(1.33)[1]	72.77	73.87			
1/12/89					71.93(1.33)		73.03			
1/18/89			72.91	71.87	71.97(1.50)	72.72				
1/19/89	72.84		72.83	71.81	71.80(1.56)	72.75				
1/20/89			72.87	71.83	72.78(0.30)	72.71				
1/26/89	72.89		72.90	71.79	72.51(0.73)	72.69				
2/7/89			72.87	71.75	71.95(1.44)	72.67				
2/17/89	72.87		72.87	71.76	71.57(1.96)	72.68				
3/3/89			73.05	71.77	71.35(2.55)	72.75				
3/14/89	73.18		73.19	71.96	71.34(2.69)	72.89				
3/30/89	73.33		73.32	72.05	71.51(2.58)	73.00				
4/3/89	73.31		73.29	72.07	71.52(2.56)	73.00		73.13	73.35	73.63
5/4/89	73.21		73.21	72.07	71.35(2.66)	73.01		73.09	73.27	73.81
6/7/89	72.91		72.92	71.85	70.83(3.01)	72.79		72.83	72.99	73.58
7/5/89	72.71		72.73	71.76	70.4(3.38)	72.62		72.62	72.82	73.41

---

[1] (1.33) indicates thickness of free product (feet)

[2] TOC = Top of Casing

V ANALYTICAL TESTING

Groundwater samples from the monitoring wells and selected soil samples from the borings were transmitted to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services to conduct hazardous waste and water testing. Soil samples from Test Boring 1A were analyzed for total petroleum hydrocarbons (TPH) in accordance with EPA 8015 test method (sonication). The results indicated the presence of gasoline and not other heavier hydrocarbons. This data was consistent with our research, which indicated that the tank was used to store gasoline. For this reason, all subsequent analyses were performed to check for total volatile hydrocarbons (TVH) in accordance with EPA Method 8015 (purge and trap). Selected samples were also analyzed for purgeable aromatic compounds in accordance with EPA Method 602/8020, and for total organic lead and ethyldibromide. Laboratory test reports are presented in the Appendix. The analytical test results for soil samples are summarized in Table 2. Groundwater analysis results are presented in Table 3. In addition, the analytical results are graphically presented on Plates 27 and 28.

The engineering properties of the materials encountered were evaluated by laboratory tests. The testing program included moisture content/dry density determinations, shear strength, grain size distribution, and percent passing a #200 sieve. The grain size distribution tests are presented on Plate 26. The remainder of the test results are presented on the boring logs.

Table 2. CONTAMINANT CONCENTRATIONS IN SOIL

Sample[3]	TVH[1] mg/kg[2]	Benzene mg/kg	Toluene mg/kg	Total Xylenes mg/kg	Ethyl Benzene mg/kg
1A @ 16.0	ND				
1A @ 21.0	3700[5]				
1 @ 16.0	ND[4]	ND	ND	ND	ND
1 @ 21.0	ND	ND	ND	ND	ND
1 @ 25.0	ND	ND	ND	ND	ND
2 @ 16.0	ND	ND	ND	ND	ND
2 @ 21.0	1810	26.3	42.5	154	24.8
2 @ 25.5	7530	29.5	447	752	87.9
3 @ 16.0	ND	ND	ND	ND	ND
3 @ 21.0	2370	15.9	39.2	199	31.0
3 @ 25.5	ND	ND	ND	ND	ND
4 @ 16.0	54	ND	ND	3.0	0.5
4 @ 21.0	6770	21.9	158	598	101
4 @ 26.0	ND	ND	0.2	ND	ND
6 @ 17.5	ND	ND	ND	ND	ND
6 @ 23.0	ND	ND	ND	ND	ND
6 @ 27.0	ND	ND	ND	ND	ND
7 @ 19.0	ND	ND	ND	ND	ND
7 @ 24.0	987	ND	16	64	12
7 @ 28.5	2020	32.8	74.6	152	26.5
8 @ 16.0	ND	ND	ND	ND	ND
8 @ 21.0	ND	ND	ND	ND	ND
8 @ 26.0	ND	ND	ND	ND	ND
11 @ 25.0	ND	ND	ND	ND	ND
14 @ 19.0	ND	ND	ND	ND	ND
14 @ 22.0	ND	ND	ND	ND	ND
14 @ 25.0	6710	38.9	324	735	122
15 @ 25.0	ND	ND	ND	ND	ND
16 @ 25.0	7660	39.3	257	719	117

Table 2. CONTAMINANT CONCENTRATIONS IN SOIL (continued)

Sample[1]	TVH[2] mg/kg[3]	Benzene mg/kg	Toluene mg/kg	Total Xylenes mg/kg	Ethyl Benzene mg/kg
28 @ 23.0	ND[4]	ND	ND	ND	ND
28 @ 26.0	ND	0.2	0.2	4.0	ND
28 @ 29.0	ND	ND	ND	ND	ND
29 @ 27.0	ND	ND	ND	ND	ND
29 @ 30.0	139	ND	ND	ND	ND
29 @ 33.0	ND	ND	ND	ND	ND
30 @ 25.0	5350	36.4	120	383	71.4
30 @ 27.0	ND	0.3	0.3	0.1	ND
31 @ 25.0	ND	ND	ND	ND	ND
31 @ 27.0	ND	ND	ND	ND	ND
39 @ 24.5	ND				
39 @ 27.0	ND				
40 @ 24.0	ND				
40 @ 27.0	ND				
41 @ 24.0	ND				
41 @ 26.0	5000				
41 @ 27.0	22				
41 @ 28.0	ND				
42 @ 21.0	ND				
42 @ 24.0	ND				
42 @ 26.0	Trace				
43 @ 23.0	ND				
43 @ 24.5	1000				
43 @ 26.0	ND				

	EDB[6]	TEL[7]	Purgeable Halocarbons
29 @ 30.0			ND
30 @ 25.0	ND	ND	

---

[1] TVH = Total Volatile Hydrocarbons as gasoline
[2] mg/kg = milligrams per kilogram or parts per million (ppm)
[3] Boring number and sample depth (feet)
[4] ND = not detected at concentrations above detection limit; see test reports for detection limits
[5] Samples for Boring 1A tested for TPH, EPA method 3550 extraction
[6] EDB = 1,2 - dibromoethane, EPA method 8011
[7] TEL = total organic lead, EPA method 7420
[8] EPA 8010

Table 3. CONTAMINANT CONCENTRATIONS IN GROUNDWATER

	Date 7/5/88	Date 9/2/88	Date 4/3/89	Date 7/6/89
Well 8				
TVH[1]	ND[2]			
Benzene	ND			
Toluene	ND	Well Removed		
Xylene	ND			
Ethylbenzene	ND			
Well 11				
TVH	10		53,000	22,000
Benzene	1800[4]		7,100	5,300
Toluene	ND		4,000	3,200
Xylene	1200		2,400	2,300
Ethylbenzene	ND		380	390
Organic Lead				ND
EDB[3]				26
Well 16				
TVH	90			
Benzene	3100			
Toluene	2700	Well Removed		
Xylene	5500			
Ethylbenzene	ND			
Well 28				
TVH		890		13,000
Benzene		431		4,900
Toluene		75.4		1,500
Xylene		84		1,300
Ethylbenzene		ND		100
Organic Lead		ND		ND
EDB		9.2		27
Well 29				
TVH		ND	450	ND
Benzene		ND	ND	ND
Toluene		8.1	2	15
Xylene		ND	6.7	ND
Ethylbenzene		ND	2	ND
Organic Lead		ND		ND
EDB		ND		ND

Table 3. CONTAMINANT CONCENTRATIONS IN GROUNDWATER (continued)

	Date 7/5/88	Date 9/2/88	Date 4/3/89	Date 7/6/89
Well 31				
TVH		ND	ND	ND
Benzene		ND	ND	ND
Toluene		ND	ND	ND
Xylene		ND	ND	ND
Ethylbenzene		ND	ND	ND
Organic Lead		ND		ND
EDB		ND		ND
Well 39				
TVH			2,000	7,900
Benzene			250	2,700
Toluene			11	1,300
Xylene			210	860
Ethylbenzene			ND	97
Organic Lead				ND
EDB				3
Well 42				
TVH				13,000
Benzene				4,500
Toluene				100
Xylene				1,000
Ethylbenzene				ND
Organic Lead				ND
EDB				8

---

[1] TVH = Total volatile hydrocarbons, as gasoline
[2] ND = not detected at concentrations above detection limit
[3] EDB = Ethylene Dibromide
[4] Concentrations in micrograms/liter or ppb

VI CONCLUSIONS

A. Soil Contamination

The results of our investigation indicate that detectable concentrations of gasoline and its purgeable aromatic constituents, i.e., benzene, toluene, xylene and ethylbenzene (BTXE), are present in the soil beneath Martin Luther King, Jr. Way (MLK Way) and 14th Street. Based on the data, we estimate that the lateral extent of soil contamination is that shown on Plates 27 thru 29.

Soil contamination appears to extend west and northwest of the previous tank for distances up to about 60 to 70 feet. The contaminated soil layer is thickest near the previous tank and thins rapidly in a westerly direction. At distances of 40 feet or so from the previous tank, the contaminated soil layer appears to be less than about 3 feet thick.

Total volatile hydrocarbon concentrations in the soil samples analyzed vary up to 7660 ppm. We estimate that the higher concentrations are associated with samples containing free product, as subsequently discussed. The contaminated soils also contain benzene, toluene, xylenes and ethylbenzene (BTXE). Concentrations are summarized in Table 2 and on Plate 27.

A significant portion of the soil contaminated by tank leakage was remediated. The extent of the Phase 1 cleanup is shown on Plates 1 and 29.

B. Groundwater Contamination

1. Free Floating Product

Free floating gasoline product has been measured in Wells 16, 30 and 43. Product thicknesses in the wells range from 16 to 41 inches. The downgradient (northwest) extent of the free product has been relatively well defined and exists between Wells 30 and 42, as shown on Plates 28 and 29.

As Plates 28 and 29 indicate, the free product plume extends northwest of the previous tank, and exists as a "lens" perched on top of the groundwater surface. The thickest portion of the lens appears to exist near Test Boring 30, approximately 55 feet from the previous tank. The variations in product thickness in the wells suggest that the lens may be experiencing some movement. However, the rate of free product migration appears to be very slow since free product has not been recorded in Wells 11, 28 and 42, which are situated within 10 to 15 feet of wells containing free floating gasoline.

2. Dissolved Constituents

Dissolved gasoline, and BTXE were detected in groundwater. The lateral extent of the dissolved product plume has not been fully defined along the southern side. However, we judge that its approximate extent is close to that graphically shown on Plate 28. The downgradient edge of the plume appears to extend at least 200 feet northwest of the previous tank. Very low concentrations of TVH and BTXE have been detected in Well 29.

C. **Remediation**

The petroleum hydrocarbon concentrations that exist in the soil and groundwater are sufficiently high that we judge that remediation of soil and groundwater will likely be necessary. The scope and extent of remediation will have to be negotiated with the RWQCB and the ACHCSA. It is recommended that the initial phase of remediation consist of the recovery of free floating gasoline. When free product level thicknesses are reduced significantly, we recommend that groundwater and contaminated soil remediation be initiated.

In brief, the recovery of free product should involve the installation of two extraction wells, one situated near Well 30 and the other situated about 35 feet south of Well 30. A pump capable of operating at low flow rates and skimming the product from the water surface should be installed in the wells. The recovered gasoline product should be pumped directly into suitable waste containers for subsequent recycling.

Groundwater remediation should involve the installation of one or more groundwater extraction wells. Groundwater should be removed from the wells by pumping and treated by a facility utilizing activated carbon filtering methods. BTXE concentrations in the groundwater significantly exceed DHS action levels for drinking water. However, we judge that the area will likely not be considered a particularly sensitive groundwater region by the RWQCB. Although unconfirmed, we suspect that groundwater in the area is likely not used as a drinking water source. For this reason, we judge that drinking water standards will not be used to establish groundwater cleanup levels; some other standard will likely be applicable. Cleanup levels will have to be negotiated with the RWQCB.

Remediation of the highly contaminated soils is complicated by the fact that they exist at significant depths, beneath major city streets crowded with underground utilities. At this time, we believe that the most appropriate means of soil remediation will involve a combination of in situ treatment and physical removal. The removal of contaminated soils by drilling with a large diameter auger will likely be most appropriate where contamination exists in dense sandy soils containing significant quantities of silt and clay. Where relatively clean sandy soils exist, we believe that in situ means of remediation will be most suitable. At this time, we judge that a process such as in situ volatilization or in situ bioremediation will prove most successful for the given conditions.

D. Additional Hydrogeologic Characterization

As discussed previously, the vertical and lateral extent of the groundwater contamination has not been fully defined. Consequently, we conclude that additional hydrogeologic characterization will be necessary. Future investigation should include the installation of monitoring wells to:

1. Define the lateral extent of the dissolved product plume, and
2. Evaluate groundwater quality in deeper aquifers.

Additionally, a pump test should be conducted using one of the existing wells to evaluate anticipated groundwater extraction well performance.

List of Attached Plates:

Plate 1	Site Plan
Plate 2 thru 25	Logs of Borings 1 thru 11,14 thru 16, 28 thru 31 and 39 thru 43
Plate 26	Unified Soil Classification System
Plate 27	Particle Size Analysis
Plate 28	Gasoline Concentrations in Soil
Plate 29	Gasoline Concentrations in Water
Plate 30	Cross Section
Appendix	Laboratory Test Reports Chain-of-Custody Documents

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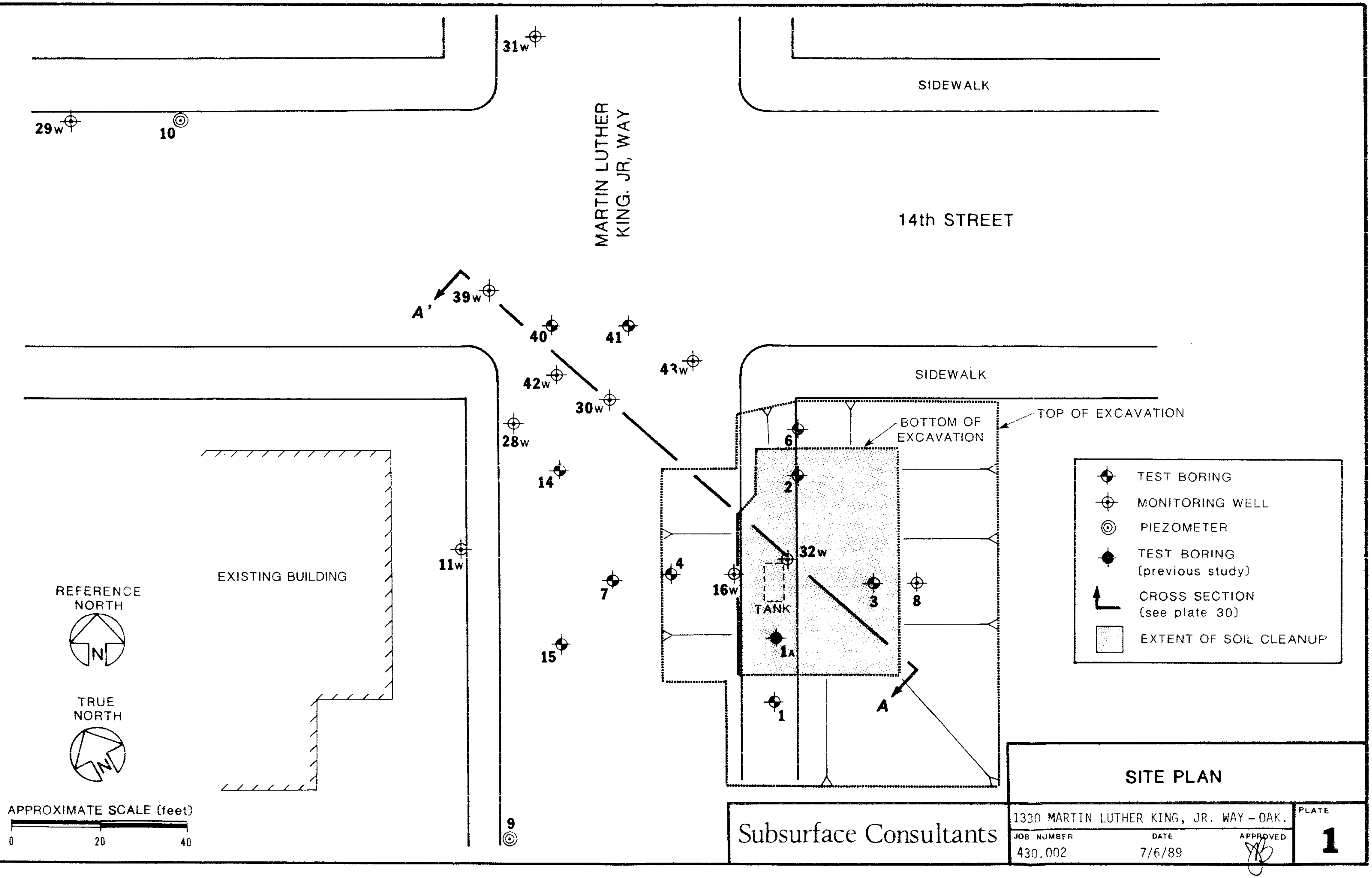

SITE PLAN

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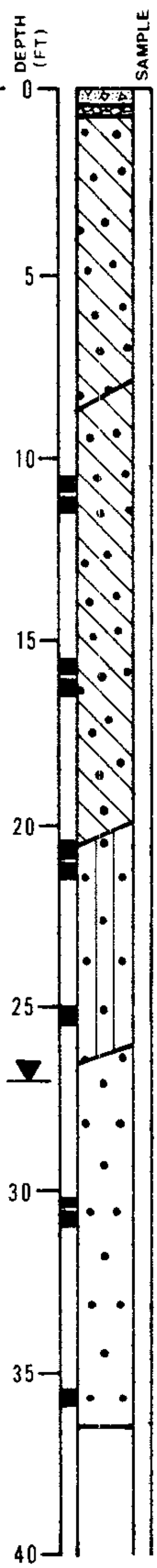
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/6/89		1

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				6" CONCRETE 3" BASE ROCK BROWN CLAYEY SAND (SC) medium dense, moist
				MOTTLED BROWN CLAYEY SAND (SC) medium dense, moist
UC = 705	14.2	122	20	
			29	
%-200 = 14.0	17.2	98	35	GRAY BROWN SILTY SAND (SM-SP) dense, moist
			39	
				groundwater level 6/23/88
				GRAY BROWN SAND (SP) medium dense, saturated
				boring backfilled with a cement/ bentonite grout upon completion of drilling

UC = UNCONFINED COMPRESSIVE SHEAR STRENGTH

%-200 = % PASSING #200 SIEVE (0.074mm)

SAMPLE TYPE:
CALIFORNIA DRIVE SAMPLE
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES

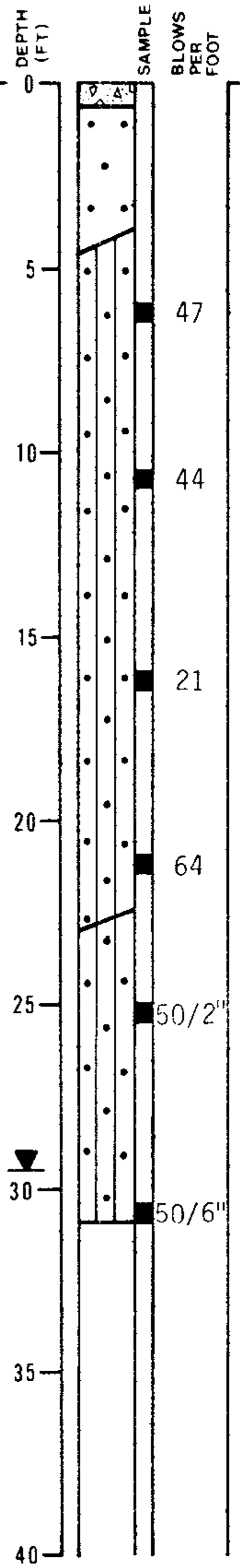
HAMMER WEIGHT: 140 POUNDS
HAMMER DROP : 30 INCHES

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.			PLATE 2
	JOB NUMBER 430.002	DATE 6/29/88	APPROVED	

LOG OF TEST BORING 1A

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-6-88
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



6" CONCRETE SLAB

BROWN SAND (SP)
loose, moist (fill)

BROWN SILTY SAND (SM)
dense, moist

becomes very dense, gasoline
oder noted

GREY BROWN SILTY SAND (SM/SP)
very dense, moist

groundwater level during drilling

boring backfilled with cement/
bentonite grout

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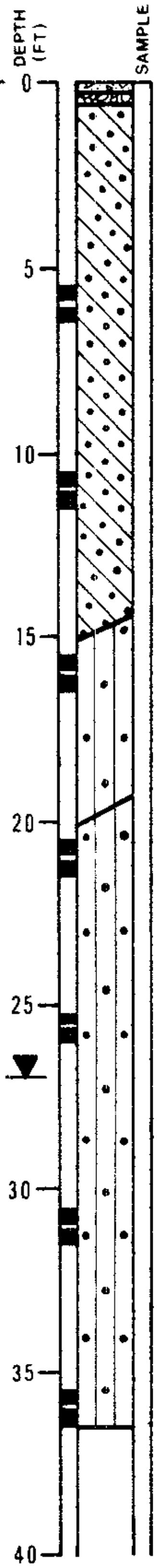
JOB NUMBER 430.001
DATE 6/30/88
APPROVED

PLATE 3

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	BLOWS PER FOOT	
			0		3" THICK CONCRETE 3" BASE ROCK BROWN CLAYEY SAND (SC) medium dense to dense, moist
			5	26	
					becomes mottled brown and gray below 9'
UC = 1021	13.7	121	10	35	
			15	31	BROWN SILTY SAND (SM) dense, moist
					interbedded with some clayey sand
%-200 = 15.4	16.0	106	20	27	BROWN SILTY SAND (SM) medium dense to dense, moist
%-200 = 26.6			25	20	
					groundwater level 30 minutes after drilling
			30	36	
			35		boring backfilled with cement/bentonite grout upon completion of drilling
			40		

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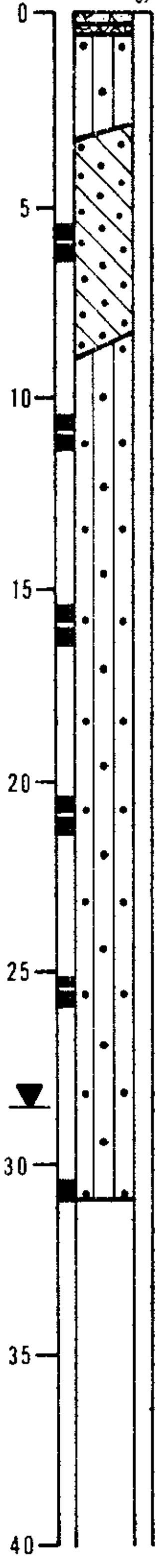
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE **4**

LOG OF TEST BORING 3

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			27
%-200 = 37.3	12.9	118	33
%-200 = 18.3			29
%-200 = 13.5	17.0	105	29
			30
			16



3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM)
loose, moist, with numerous pieces of glass, brick, etc. (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM)
dense, moist

groundwater level 6/23/88

boring backfilled with a cement/bentonite grout upon completion of drilling

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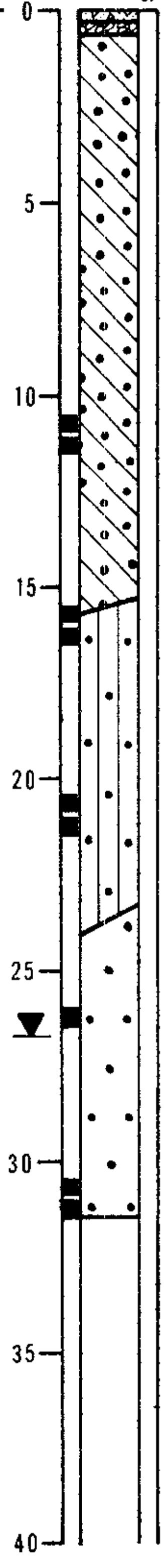
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE **5**

LOG OF TEST BORING 4

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				4" ASPHALTIC CONCRETE 3" BASE ROCK
				BROWN CLAYEY SAND (SC) medium dense, moist
				becomes mottled gray brown below 8'
UC = 1329	13.1	123	32	
			25	GRAY BROWN SILTY SAND (SM) dense, moist
%-200 = 22.5	16.9	99	25	
				GRAY BROWN SAND (SP) medium dense, saturated
			17	groundwater level 6/24/88
			17	boring backfilled with a cement/ bentonite grout upon completion of drilling

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JOB NUMBER	DATE	APPROVED
430.002	6/29/88	

PLATE
6

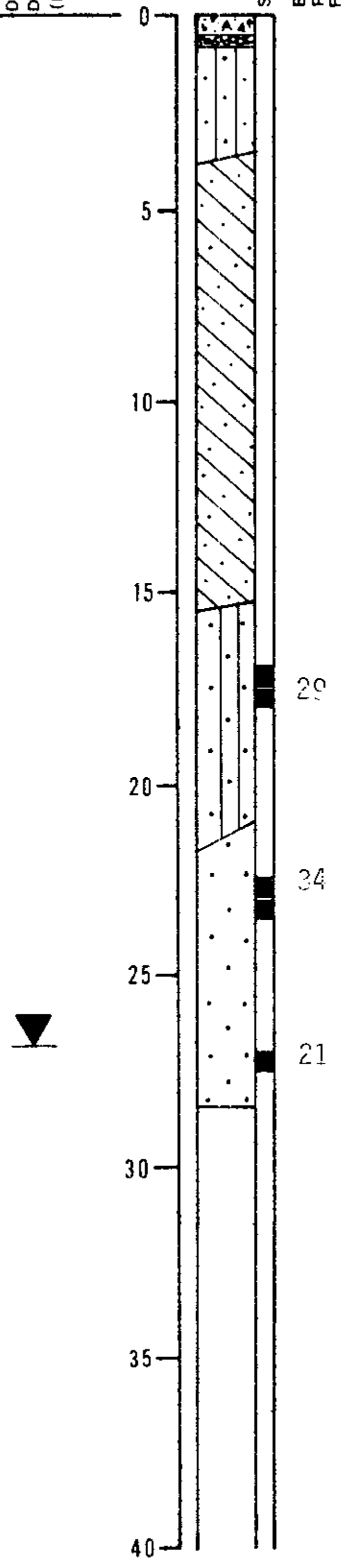
LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-24-83

ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



6" CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)
BROWN SILTY CLAYEY SAND (SC)
medium dense, moist

color change to mottled brown and gray below 10 feet

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

BROWN SAND (SP)
medium dense to dense, moist

GROUNDWATER LEVEL 6-24-83

boring backfilled with a cement/bentonite grout upon completion of drilling

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JOB NUMBER	DATE	APPROVED
430.002	7-11-83	

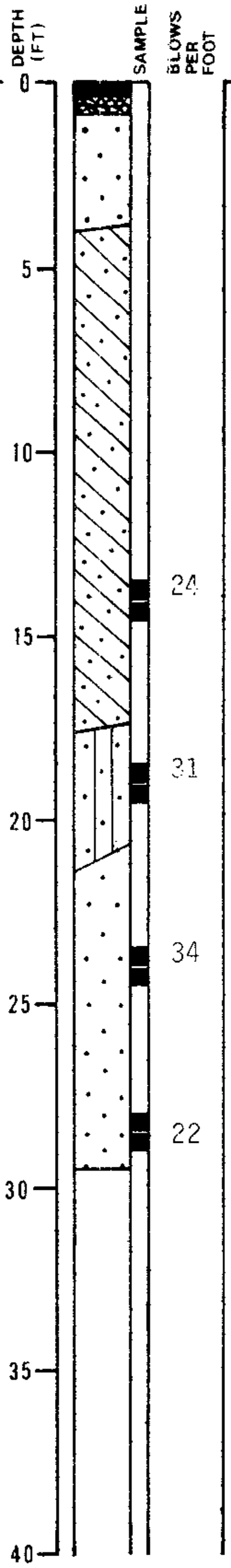
PLATE
7

11

LOG OF TEST BORING 7

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 25.5	14.4	103
%-200 = 5.6	12.4	104



4" ASPHALTIC CONCRETE
6" BASE ROCK
BROWN SAND (SP)
medium dense, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

color change to mottled gray and brown below 8 feet

GRAY BROWN SILTY SAND (SM)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

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JOB NUMBER 430.002
DATE 7-11-88
APPROVED

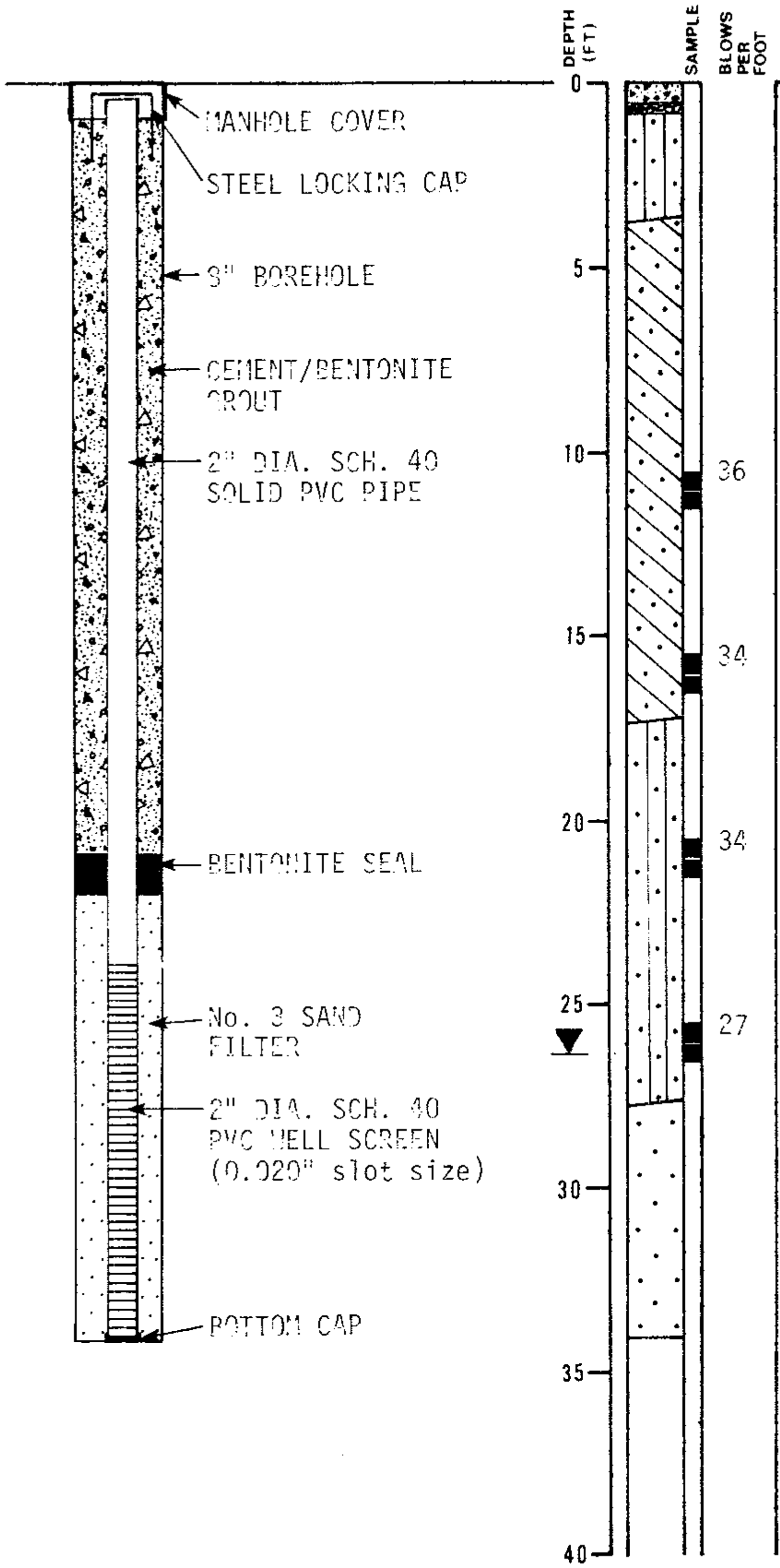
PLATE 8

LOG OF TEST BORING 8

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-24-88

ELEVATION --



6" CONCRETE

3" BASE ROCK

DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

medium dense to dense, saturated, fine grained

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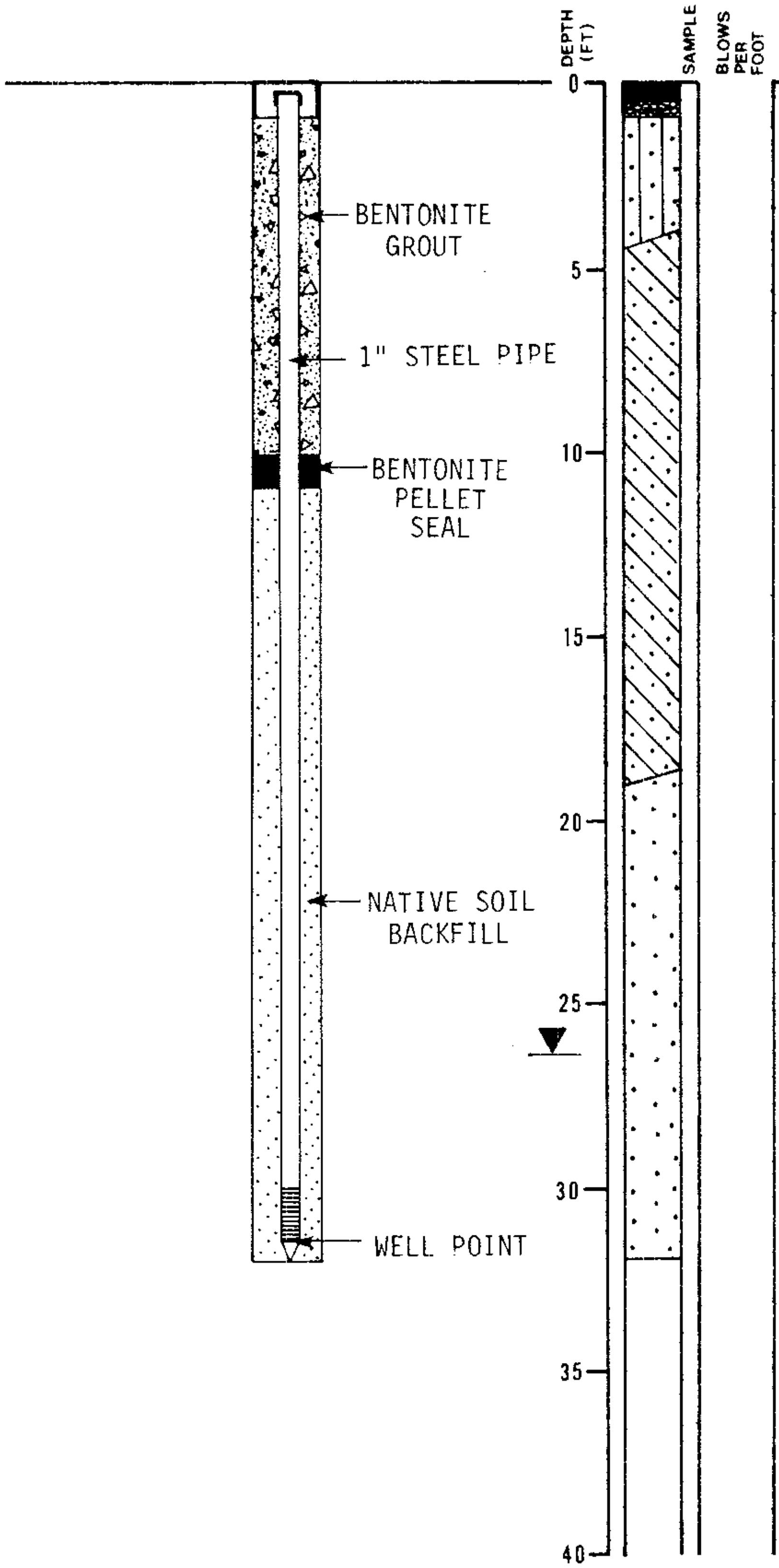
LOG OF TEST BORING 9

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
3" BASE ROCK
BROWN SILTY SAND (SM)
medium dense to dense, moist, fine grained
BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

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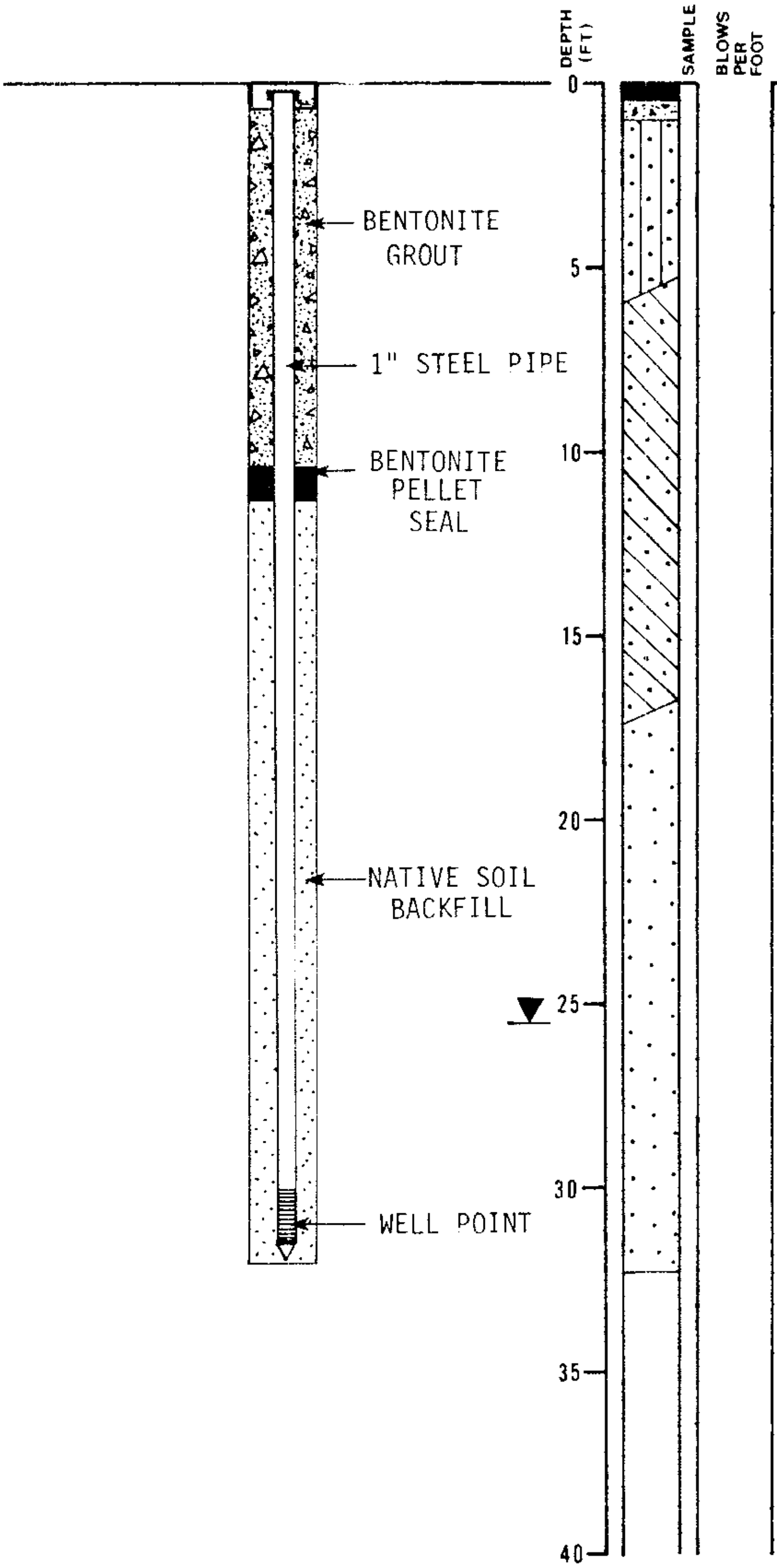
JOB NUMBER	DATE	APPROVED
430.002	7-28-88	

PLATE
10

LOG OF TEST BORING 10

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
4" CONCRETE
BROWN SILTY SAND (SM)
mediun dense, moist, fine grained

BROWN CLAYEY SAND (SC)
dense, moist, fine grained

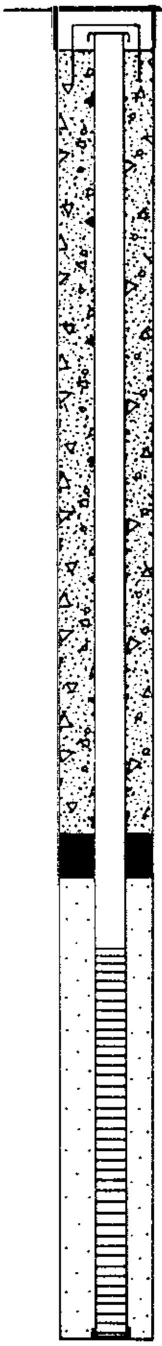
BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

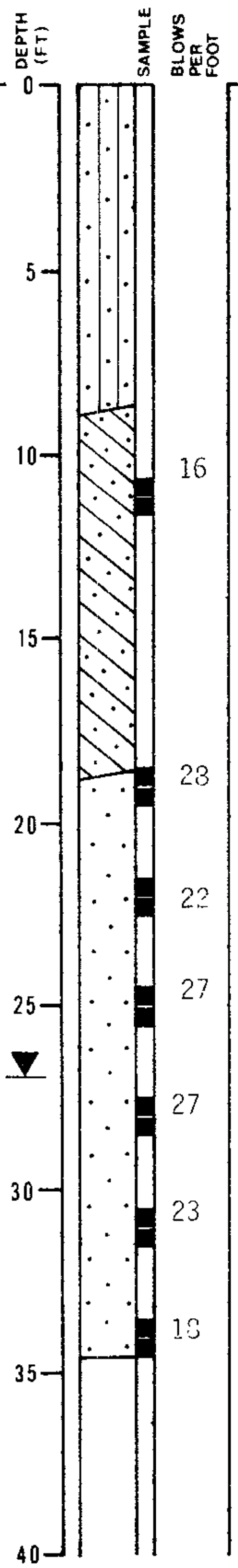
Subsurface Consultants	1330 MARTIN LUTHER KING JR. WAY, OAK			PLATE
	JOB NUMBER 430.002	DATE 7-28-88	APPROVED RB	11

LOG OF TEST BORING 11

EQUIPMENT 8" Hollow stem
DATE DRILLED 6-30-88
ELEVATION --



WELL DETAILS:
(see log of boring 8)



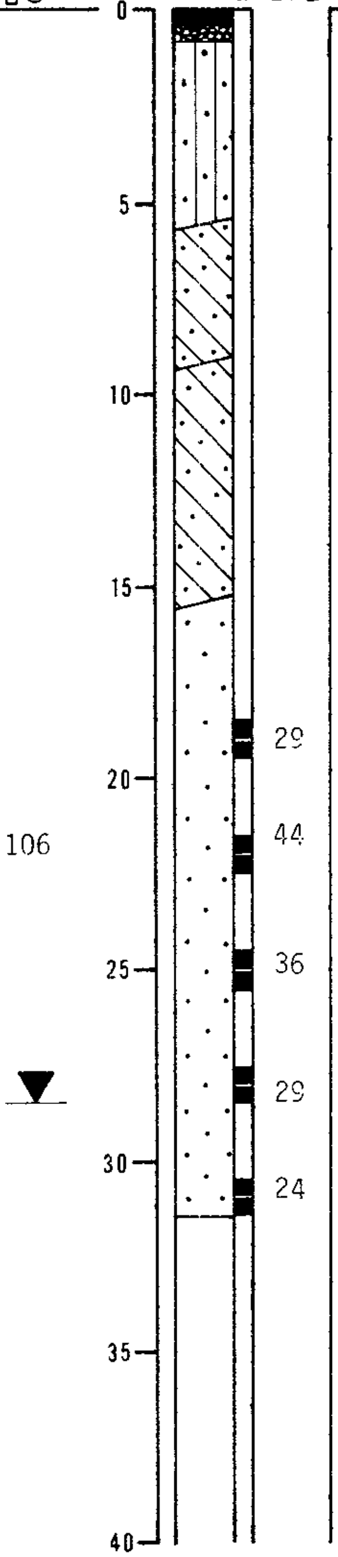
MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
			BROWN SILTY SAND (SM) medium dense, moist (fill)
		16	MOTTLED GRAY AND BROWN CLAYEY SAND (SC) medium dense, moist
		28	GRAY BROWN SAND (SP) medium dense, moist, fine grained
		22	
12.5	114	27	
			GROUNDWATER LEVEL 9-28-89
		27	
		23	
		18	

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.			PLATE
	JOB NUMBER 430.002	DATE 10/5/89	APPROVED	12

LOG OF TEST BORING 14

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 7.2	10.8	106
%-200 = 5.9		



4" ASPHALTIC CONCRETE
4" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED OLIVE GREEN AND BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER LEVEL 7-1-88

boring backfilled with a cement/bentonite grout upon completion of drilling

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JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		13

LOG OF TEST BORING 15

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	BLOWS PER FOOT	
			0		4" ASPHALTIC CONCRETE 4" BASE ROCK BROWN SILTY SAND (SM) medium dense, moist (fill)
			5		GRAY BROWN SAND (SP) medium dense, moist, fine grained
			10		DARK GRAY BROWN CLAYEY SAND (SC) medium dense, moist color change to brown below 10 feet
			15		BROWN SAND (SP) dense, moist, fine grained
				31	color change to gray brown below 20 feet
			20		
%-200 = 7.2				33	
	12.5	114	25	32	
		▼			GROUNDWATER LEVEL 7-1-88
				29	color change to brown below 26 feet
			30		
				34	
			35		boring backfilled with a cement/bentonite grout upon completion of drilling
			40		

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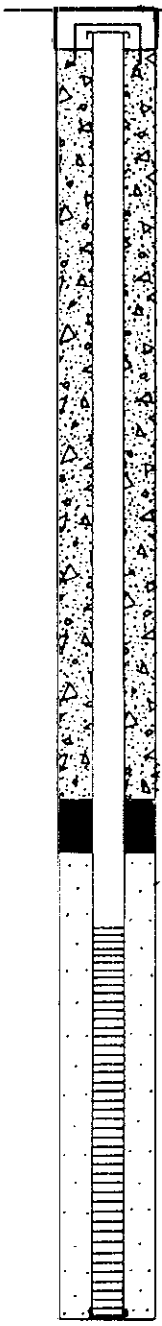
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		14

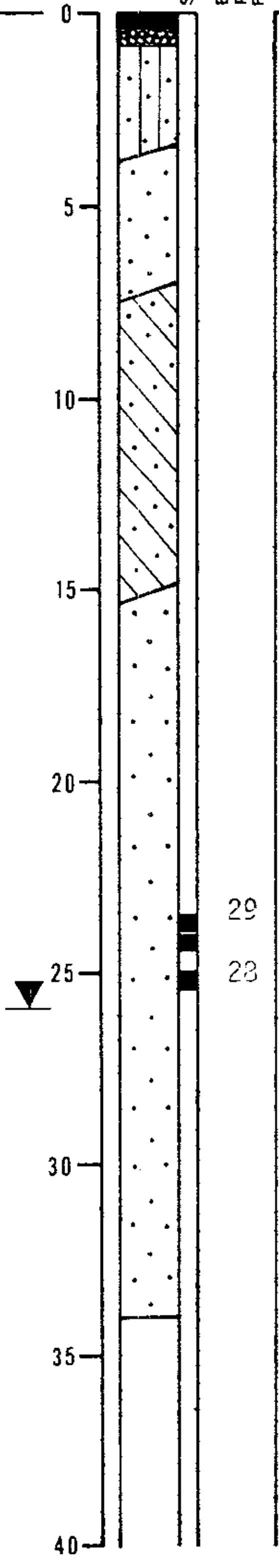
LOG OF TEST BORING 16

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --

MOISTURE CONTENT %
DRY DENSITY (PCF)
DEPTH (FT)
SAMPLE
BLOWS PER FOOT



WELL DETAILS:
(see log of boring 8)



4" ASPHALT CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

BROWN SAND (SP)
medium dense, moist
fine grained

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray and brown below 12 feet

GRAY BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

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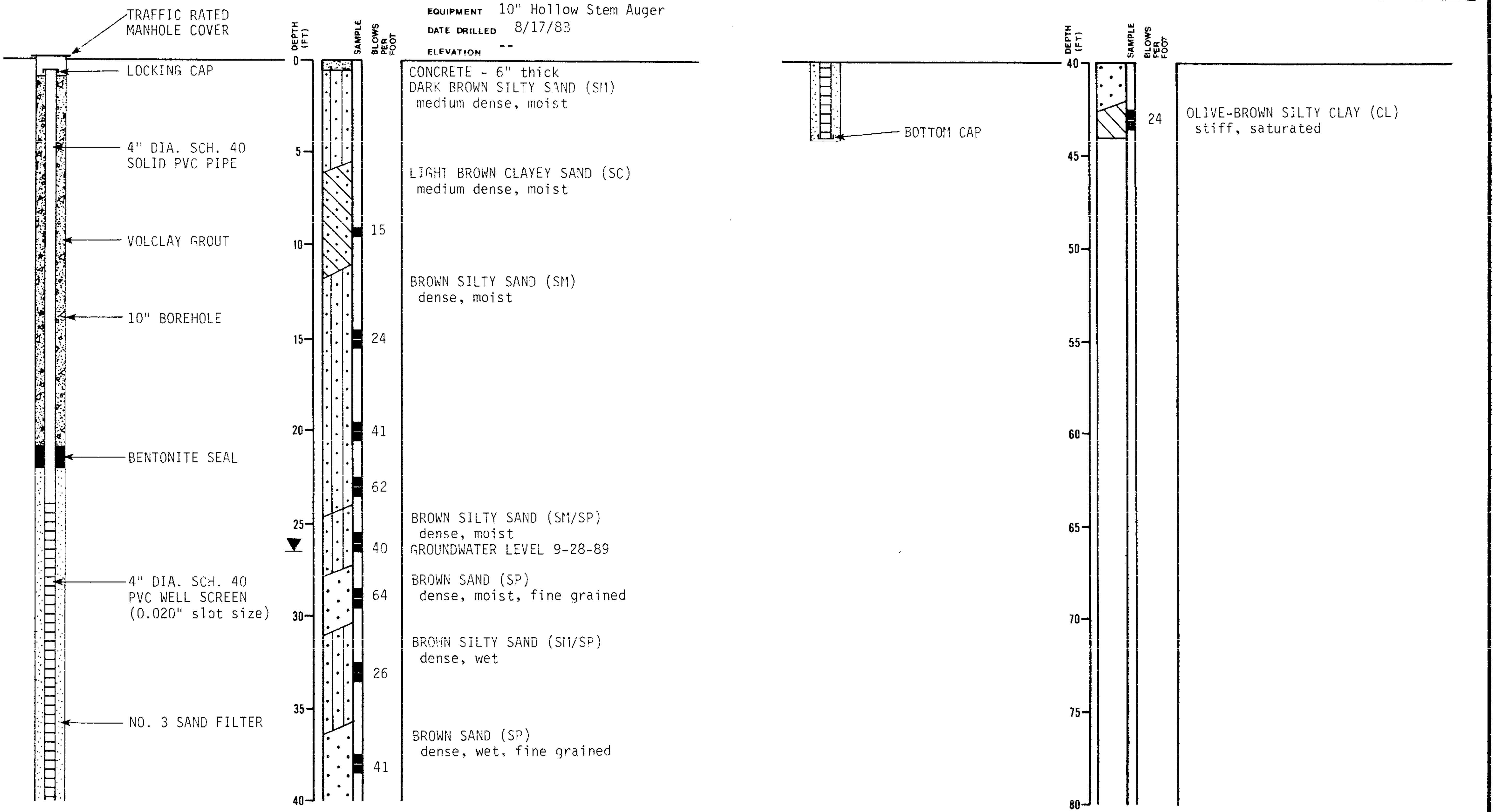
JOB NUMBER 430.002
DATE 10/5/89
APPROVED

PLATE
15

LOG OF TEST BORING 28

EQUIPMENT 10" Hollow Stem Auger
DATE DRILLED 8/17/83
ELEVATION --



CONCRETE - 6" thick
DARK BROWN SILTY SAND (SM)
medium dense, moist

LIGHT BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
dense, moist

BROWN SILTY SAND (SM/SP)
dense, moist
GROUNDWATER LEVEL 9-28-89

BROWN SAND (SP)
dense, moist, fine grained

BROWN SILTY SAND (SM/SP)
dense, wet

BROWN SAND (SP)
dense, wet, fine grained

OLIVE-BROWN SILTY CLAY (CL)
stiff, saturated

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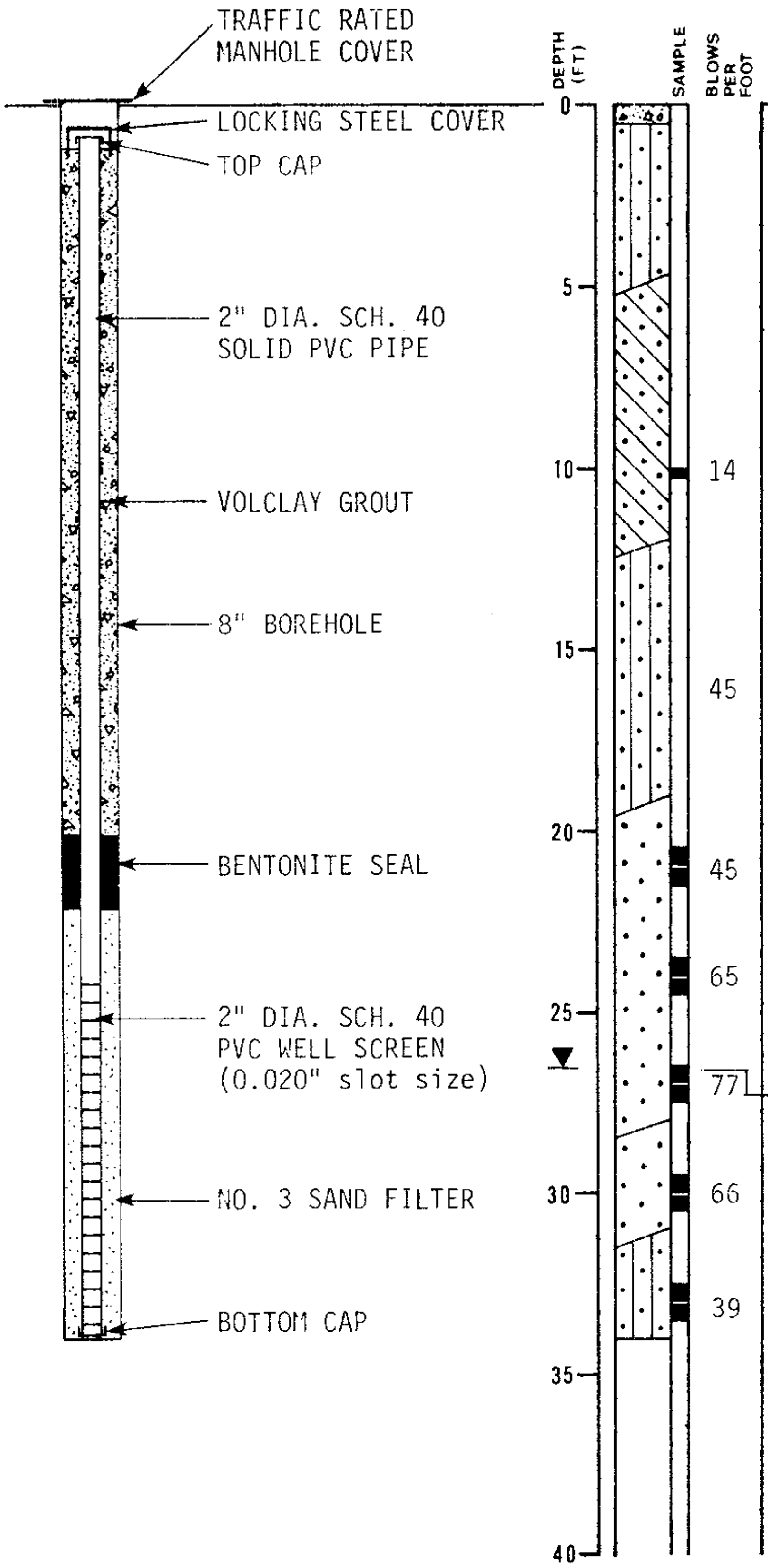
JOB NUMBER	DATE	APPROVED
430.002	10/5/89	

PLATE
16

LOG OF TEST BORING 29

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 8/17/88
ELEVATION --



CONCRETE - 6" thick

DARK BROWN SILTY SAND (SM)
medium dense, moist

MOTTLED OLIVE-BROWN CLAYEY SAND (SC)
medium dense, moist

OLIVE-GRAY/BROWN SILTY SAND (SM/SP)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

slight increase in silt content below 25.0 feet

GROUNDWATER LEVEL 9/28/89

GRAY SAND (SP)
dense, wet
mild gasoline odor

BROWN SILTY SAND (SM)
dense, wet

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JOB NUMBER	DATE	APPROVED
430.002	9/6/88	

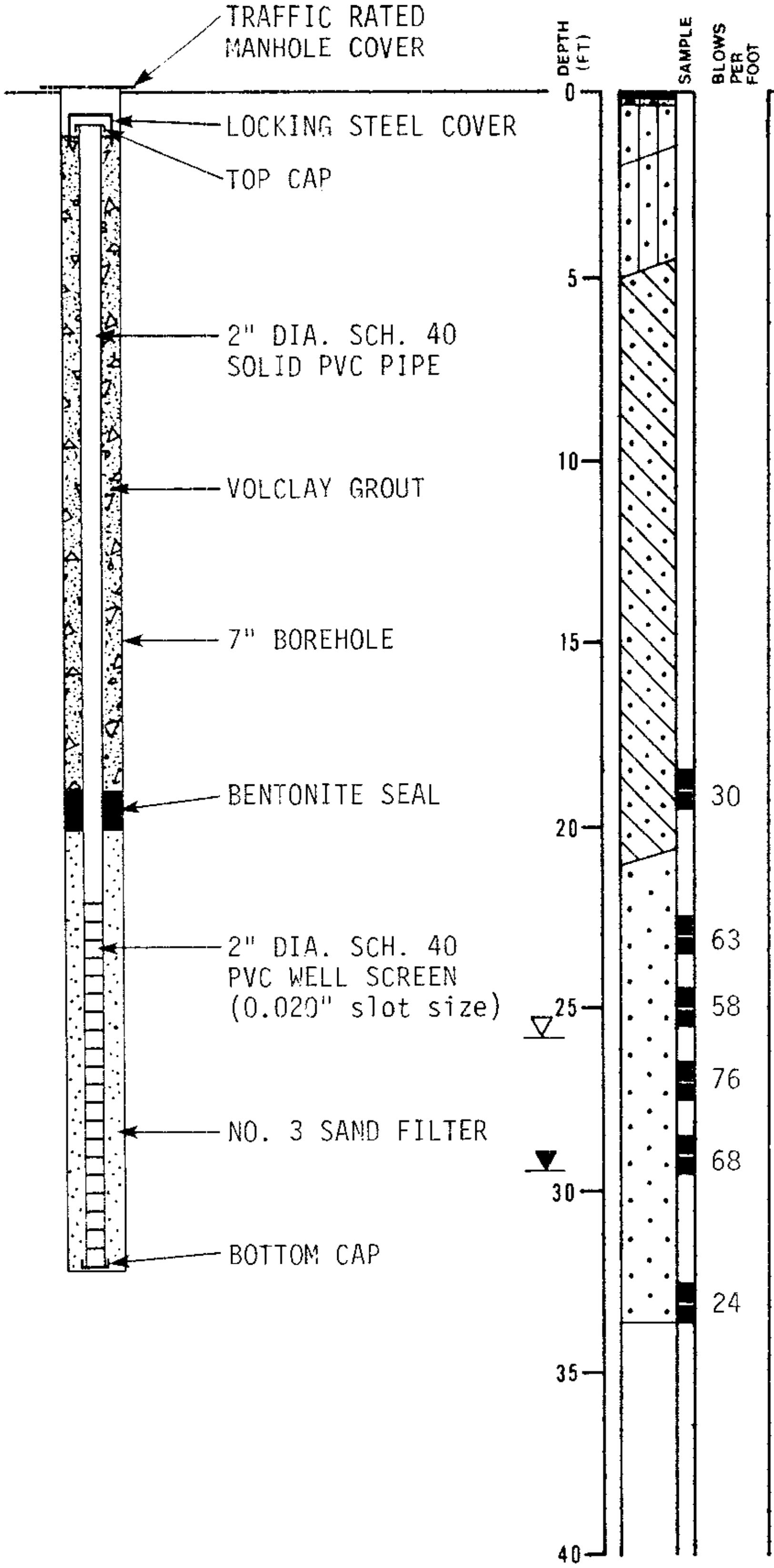
PLATE
17

LOG OF TEST BORING 30

EQUIPMENT 7" Hollow Stem Auger

DATE DRILLED 8/26/88

ELEVATION --



ASPHALTIC CONCRETE - 2" thick

CONCRETE SLAB - 2" thick

BLACK SILTY SAND (SM)
medium stiff, moist

BROWN SILTY SAND (SM)
medium stiff, moist

GRAY-BROWN CLAYEY SAND (SC)
medium dense, moist

color change to gray below 10.0 feet

color change to brown below 13.0 feet

color change to olive-green below 17.0 feet

GRAY SAND (SP)
very dense, moist

FREE PRODUCT SURFACE 9/28/89
44" thick

GROUNDWATER LEVEL 9/28/89

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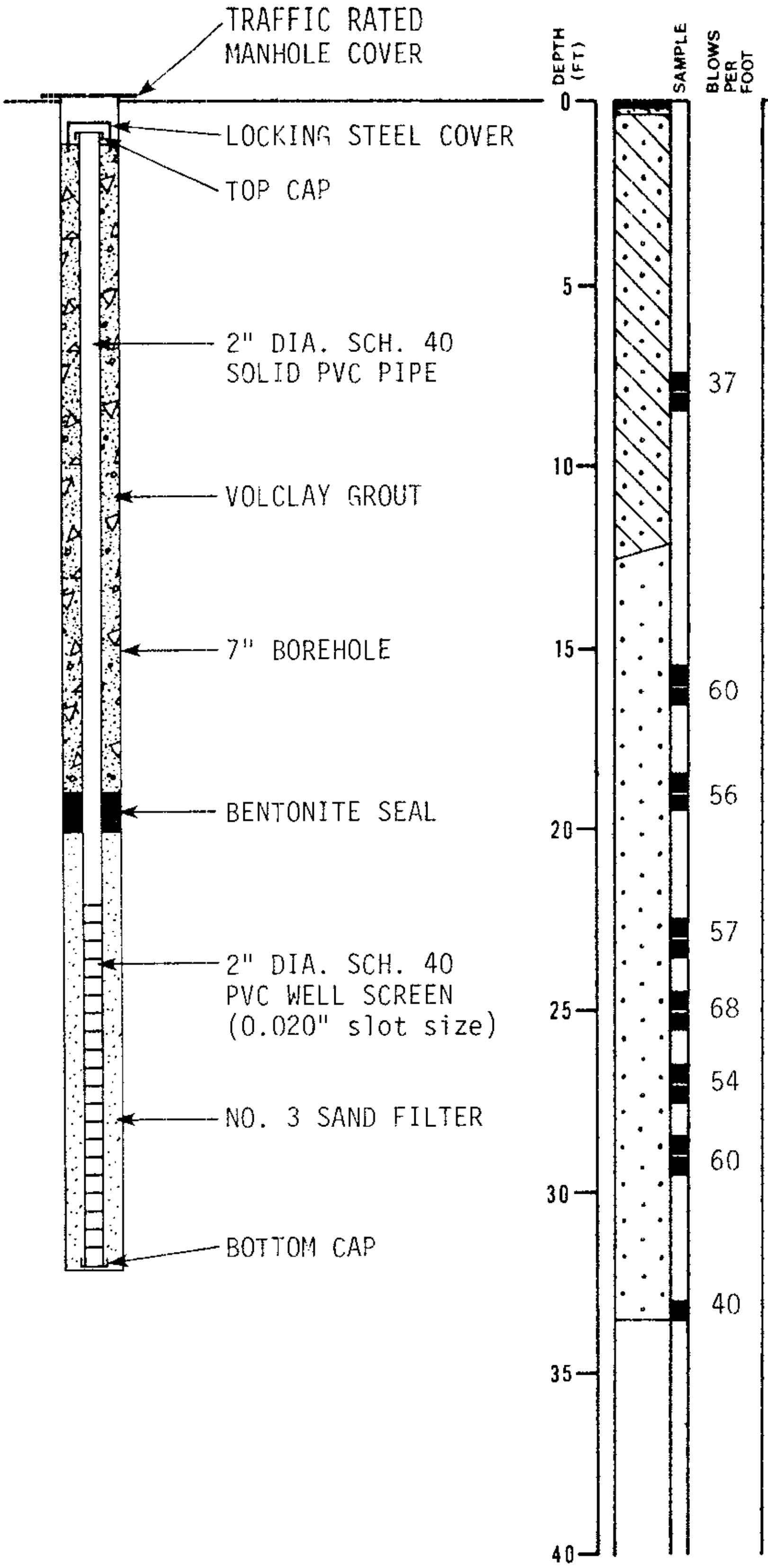
JOB NUMBER	DATE	APPROVED	PLATE
430.002	9/6/88		18

LOG OF TEST BORING 31

EQUIPMENT 7" Hollow Stem Auger

DATE DRILLED 8/26/88

ELEVATION --



ASPHALTIC CONCRETE - 2" thick

CONCRETE SLAB - 2" thick

DARK GRAY-BROWN CLAYEY SAND (SC)
medium dense, moist

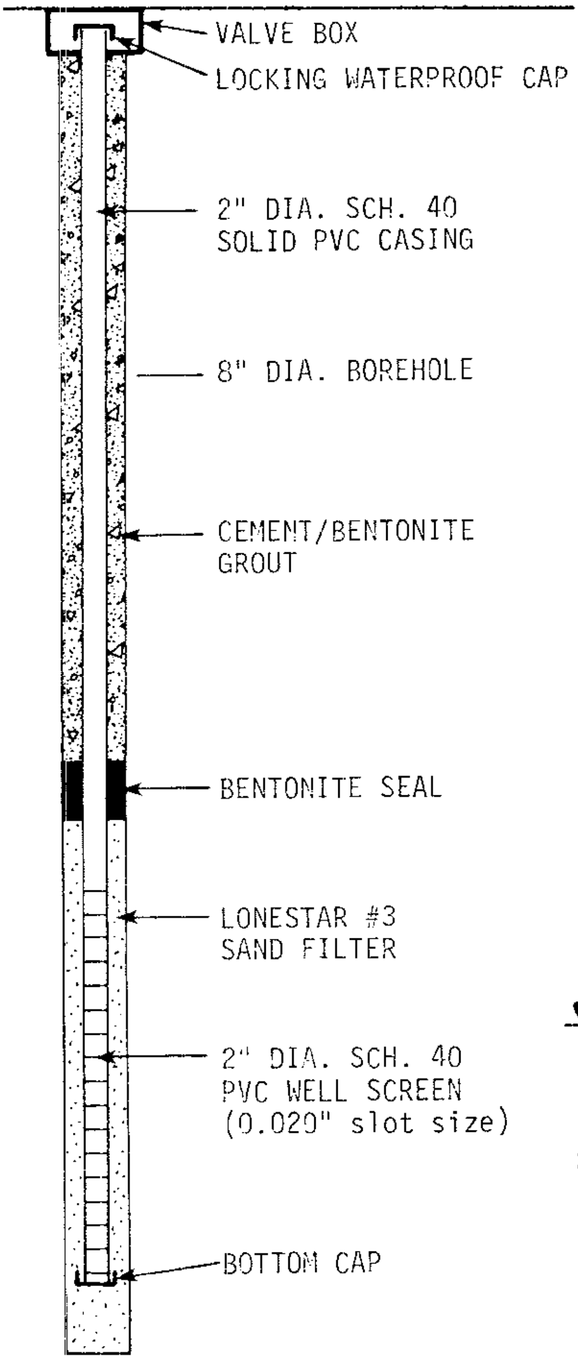
BROWN SAND (SP)
dense, moist

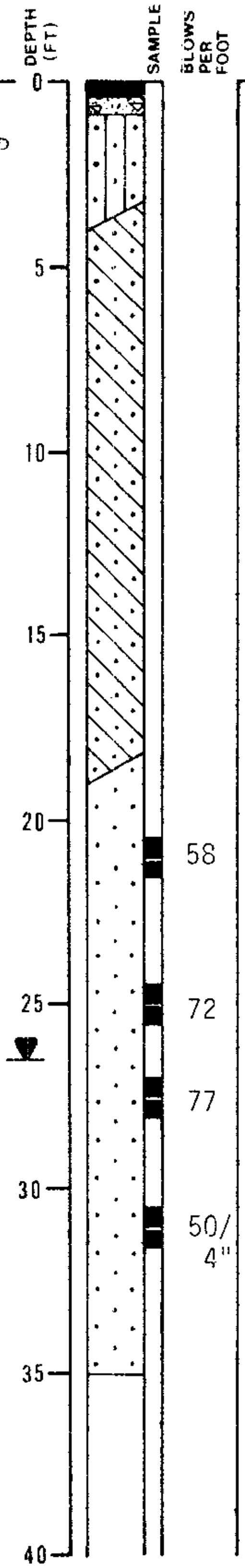
GROUNDWATER LEVEL 9/28/89

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY - OAK.			PLATE
	JOB NUMBER 430.002	DATE 9/6/88	APPROVED	19

LOG OF TEST BORING 39

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --





ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
GRAY-GREEN SILTY SAND (SM)
medium dense, moist (fill)
GRAY-GREEN CLAYEY SAND (SC)
medium dense, moist

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL 9/28/89

SAMPLER TYPE:
CALIFORNIA DRIVE
O.D.: 2.5" I.D.: 2.0"
HAMMER WEIGHT: 140 pounds
HAMMER DROP: 30 inches

Subsurface Consultants

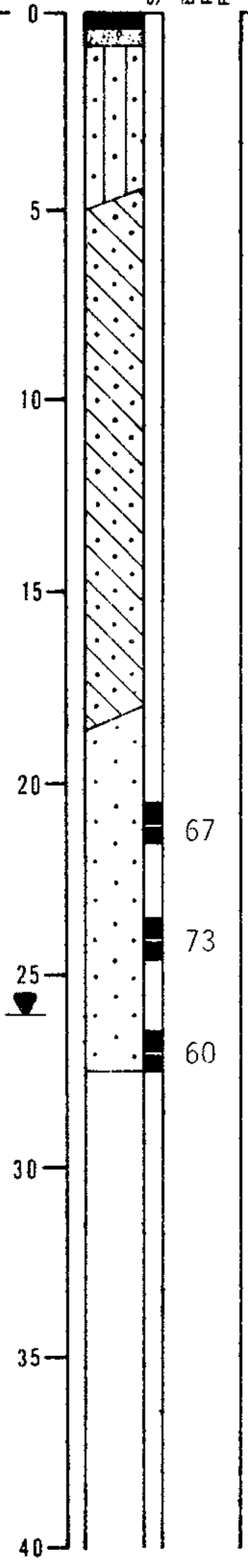
1330 MARTIN LUTHER KING, JR. WAY- OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		20

LOG OF TEST BORING 40

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
GRAY-GREEN SILTY SAND (SM)
medium dense, moist

GRAY-GREEN CLAYEY SAND (SC)
medium dense, moist

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

(BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT UPON COMPLETION
OF DRILLING)

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED
430.002	7/7/89	

PLATE
21

11

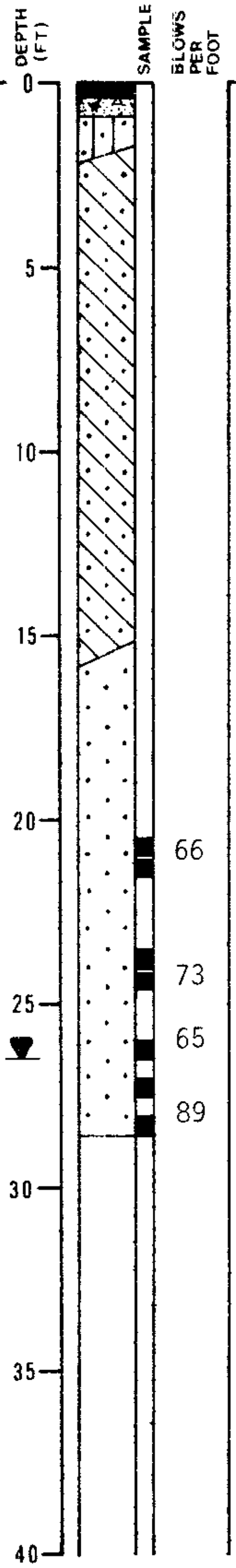
LOG OF TEST BORING 41

EQUIPMENT 8" Hollow Stem Auger

DATE DRILLED 3/29/89

ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
DARK BROWN SILTY SAND (SM)
medium dense, moist
BROWN CLAYEY SAND (SC)
medium dense, moist

color changes to green

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

(BORING BACKFILLED WITH CEMENT/ BENTONITE GROUT UPON COMPLETION OF DRILLING)

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY - OAK.

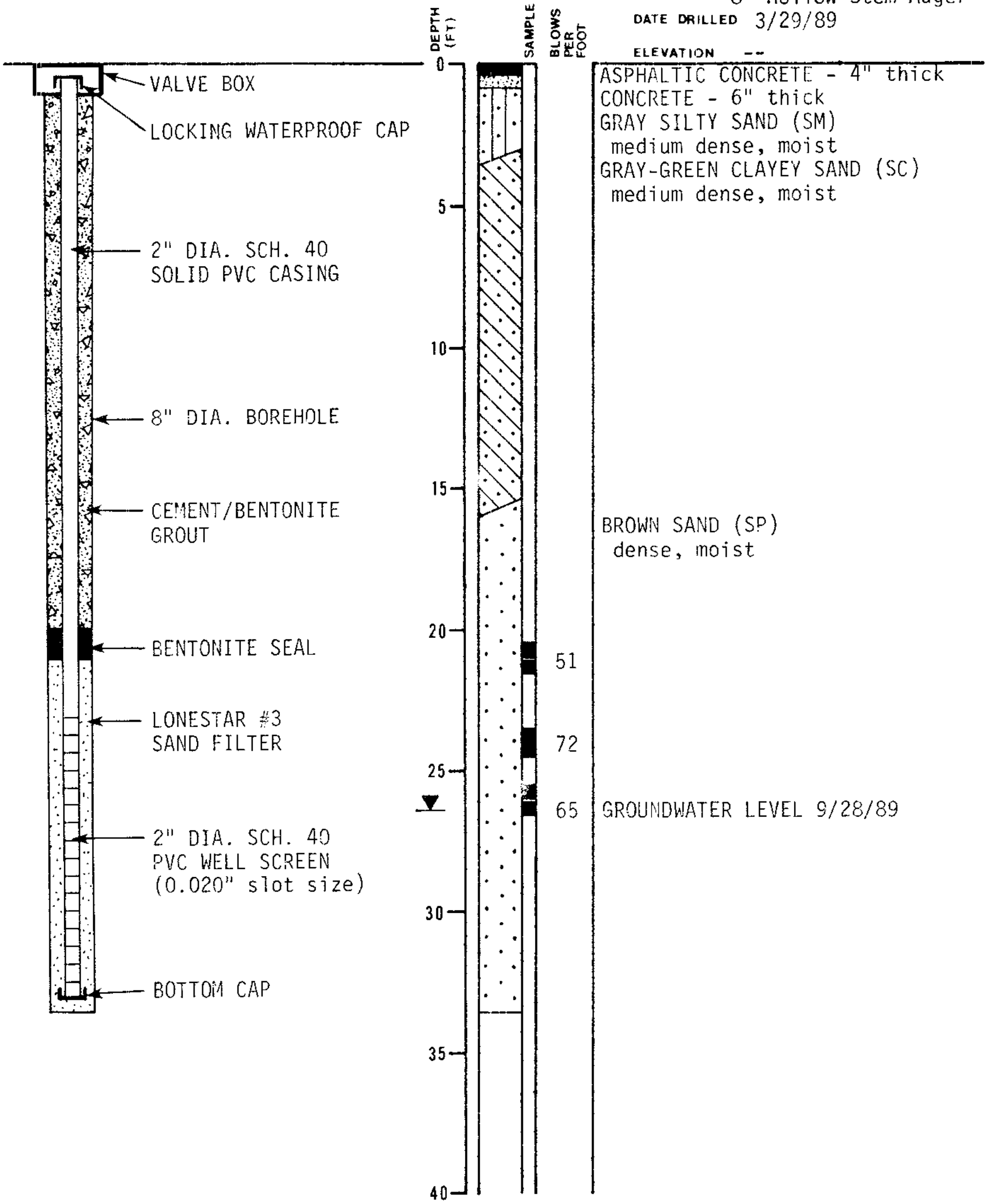
JOB NUMBER	DATE	APPROVED
430.002	7/7/89	

PLATE

22

LOG OF TEST BORING 42

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --



Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY - OAK.	PLATE
	JOB NUMBER 430.002 DATE 7/7/89 APPROVED	23

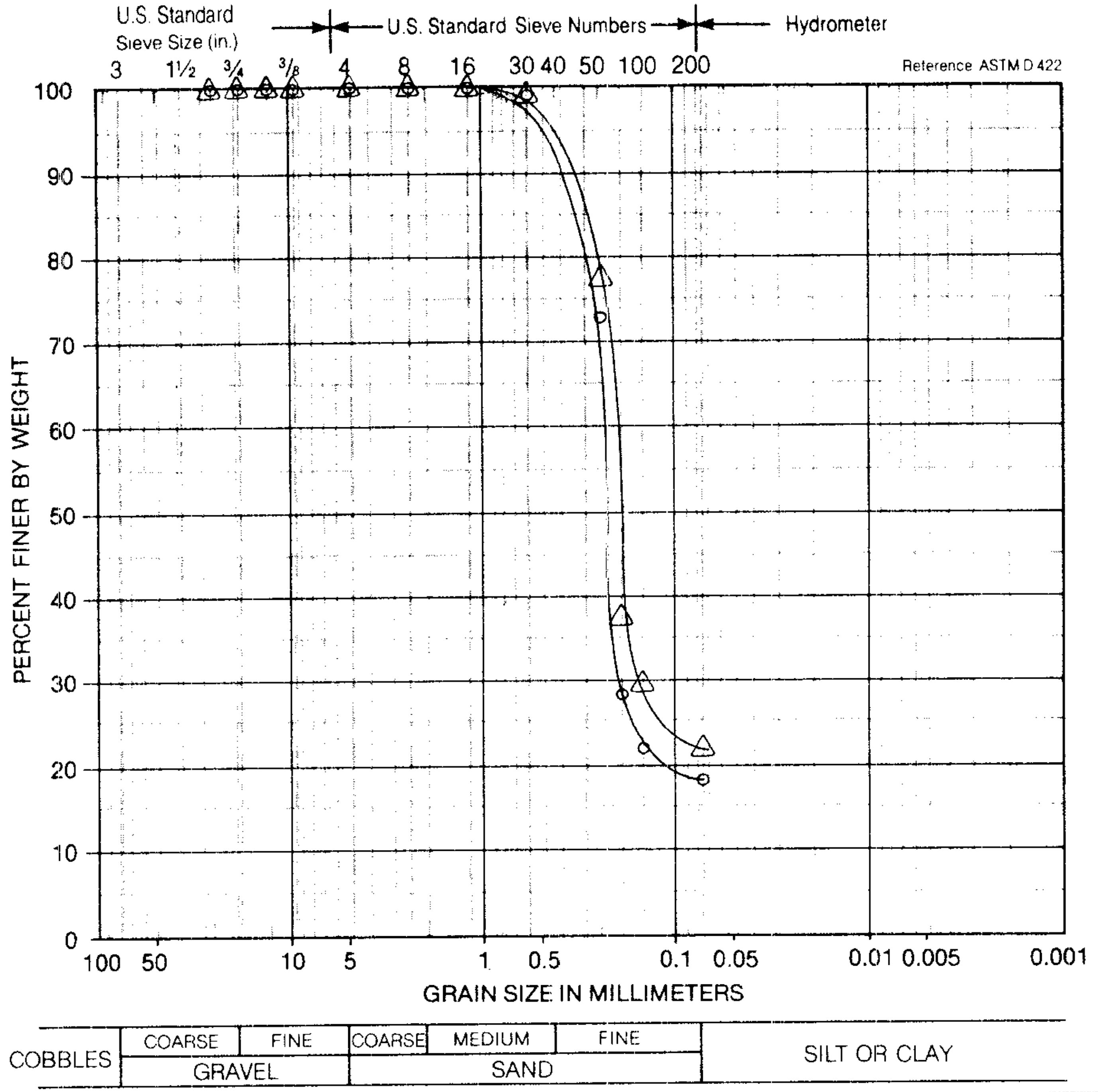
GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/28/89		25



Symbol	Sample Source	Classification
○	BORING 3 @ 15.5	BROWN SILTY SAND (SM)
△	BORING 4 @ 20.5	GRAY SILTY SAND (SM)

PARTICLE SIZE ANALYSIS

Subsurface Consultants

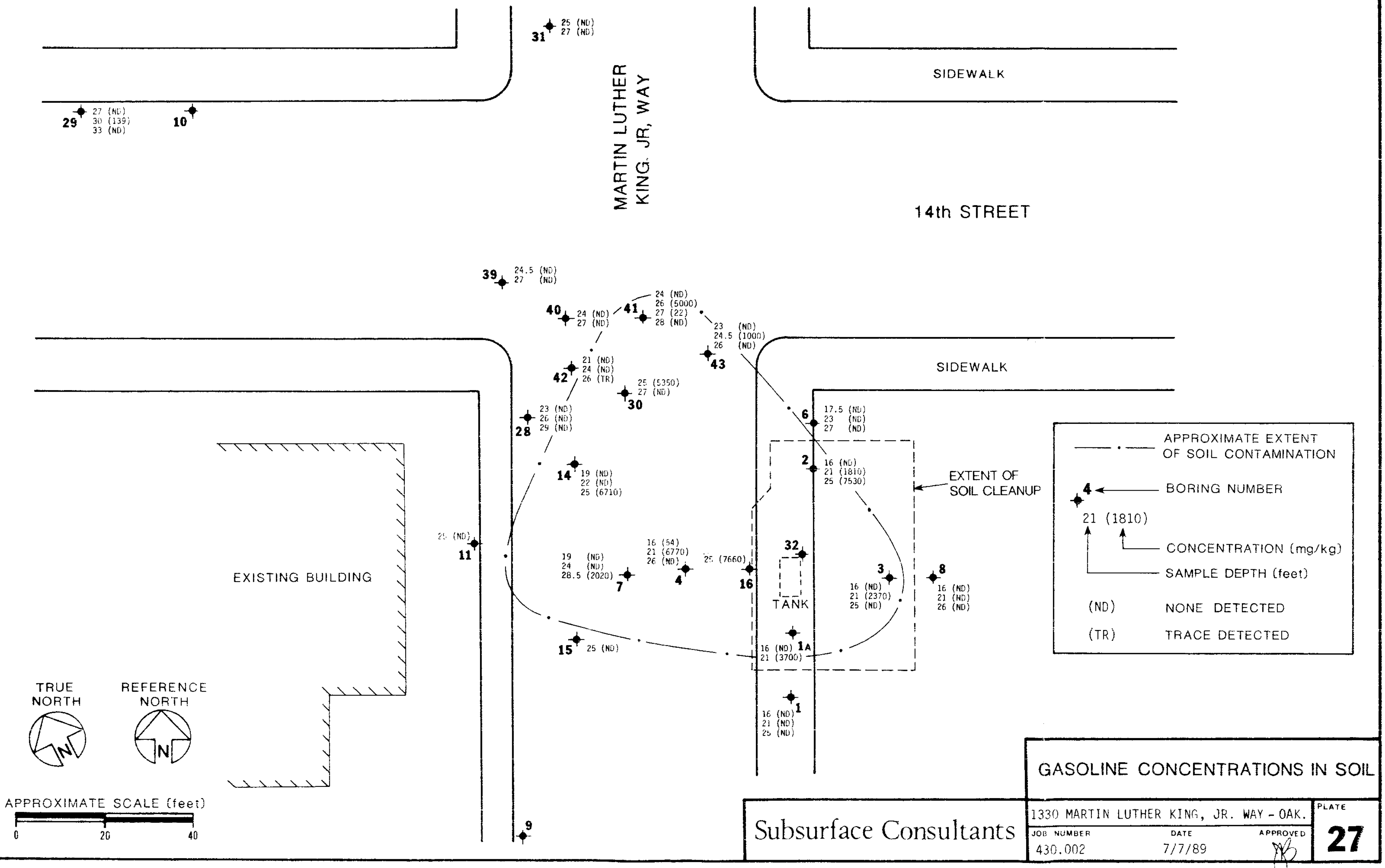
1330 MARTIN LUTHER KING JR. WAY, OAK.

JOB NUMBER 430.002

DATE 7-28-88

APPROVED

PLATE 26

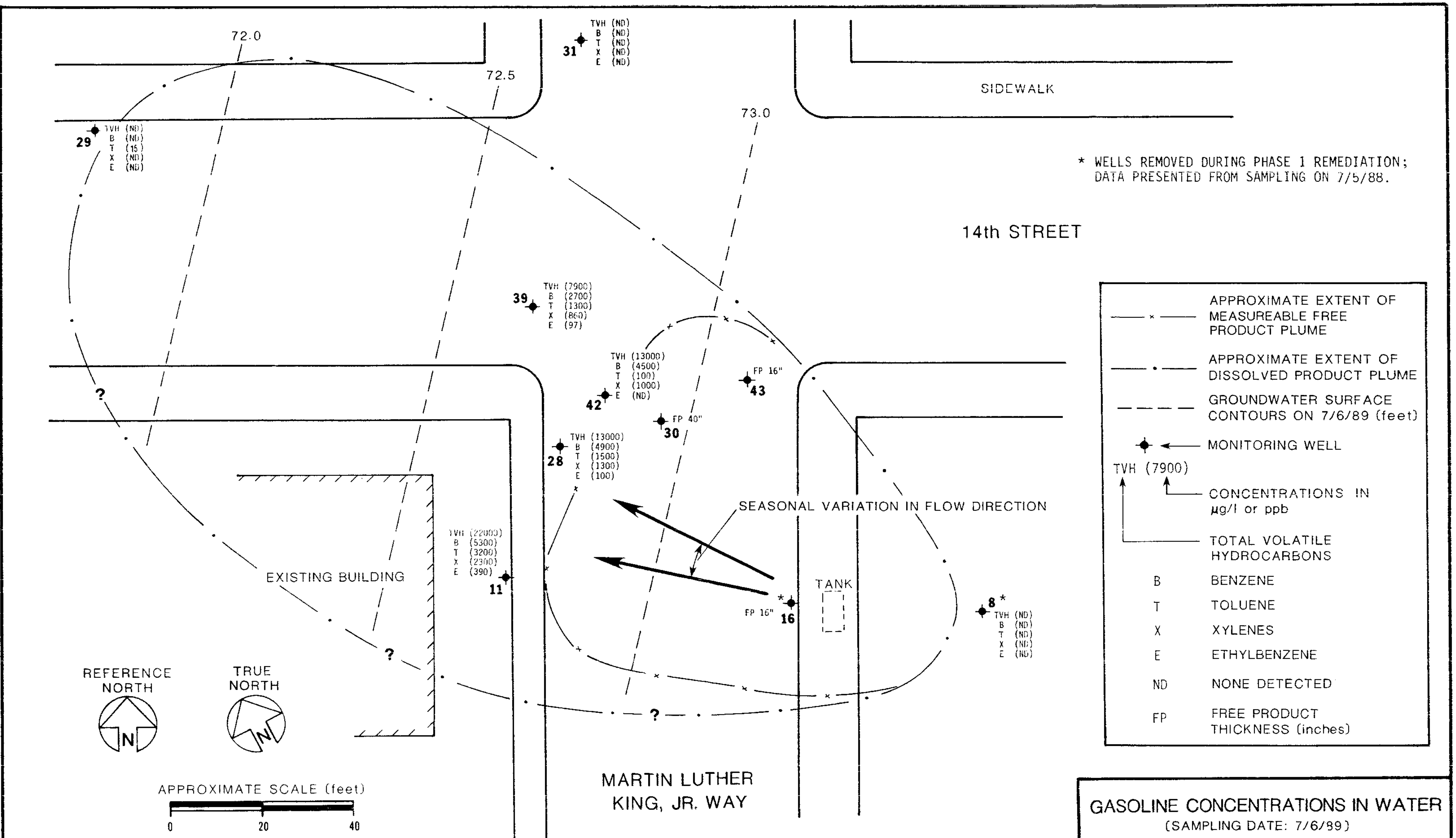


Subsurface Consultants

GASOLINE CONCENTRATIONS IN SOIL

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		27



ELEVATION BENCHMARK: PG&E manhole in Martin Luther King, Jr. Way was assumed to be at elevation 100.00 feet.

Subsurface Consultants

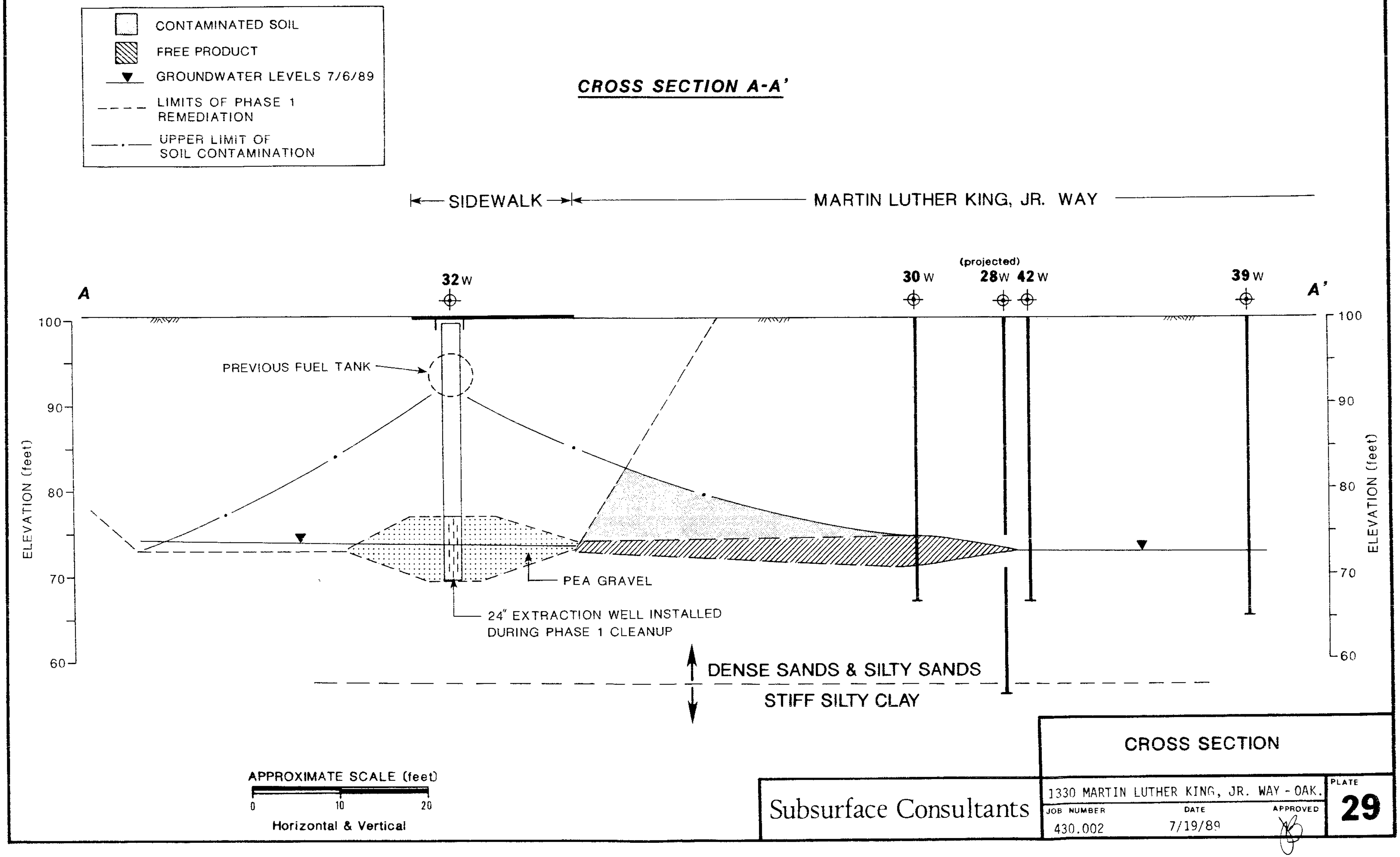
GASOLINE CONCENTRATIONS IN WATER

(SAMPLING DATE: 7/6/89)

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		28

CROSS SECTION A-A'



CROSS SECTION

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/19/89		29

BORING 1A

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

JOB NUMBER: 14810
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK

DATE RECEIVED: 06/07/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	SAMPLE ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14810-1	1 @ 16'	ND(10)	ND(10)	ND(10)
14810-2	1 @ 21'	3,700	ND(10)	ND(10)

		GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
14810-3	BORING 1	68	ND(10)	ND(10)

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

Duplicate: Relative % Difference	4
Spike: % Recovery	112

Laboratory Director

Curtis & Tompkins, Ltd

BORING 1A

LABORATORY NUMBER: 14810-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK
SAMPLE ID: BORING 1

DATE RECEIVED: 06/08/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	4,200	100
Toluene	4,800	500
Ethyl Benzene	1,700	100
Total Xylenes	12,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

%RPD	4
%RECOVERY	118

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

LABORATORY NUMBER: 14984A
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-1	1 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-2	1 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-3	1 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-4	2 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-5	2 @ 21.0	1,810	26.3	42.5	154	24.8
14984-6	2 @ 25.5	7,530	29.5	447	752	87.9
14984-7	3 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-8	3 @ 21.0	2,370	15.9	39.2	199	31.0
14984-9	3 @ 25.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 14984
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 2 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-10	4 @ 16.0	54.0	ND(0.1)	ND(0.1)	3.0	0.5
14984-11	4 @ 21.0	6,770	21.9	158	598	101
14984-12	4 @ 26.0	ND(10)	ND(0.1)	0.2	ND(0.1)	ND(0.1)
14984-13	6 @ 17.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-14	6 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-15	6 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-16	7 @ 19.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-17	7 @ 28.5	2,020	32.8	74.6	152	26.5
14984-18	8 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-19	8 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-20	8 @ 26.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

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

LABORATORY NUMBER: 14983
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 06-28-88
DATE REPORTED: 06-29-88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14983-1	7 @ 24.0	987	ND(1)	16	64	12

QA/QC SUMMARY

%RPD	<1
%RECOVERY	81

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15050
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY, FUEL TANK

DATE RECEIVED: 07/05/88
DATE EXTRACTED: 07/12/88
DATE ANALYZED: 07/15/88
DATE REPORTED: 07/18/88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15050-1	11@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-2	12@ 23.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-3	14@ 19.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-4	14@ 22.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-5	14@ 25.0'	6,710	38.9	324	735	122
15050-6	15@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-7	16@ 25.0'	7,660	39.3	257	719	117

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	4	--	3	1	1
%RECOVERY	--	93	96	95	91

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-08-88
DATE REPORTED: 07-20-88
PAGE 1 OF 4

Total Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
15066-1	WELL #8	TRACE	ND(0.05)	ND(0.05)
15066-2	WELL #11	10	ND(0.05)	ND(0.05)
15066-3	WELL #16	90	ND(0.05)	ND(0.05)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	7
Spike: % Recovery	112

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066-1
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #8

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

LABORATORY NUMBER: 15066-2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #11

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	1,800	100
Toluene	ND	100
Ethyl Benzene	ND	100
Total Xylenes	1,200	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY % 106

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

LABORATORY NUMBER: 15066-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #16

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	3,100	100
Toluene	2,700	100
Ethyl Benzene	ND	100
Total Xylenes	5,500	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

JOB NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-22-88
DATE REPORTED: 07-01-88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14932-1	1,000	ND(10)	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	21
Spike: % Recovery	87

Stephen L. [illegible]
Laboratory Director

LABORATORY NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-30-88
DATE REPORTED: 07-01-88
PAGE 2 OF 2

EPA 8020: Volatile Aromatic Hydrocarbons in Soils & Wastes
Extraction Method: EPA 5030 - Purge & Trap

COMPOUND	Result ug/Kg	LOD ug/Kg
Benzene....................................	790	100
Toluene....................................	1,200	500
Ethyl Benzene..............................	7,300	100
Total Xylenes..............................	38,000	100
Chlorobenzene..............................	ND	100
1,4-Dichlorobenzene........................	ND	100
1,3-Dichlorobenzene........................	ND	100
1,2-Dichlorobenzene........................	ND	100

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	6
Average Spike Recovery %	89

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15445
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/19/88
DATE ANALYZED: 08/29/88
DATE REPORTED: 08/30/88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15445-1	28 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-2	28 @ 26.0	ND(10)	0.2	0.2	4.0	ND(0.1)
15445-3	28 @ 29.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-4	29 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-5	29 @ 30.0	139 *	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-6	29 @ 33.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

* Fingerprint pattern does not match hydrocarbon standard. Quantitation based on gasoline standard.

QA/QC SUMMARY

%RPD	<1	8	16	<1	<1
%RECOVERY	98	95	96	101	100

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15445-5
CLIENT: SUBSURFACE CONSULTANTS
SAMPLE ID: 29 @ 30.0
JOB #: 430.002

DATE RECEIVED: 08-19-88
DATE ANALYZED: 08-29-88
DATE REPORTED: 09-07-88
PAGE 2 OF 2

EPA 8010: Volatile Halocarbons in Soil & Wastes
Extraction Method: EPA 5030 - Purge & Trap

Compound	Result ug/Kg	LOD ug/Kg
chloromethane	ND	25
bromomethane	ND	25
vinyl chloride	ND	25
chloroethane	ND	25
methylene chloride	ND	25
trichlorofluoromethane	ND	25
1,1-dichloroethene	ND	25
1,1-dichloroethane	ND	25
trans-1,2-dichloroethene	ND	25
chloroform	ND	25
freon 113	ND	25
1,2-dichloroethane	ND	25
1,1,1-trichloroethane	ND	25
carbon tetrachloride	ND	25
bromodichloromethane	ND	25
1,2-dichloropropane	ND	25
cis-1,3-dichloropropene	ND	25
trichloroethylene	ND	25
1,1,2-trichloroethane	ND	25
trans-1,3-dichloropropene	ND	25
dibromochloromethane	ND	25
2-chloroethylvinyl ether	ND	25
bromoform	ND	25
tetrachloroethene	ND	25
1,1,2,2-tetrachloroethane	ND	25
chlorobenzene	ND	25
1,3-dichlorobenzene	ND	25
1,2-dichlorobenzene	ND	25
1,4-dichlorobenzene	ND	25
1,2-dibromoethane (EDB)	ND	25

ND = None Detected. Limit of detection (LOD) in last column.

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15518
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/29/88
DATE ANALYZED: 09/09/88
DATE REPORTED: 09/12/88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15518-1	30 @ 25.0	5,350	36.4	120	383	71.4
15518-2	30 @ 27.0	ND(10)	0.3	0.3	0.1	ND(0.1)
15518-3	31 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15518-4	31 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

QA/QC SUMMARY

%RECOVERY	97	91	84	82	81

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15518
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/29/88
DATE ANALYZED: 09/09/88
DATE REPORTED: 09/12/88
PAGE 2 OF 2

LAB ID	SAMPLE ID	1,2-dibromoethane (EDB) EPA 8010 (ug/Kg)
15518-1	30 @ 25.0	ND(100)

LAB ID	SAMPLE ID	Organic Lead DHS Method May 1988 LUFT Manual (mg/Kg)
15518-1	30 @ 25.0	ND(1.0)

ND = Not Detected; Limit of Detection in parentheses.

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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LABORATORY NUMBER: 17124
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/07/89
DATE REPORTED: 04/20/89

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17124-1	39 @ 24.5	ND(10)
17124-2	39 @ 27.0	ND(10)
17124-3	40 @ 24.0	ND(10)
17124-4	40 @ 27.0	ND(10)
17124-5	41 @ 24.0	ND(10)
17124-6	41 @ 26.0	5,000
17124-7	41 @ 27.0	22
17124-8	41 @ 28.0	ND(10)
17124-9	42 @ 21.0	ND(10)
17124-10	42 @ 24.0	ND(10)
17124-11	42 @ 26.0	TRACE
17124-12	43 @ 23.0	ND(10)
17124-13	43 @ 24.5	1,000
17124-14	43 @ 26.0	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	6
Spike, % Recovery	114

for CBG
LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710. Phone (415) 486-0900

LABORATORY NUMBER: 17135
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK & 14TH STREET

DATE RECEIVED: 04/04/89
DATE ANALYZED: 04/06/89
DATE REPORTED: 04/17/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17135-1	11	53,000	7,100	4,000	380	2,400
17135-2	29	450	ND(1.0)	2.0	2.0	6.7
17135-3	31	ND(50)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
17135-4	39	2,000	250	11	ND(1.0)	210

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	5
%RECOVERY	142

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17135
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK & 14TH STREET

DATE RECEIVED: 04/04/89
DATE ANALYZED: 04/06/89
DATE REPORTED: 04/17/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17135-1	11	53,000	7,100	4,000	380	2,400
17135-2	29	450	ND(1.0)	2.0	2.0	6.7
17135-3	31	ND(50)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
17135-4	39	2,000	250	11	ND(1.0)	210

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	5
%RECOVERY	142

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-12-88
DATE REPORTED: 09-22-88
PAGE 1 OF 3

ORGANIC LEAD IN AQUEOUS SOLUTIONS
DHS METHOD
MAY 1988 LUFT MANUAL

LAB ID	CLIENT ID	ORGANIC LEAD mg/L
15578-1	28	ND(0.1)
15578-2	29	ND(0.1)
15578-3	31	ND(0.1)

ND = NONE DETECTED; LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	<1
%RECOVERY	98

LABORATORY DIRECTOR

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-15-88
DATE REPORTED: 09-21-88
PAGE 2 OF 3

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	TOTAL XYLENES (ug/L)	ETHYL BENZENE (ug/L)
15578-1	28	890	431	75.4	84.0	ND(1)
15578-2	29	ND(50) *	ND(1)	8.1	ND(1)	ND(1)
15578-3	31	ND(50)	ND(1)	ND(1)	ND(1)	ND(1)

* Sample contains hydrocarbons not quantifiable as gasoline.

ND = NONE DETECTED; LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	24	2	6	8	<1
%RECOVERY	138	103	105	103	104

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-06-88
DATE REPORTED: 09-22-88
PAGE 3 OF 3

1,2-Dibromoethane (EDB)
EPA 601

LAB ID	SAMPLE ID	EDB (ug/L)
15578-1	28	9.2
15578-2	29	ND(1)
15578-3	31	ND(1)

ND = None Detected. Limit of detection is indicated in parentheses.

QA/QC:

Duplicate: Relative % Difference	3
Average Spike Recovery %	132

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DATE RECEIVED: 07/06/89
DATE REPORTED: 07/13/89
PAGE 1 OF 4

LAB NUMBER: 17785

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 6 WATER SAMPLES

JOB #: 430.002
LOCATION: MLK TANK

RESULTS: SEE ATTACHED

Laboratory Director

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/13/89
PAGE 2 OF 4

ANALYSIS: ORGANIC LEAD
METHOD REFERENCE: DHS LUFT MANUAL 1988

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17785-1	11	ND	mg/L	0.2
17785-2	28	ND	mg/L	0.2
17785-3	29	ND	mg/L	0.2
17785-4	31	ND	mg/L	0.2
17785-5	39	ND	mg/L	0.2
17785-6	42	ND	mg/L	0.2

ND = NOT DETECTED.

QA/QC:

RPD, %	2
RECOVERY, %	118

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/13/89
DATE REPORTED: 07/17/89
PAGE 3 OF 4

ANALYSIS: ETHYLENE DIBROMIDE
METHOD REFERENCE: EPA 504

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17785-1	11	26	ug/L	0.05
17785-2	28	27	ug/L	0.05
17785-3	29	ND	ug/L	0.05
17785-4	31	ND	ug/L	0.05
17785-5	39	3	ug/L	0.05
17785-6	42	8	ug/L	0.05

ND = NOT DETECTED.

QA/QC:

RPD, %	2
RECOVERY, %	111

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/13/89
PAGE 4 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17785-1	11	22,000	5,300	3,200	390	2,300
17785-2	28	13,000	4,900	1,500	100	1,300
17785-3	29	ND(50)	ND(1)	15	ND(1)	ND(1)
17785-4	31	ND(50)	ND(1)	ND(1)	ND(1)	ND(1)
17785-5	39	7,900	2,700	1,300	97	860
17785-6	42	13,000	4,500	100	ND(25)	1,000

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	6
%RECOVERY	111

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: BRAMALEA PACIFIC TANK

SCI Job Number: 430.001

Project Contact at SCI: JERIANN ALEXANDER

Sampled By: STAN CARSON

Analytical Laboratory: CURTIS & TOMPKINS

Analytical Turnaround: VERBAL RESULTS BY FRI 6/10/88

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
1@16'	S	T	6/6/88		TPH	8015 w/SONICATION
1@21'	S	T	✓		TPH	8015 w/SONICATION
BORING 1	W	VOA-3	✓		TPH/BTXE	8015/602

* * * * * *

Released by: Date: 6/8/88

Released by Courier: Date:

Received by Laboratory: Gabriella Stephan Date: 6/8/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: Martin Luther King Jr Way & 14th STREET FUEL TANK

SCI Job Number: 430 002

Project Contact at SCI: Jim Bowers / Tom TEBB

Sampled By: TT

Analytical Laboratory: Curtis & Tompkins, Ltd.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
24 @ 23.0'	S	T	8-17-88		TVH & BTX & E	
24 @ 26.0'	S	T	8-17-88		↓	
24 @ 29.0'	S	T	8-17-88		↓	
25 @ 27.0	S	T	8-17-88		TVH & BTX & E	
25 @ 30.0	S	T	8-17-88		↓	} EPA 8010 + EDB
25 @ 33.0	S	T	8-17-88		↓	

* * * * * *

Released by: Date: 8/19/88

Released by Courier: Date:

Received by Laboratory: Date: 8/19/86

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: MLK JR WAY AND 14th STREET FUEL TANK

SCI Job Number: 430.002

Project Contact at SCI: Jim Bowers / Tom Tebb

Sampled By: Juri A.

Analytical Laboratory: Curtis & Tompkins, Ltd

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
30 @ 25.0'	S	T	8-26-88		TVH & BTX & E, ORGANIC LEAD AND EDB	
30 @ 27.0'	S	T	8-26-88		TVH & BTX & E, ~~ORGANIC LEAD AND EDB~~	
31 @ 25.0'	S	T	8-26-88		TVH & BTX & E	
31 @ 27.0	S	T	8-26-88		TVH & BTX & E	

* * * * * *

Released by: Date: 8/29/88

Released by Courier: Date:

Received by Laboratory: Date: 8/29/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: ML King Tank

SCI Job Number: 430.002

Project Contact at SCI: JIM BOWERS

Sampled By: T. TEBB

Analytical Laboratory: Curtis + Thompkins, Ltd.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
28	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	
29	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	

* * * * * *

Released by: Jon Alexander Date: 9/6/88

Released by Courier: Date:

Received by Laboratory: Gabriella Stephan Date: 9/6/88

Relinquished by Laboratory: Date:

Received by: Date:

---

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: ML KING TANK

SCI Job Number: 430.002

Project Contact at SCI: JIM BOWERS

Sampled By: T. TEBB

Analytical Laboratory: Curtis & Thompkins, Ltd.

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
31	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	

* * * * * *

Released by: Jim Alexander Date: 9/6/88

Released by Courier: Date:

Received by Laboratory: Gabrielle Stephan Date: 9/6/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: ML King TANK

SCI Job Number: 430.002

Project Contact at SCI: S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
39 @ 24.5' &e	S	T	3/29/89		TVH	
39 @ 27' &e	S	T	3/29/89		TVH	
40 @ 24'	S	T	3/29/89		TVH	
40 @ 27'	S	T	3/29/89		TVH	
41 @ 24'	S	T	3/29/89		TVH	
41 @ 26	S	T	↓		TVH	
41 @ 27	S	T	↓		TVH	
41 @ 28	S	T	↓		TVH	

* * * * * *

Released by: Date: 3/31/89

Released by/Courier: Date:

Received by Laboratory: Date: 3/31/89 1700

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: ML King TANK

SCI Job Number: 430.002

Project Contact at SCI: S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS + TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
42 @ 21'	S	T	3/29/89		TVH	
42 @ 24'	S	T			TVH	
42 @ 26	S	T			TVH	
43 @ 23'	S	T	3/30/89		TVH	
43 @ 24.5'	S	T			TVH	
43 @ 26	S	T			TVH	

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Released by: Date: 3/31/89

Released by Courier: Date:

Received by Laboratory: Date: 3/31/89 1700

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: MLK + 14th Street

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: Chris O'Dea

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
11*	W	V	4/3/89		TVH/BTXE	[illegible]
21*	W	V	4/3/89		TVH/BTX	[illegible]/6
31*	W	V	4/3/89		[illegible]	[illegible]/6
41*	W	V	[illegible]		[illegible]	[illegible]
*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* * * * * *

Released by: Date: 4/4/89

Released by Courier: Date:

Received by Laboratory: Gabrielle Stephan. Date: 4/4/89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans

-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: MLK tank

SCI Job Number: 436.002

Project Contact at SCI: [illegible]

Sampled By: John Wolfe

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: 5 day

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
11	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
25	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
29	W	4 V 1 G	7/5/89		TVH-G BTXE EDB TEL	
31	W	4 V 1 G	7/5/89		TVH-G BTXE EDB TEL	
39	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
42	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	

* * * * * *

Released by: John Wolfe Date: 7/6/89

Released by Courier: Date:

Received by Laboratory: Nancy Wilson Date: 7/6/89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

11-20-89

■ Subsurface Consultants, Inc.

89 NOV 22 AM 10: 52

STID 3623

PROGRESS REPORT 2
OFF-SITE GASOLINE CONTAMINATION INVESTIGATION

1330 MARTIN LUTHER KING, JR. WAY
OAKLAND, CALIFORNIA 94612
SCI 430.002

Prepared for:

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November 20, 1989

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I INTRODUCTION

This report records the results of an investigation of off-site soil and groundwater contamination resulting from a leaking underground fuel tank at 1330 Martin Luther King, Jr. Way in Oakland, California. The investigation was directed toward characterizing the lateral and vertical extent of soil contamination and evaluating impacts on groundwater. The location of the site is shown on Plate 1. Subsurface Consultants, Inc. (SCI) previously conducted an initial assessment of the problem; the results of this study were recorded in "Progress Report 1" dated July 21, 1988. A remediation plan was subsequently developed for the remediation of on-site contaminated soils. On-site contaminated soils have since been remediated as briefly described below.

II SUMMARY OF ON-SITE SOIL REMEDIATION

The remediation of soil contamination on site has been completed to date. Remediation consisted of excavating the gasoline contaminated soils to depths approximately 1 foot below the existing groundwater surface, which was situated approximately 27 feet below ground. The contaminated soils were subsequently aerated on site and then used to backfill the excavation.

Following contaminated soil removal, soil samples were obtained from the bottom and walls of the excavation and analyzed to check for the presence of total volatile petroleum hydrocarbons (TVH), as gasoline. Gasoline contaminated soils were removed to below detectable limits on the north, south and east sides, and the bottom of the excavation. Contaminated soils west of the excavation were left in place due to physical constraints created by Martin Luther King, Jr. Way and associated underground utilities. The contaminated soils left in place were to be remediated at a later date.

The excavated soils were stockpiled, sampled and analyzed for gasoline, and then aerated on site in accordance with the Bay Area Air Quality Management Division Guidelines. Soil aeration was monitored in the field using an organic vapor meter (OVM). The aerated soils were sampled and tested for TVH and benzene, toluene, xylene and ethylbenzene (BTXE), in accordance with the Regional Water Quality Control Board (RWQCB) guidelines. Once analytical testing indicated that the soils contained no detectable gasoline, aeration was considered complete.

Before replacing the aerated soils, a 24-inch-diameter corrugated metal pipe was placed vertically in the excavation to act as an extraction well for future groundwater remediation. A layer of pea gravel was placed in the bottom of the excavation; the corrugated metal pipe was terminated in the gravel. A geotextile fabric was placed over the pea gravel to limit the migration of fine-grained soils into the pea gravel. The corrugated metal pipe was fitted with a locking cover (Plate 29).

III FIELD INVESTIGATION

A. Test Borings and Soil Sampling

Subsurface conditions near the previous tank were explored by drilling 23 test borings. The borings ranged from 25 to 44 feet deep. Boring locations are shown on Plate 1. Test Borings 8, 11, 16, 28 thru 31, 39, 42 and 43 were converted to groundwater monitoring wells. Test Borings 9 and 10 were unsampled probes and were utilized to install piezometer standpipes. The piezometers were used to establish groundwater elevations in areas away from the tank and evaluate the direction of groundwater flow. Borings 5 and 12, 17 thru 27 and 33 thru 38 were drilled in nearby areas for another investigation; the logs of these borings have been omitted from this report. The test borings were drilled with a truck-mounted rig equipped with 8-inch-diameter, hollow-stem augers, except for Boring 28 which was drilled with 10-inch-diameter hollow-stem auger drilling equipment to allow installation of a 4-inch-diameter monitoring well.

Our geologist observed drilling operations and prepared logs of the borings. Soil samples were obtained using a California Drive sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches. The sampler was driven with a 140-pound hammer having a drop of approximately 30 inches. The blow counts required to drive the sampler the final 12 inches of an 18-inch penetration were recorded and are shown on the Boring Logs, Plates 2 thru 24. Soils are classified in accordance with the Unified Soil Classification System, described on Plate 25.

Soil samples were retained in brass sample liners. Samples for environmental analysis were capped and sealed with plastic tape. Teflon sheeting was placed between the caps and the soil sample. Upon sealing and labeling, the samples were promptly refrigerated on-site in ice chests.

All augers, drill rods, samplers, well casing, etc., that were placed into the test borings were steam-cleaned prior to their initial use and before each subsequent use to reduce the likelihood of cross contamination between borings.

B. Monitoring Wells

The groundwater monitoring wells are constructed of 2-inch-diameter Schedule 40 PVC pipe having flush threaded joints, with the exception of the well in Boring 28, which consists of 4-inch-diameter PVC pipe. The lower portion of each well consists of machine-slotted well screen having 0.020 inch slots. The annular space around the screened section was backfilled with Lone Star #3 sand. A bentonite plug, approximately 12 inches thick, was placed above the sand. The annulus above the plug was backfilled with bentonite grout. The wells were finished flush with the groundsurface. The wellheads are secured by locking covers. Specific details of the wells are shown on the appropriate boring logs.

The wells were developed by removing water with a Teflon bailer until the water became relatively free of turbidity. After development, each well was sampled with a Teflon sampling device. The bailer and sampler were steam-cleaned prior to their initial use and each subsequent use to limit the likelihood of cross contamination between wells. The water samples were promptly refrigerated on-site in ice chests. All soil and water samples remained refrigerated until delivered to the analytical laboratory. Chain-of-custody documents accompanied all samples delivered to the laboratory.

The piezometers consist of 1.25 inch steel pipe fitted with a prefabricated steel well point tip. The piezometer pipes extend approxiamtely 32 feet below the groundsurface. A bentonite pellet seal was placed in the piezometer boreholes at about mid-depth. The annulus above the bentonite pellet seal was backfilled with bentonite grout.

Exploratory borings that were not converted to piezometers or monitoring wells were backfilled with cement/bentonite grout.

C. <u>Groundwater Level Measurements</u>

Groundwater levels were measured at frequent intervals to evaluate groundwater flow direction, gradient and seasonal variations. The groundwater levels were measured from the top of the well casing using a Solinst well sounder. The water level measurements were related to elevation by surveying the tops of all well casings. Elevations are based on an assumed datum; the PG&E manhole in Martin Luther King, Jr. Way was assumed to have an elevation of 100 feet. Water levels in wells that contained free product were measured by using a steel tape with water and gasoline sensitive pastes. Groundwater levels were measured to the nearest 0.01 foot.

D. Slug Tests

The permeability of the soils was evaluated using slug tests in four wells. Slug testing consisted of bailing water from the well until the water level was significantly drawn down, and then recording the rate at which recharge occurs. Approximately 15 to 20 gallons of water were removed during drawdown. The results of the slug tests are presented below.

Well	Permeability k (cm/sec)
11	3.5×10^{-3}
28	5.0×10^{-3}
29	7.9×10^{-3}
31	1.3×10^{-2}

IV SITE CONDITIONS

A. Soil Conditions

The test borings indicate that soil conditions in the area are relatively uniform. The upper 9 to 20 feet of soil consists of a clayey sand. These materials are dense and are estimated to contain between 30 and 50 percent silt and clay. Below the clayey sands, the silt and clay content in the sand decreases. Relatively clean, fine grained silty sand exists below depths near the groundwater surface. These lower sands contain between 5 and 25 percent silt and clay size particles.

B. Groundwater Hydrology

Groundwater was encountered approximately 26.5 feet below the groundsurface. This depth corresponds to an elevation[1] of about 73 feet. Groundwater level data from the wells indicates that groundwater is flowing toward the northwest at a gradient of approximately 0.8 percent. Groundwater level data recorded in the wells and piezometers is summarized in Table 1. Seasonal variations in groundwater elevation of several tenths of a foot were observed.

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[1] Assumed datum: The elevation of the PG&E manhole in Martin Luther King, Jr. Way, west of the tank, was assumed to have an elevation of 100 feet.

Table 1. GROUNDWATER ELEVATION DATA (feet)

WELL	11	16	28	29	30	31	32	39	42	43
TOC ELEV[2]	99.66		98.99	97.95	99.30	98.90		99.00	99.12	98.87
DATE										
1/10/89			73.03	71.89	72.18(1.33)[1]	72.77	73.87			
1/12/89					71.93(1.33)		73.03			
1/18/89			72.91	71.87	71.97(1.50)	72.72				
1/19/89	72.84		72.83	71.81	71.80(1.56)	72.75				
1/20/89			72.87	71.83	72.78(0.30)	72.71				
1/26/89	72.89		72.90	71.79	72.51(0.73)	72.69				
2/7/89			72.87	71.75	71.95(1.44)	72.67				
2/17/89	72.87		72.87	71.76	71.57(1.96)	72.68				
3/3/89			73.05	71.77	71.35(2.55)	72.75				
3/14/89	73.18		73.19	71.96	71.34(2.69)	72.89				
3/30/89	73.33		73.32	72.05	71.51(2.58)	73.00				
4/3/89	73.31		73.29	72.07	71.52(2.56)	73.00		73.13	73.35	73.63
5/4/89	73.21		73.21	72.07	71.35(2.66)	73.01		73.09	73.27	73.81
6/7/89	72.91		72.92	71.85	70.83(3.01)	72.79		72.83	72.99	73.58
7/5/89	72.71		72.73	71.76	70.4(3.38)	72.62		72.62	72.82	73.41

---

[1] (1.33) indicates thickness of free product (feet)

[2] TOC = Top of Casing

V ANALYTICAL TESTING

Groundwater samples from the monitoring wells and selected soil samples from the borings were transmitted to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services to conduct hazardous waste and water testing. Soil samples from Test Boring 1A were analyzed for total petroleum hydrocarbons (TPH) in accordance with EPA 8015 test method (sonication). The results indicated the presence of gasoline and not other heavier hydrocarbons. This data was consistent with our research, which indicated that the tank was used to store gasoline. For this reason, all subsequent analyses were performed to check for total volatile hydrocarbons (TVH) in accordance with EPA Method 8015 (purge and trap). Selected samples were also analyzed for purgeable aromatic compounds in accordance with EPA Method 602/8020, and for total organic lead and ethyldibromide. Laboratory test reports are presented in the Appendix. The analytical test results for soil samples are summarized in Table 2. Groundwater analysis results are presented in Table 3. In addition, the analytical results are graphically presented on Plates 27 and 28.

The engineering properties of the materials encountered were evaluated by laboratory tests. The testing program included moisture content/dry density determinations, shear strength, grain size distribution, and percent passing a #200 sieve. The grain size distribution tests are presented on Plate 26. The remainder of the test results are presented on the boring logs.

Table 2. CONTAMINANT CONCENTRATIONS IN SOIL

Sample[3]	TVH[1] mg/kg[2]	Benzene mg/kg	Toluene mg/kg	Total Xylenes mg/kg	Ethyl Benzene mg/kg
1A @ 16.0	ND				
1A @ 21.0	3700[5]				
1 @ 16.0	ND[4]	ND	ND	ND	ND
1 @ 21.0	ND	ND	ND	ND	ND
1 @ 25.0	ND	ND	ND	ND	ND
2 @ 16.0	ND	ND	ND	ND	ND
2 @ 21.0	1810	26.3	42.5	154	24.8
2 @ 25.5	7530	29.5	447	752	87.9
3 @ 16.0	ND	ND	ND	ND	ND
3 @ 21.0	2370	15.9	39.2	199	31.0
3 @ 25.5	ND	ND	ND	ND	ND
4 @ 16.0	54	ND	ND	3.0	0.5
4 @ 21.0	6770	21.9	158	598	101
4 @ 26.0	ND	ND	0.2	ND	ND
6 @ 17.5	ND	ND	ND	ND	ND
6 @ 23.0	ND	ND	ND	ND	ND
6 @ 27.0	ND	ND	ND	ND	ND
7 @ 19.0	ND	ND	ND	ND	ND
7 @ 24.0	987	ND	16	64	12
7 @ 28.5	2020	32.8	74.6	152	26.5
8 @ 16.0	ND	ND	ND	ND	ND
8 @ 21.0	ND	ND	ND	ND	ND
8 @ 26.0	ND	ND	ND	ND	ND
11 @ 25.0	ND	ND	ND	ND	ND
14 @ 19.0	ND	ND	ND	ND	ND
14 @ 22.0	ND	ND	ND	ND	ND
14 @ 25.0	6710	38.9	324	735	122
15 @ 25.0	ND	ND	ND	ND	ND
16 @ 25.0	7660	39.3	257	719	117

Table 2. CONTAMINANT CONCENTRATIONS IN SOIL (continued)

Sample[1]	TVH[2] mg/kg[3]	Benzene mg/kg	Toluene mg/kg	Total Xylenes mg/kg	Ethyl Benzene mg/kg
28 @ 23.0	ND[4]	ND	ND	ND	ND
28 @ 26.0	ND	0.2	0.2	4.0	ND
28 @ 29.0	ND	ND	ND	ND	ND
29 @ 27.0	ND	ND	ND	ND	ND
29 @ 30.0	139	ND	ND	ND	ND
29 @ 33.0	ND	ND	ND	ND	ND
30 @ 25.0	5350	36.4	120	383	71.4
30 @ 27.0	ND	0.3	0.3	0.1	ND
31 @ 25.0	ND	ND	ND	ND	ND
31 @ 27.0	ND	ND	ND	ND	ND
39 @ 24.5	ND				
39 @ 27.0	ND				
40 @ 24.0	ND				
40 @ 27.0	ND				
41 @ 24.0	ND				
41 @ 26.0	5000				
41 @ 27.0	22				
41 @ 28.0	ND				
42 @ 21.0	ND				
42 @ 24.0	ND				
42 @ 26.0	Trace				
43 @ 23.0	ND				
43 @ 24.5	1000				
43 @ 26.0	ND				

	EDB[6]	TEL[7]	Purgeable Halocarbons
29 @ 30.0			ND
30 @ 25.0	ND	ND	

---

[1] TVH = Total Volatile Hydrocarbons as gasoline
[2] mg/kg = milligrams per kilogram or parts per million (ppm)
[3] Boring number and sample depth (feet)
[4] ND = not detected at concentrations above detection limit; see test reports for detection limits
[5] Samples for Boring 1A tested for TPH, EPA method 3550 extraction
[6] EDB = 1,2 - dibromoethane, EPA method 8011
[7] TEL = total organic lead, EPA method 7420
[8] EPA 8010

Table 3. CONTAMINANT CONCENTRATIONS IN GROUNDWATER

	Date **7/5/88**	**Date** **9/2/88**	**Date** **4/3/89**	**Date** **7/6/89**
Well 8				
TVH[1]	ND[2]			
Benzene	ND			
Toluene	ND	Well Removed		
Xylene	ND			
Ethylbenzene	ND			
Well 11				
TVH	10		53,000	22,000
Benzene	1800[4]		7,100	5,300
Toluene	ND		4,000	3,200
Xylene	1200		2,400	2,300
Ethylbenzene	ND		380	390
Organic Lead				ND
EDB[3]				26
Well 16				
TVH	90			
Benzene	3100			
Toluene	2700	Well Removed		
Xylene	5500			
Ethylbenzene	ND			
Well 28				
TVH		890		13,000
Benzene		431		4,900
Toluene		75.4		1,500
Xylene		84		1,300
Ethylbenzene		ND		100
Organic Lead		ND		ND
EDB		9.2		27
Well 29				
TVH		ND	450	ND
Benzene		ND	ND	ND
Toluene		8.1	2	15
Xylene		ND	6.7	ND
Ethylbenzene		ND	2	ND
Organic Lead		ND		ND
EDB		ND		ND

Table 3. CONTAMINANT CONCENTRATIONS IN GROUNDWATER (continued)

	Date 7/5/88	Date 9/2/88	Date 4/3/89	Date 7/6/89
Well 31				
TVH		ND	ND	ND
Benzene		ND	ND	ND
Toluene		ND	ND	ND
Xylene		ND	ND	ND
Ethylbenzene		ND	ND	ND
Organic Lead		ND		ND
EDB		ND		ND
Well 39				
TVH			2,000	7,900
Benzene			250	2,700
Toluene			11	1,300
Xylene			210	860
Ethylbenzene			ND	97
Organic Lead				ND
EDB				3
Well 42				
TVH				13,000
Benzene				4,500
Toluene				100
Xylene				1,000
Ethylbenzene				ND
Organic Lead				ND
EDB				8

---

[1] TVH = Total volatile hydrocarbons, as gasoline

[2] ND = not detected at concentrations above detection limit

[3] EDB = Ethylene Dibromide

[4] Concentrations in micrograms/liter or ppb

VI CONCLUSIONS

A. Soil Contamination

The results of our investigation indicate that detectable concentrations of gasoline and its purgeable aromatic constituents, i.e., benzene, toluene, xylene and ethylbenzene (BTXE), are present in the soil beneath Martin Luther King, Jr. Way (MLK Way) and 14th Street. Based on the data, we estimate that the lateral extent of soil contamination is that shown on Plates 27 thru 29.

Soil contamination appears to extend west and northwest of the previous tank for distances up to about 60 to 70 feet. The contaminated soil layer is thickest near the previous tank and thins rapidly in a westerly direction. At distances of 40 feet or so from the previous tank, the contaminated soil layer appears to be less than about 3 feet thick.

Total volatile hydrocarbon concentrations in the soil samples analyzed vary up to 7660 ppm. We estimate that the higher concentrations are associated with samples containing free product, as subsequently discussed. The contaminated soils also contain benzene, toluene, xylenes and ethylbenzene (BTXE). Concentrations are summarized in Table 2 and on Plate 27.

A significant portion of the soil contaminated by tank leakage was remediated. The extent of the Phase 1 cleanup is shown on Plates 1 and 29.

B. Groundwater Contamination

1. Free Floating Product

Free floating gasoline product has been measured in Wells 16, 30 and 43. Product thicknesses in the wells range from 16 to 41 inches. The downgradient (northwest) extent of the free product has been relatively well defined and exists between Wells 30 and 42, as shown on Plates 28 and 29.

As Plates 28 and 29 indicate, the free product plume extends northwest of the previous tank, and exists as a "lens" perched on top of the groundwater surface. The thickest portion of the lens appears to exist near Test Boring 30, approximately 55 feet from the previous tank. The variations in product thickness in the wells suggest that the lens may be experiencing some movement. However, the rate of free product migration appears to be very slow since free product has not been recorded in Wells 11, 28 and 42, which are situated within 10 to 15 feet of wells containing free floating gasoline.

2. Dissolved Constituents

Dissolved gasoline, and BTXE were detected in groundwater. The lateral extent of the dissolved product plume has not been fully defined along the southern side. However, we judge that its approximate extent is close to that graphically shown on Plate 28. The downgradient edge of the plume appears to extend at least 200 feet northwest of the previous tank. Very low concentrations of TVH and BTXE have been detected in Well 29.

C. **Remediation**

The petroleum hydrocarbon concentrations that exist in the soil and groundwater are sufficiently high that we judge that remediation of soil and groundwater will likely be necessary. The scope and extent of remediation will have to be negotiated with the RWQCB and the ACHCSA. It is recommended that the initial phase of remediation consist of the recovery of free floating gasoline. When free product level thicknesses are reduced significantly, we recommend that groundwater and contaminated soil remediation be initiated.

In brief, the recovery of free product should involve the installation of two extraction wells, one situated near Well 30 and the other situated about 35 feet south of Well 30. A pump capable of operating at low flow rates and skimming the product from the water surface should be installed in the wells. The recovered gasoline product should be pumped directly into suitable waste containers for subsequent recycling.

Groundwater remediation should involve the installation of one or more groundwater extraction wells. Groundwater should be removed from the wells by pumping and treated by a facility utilizing activated carbon filtering methods. BTXE concentrations in the groundwater significantly exceed DHS action levels for drinking water. However, we judge that the area will likely not be considered a particularly sensitive groundwater region by the RWQCB. Although unconfirmed, we suspect that groundwater in the area is likely not used as a drinking water source. For this reason, we judge that drinking water standards will not be used to establish groundwater cleanup levels; some other standard will likely be applicable. Cleanup levels will have to be negotiated with the RWQCB.

Remediation of the highly contaminated soils is complicated by the fact that they exist at significant depths, beneath major city streets crowded with underground utilities. At this time, we believe that the most appropriate means of soil remediation will involve a combination of in situ treatment and physical removal. The removal of contaminated soils by drilling with a large diameter auger will likely be most appropriate where contamination exists in dense sandy soils containing significant quantities of silt and clay. Where relatively clean sandy soils exist, we believe that in situ means of remediation will be most suitable. At this time, we judge that a process such as in situ volatilization or in situ bioremediation will prove most successful for the given conditions.

D. Additional Hydrogeologic Characterization

As discussed previously, the vertical and lateral extent of the groundwater contamination has not been fully defined. Consequently, we conclude that additional hydrogeologic characterization will be necessary. Future investigation should include the installation of monitoring wells to:

1. Define the lateral extent of the dissolved product plume, and
2. Evaluate groundwater quality in deeper aquifers.

Additionally, a pump test should be conducted using one of the existing wells to evaluate anticipated groundwater extraction well performance.

List of Attached Plates:

Plate 1	Site Plan
Plate 2 thru 25	Logs of Borings 1 thru 11,14 thru 16, 28 thru 31 and 39 thru 43
Plate 26	Unified Soil Classification System
Plate 27	Particle Size Analysis
Plate 28	Gasoline Concentrations in Soil
Plate 29	Gasoline Concentrations in Water
Plate 30	Cross Section
Appendix	Laboratory Test Reports Chain-of-Custody Documents

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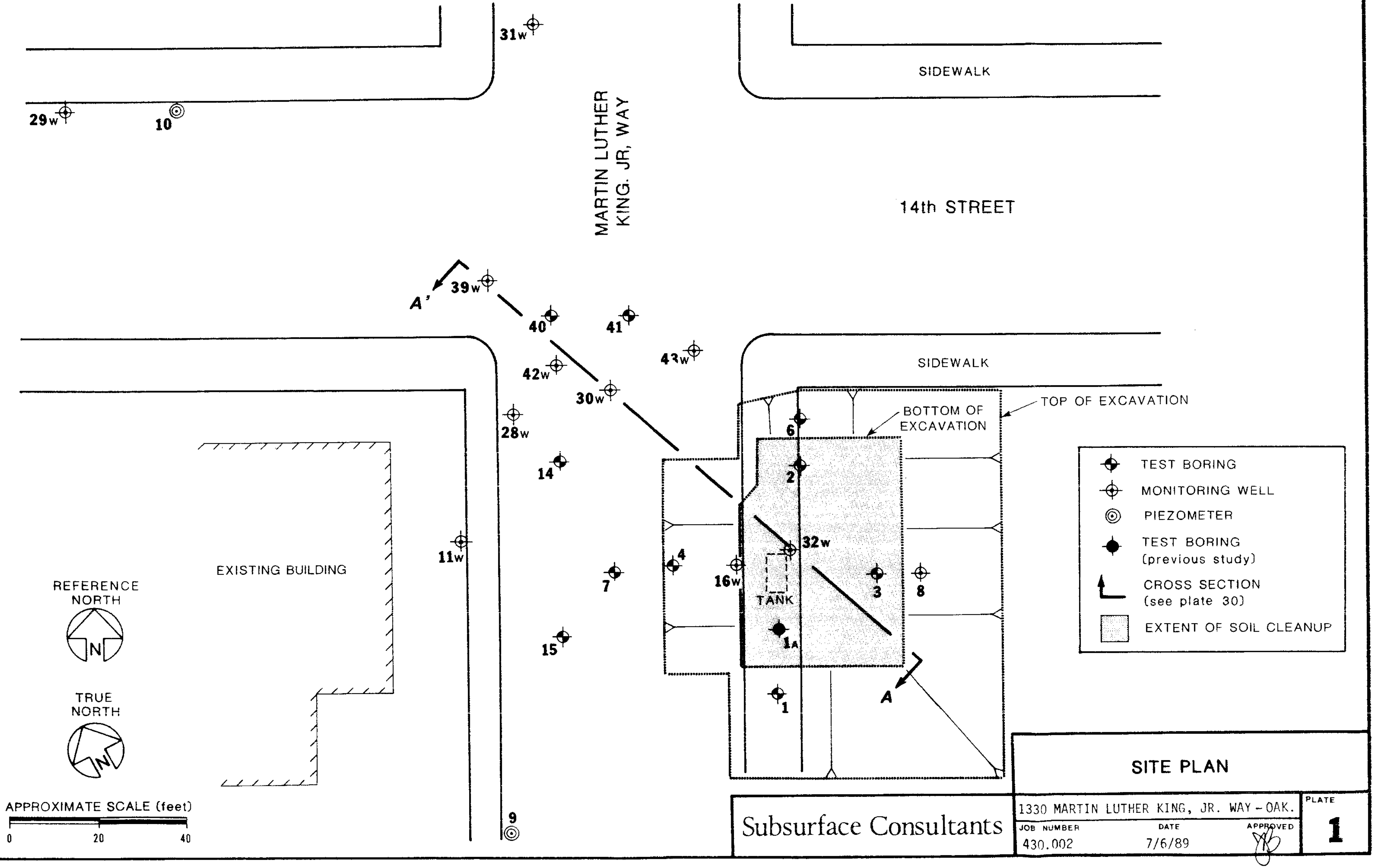


Subsurface Consultants

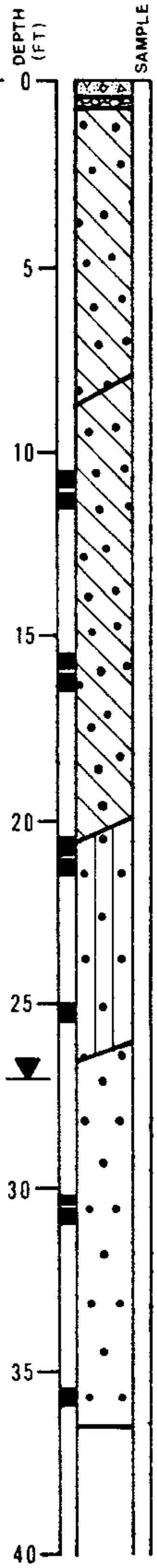
SITE PLAN

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/6/89		1

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
UC = 705	14.2	122	20
			29
%-200 = 14.0	17.2	98	35
			39

6" CONCRETE
3" BASE ROCK
BROWN CLAYEY SAND (SC)
medium dense, moist

MOTTLED BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY BROWN SILTY SAND (SM-SP)
dense, moist

groundwater level 6/23/88

GRAY BROWN SAND (SP)
medium dense, saturated

boring backfilled with a cement/bentonite grout upon completion of drilling

UC = UNCONFINED COMPRESSIVE SHEAR STRENGTH

%-200 = % PASSING #200 SIEVE (0.074mm)

SAMPLE TYPE:
CALIFORNIA DRIVE SAMPLE
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES

HAMMER WEIGHT: 140 POUNDS
HAMMER DROP : 30 INCHES

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1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE **2**

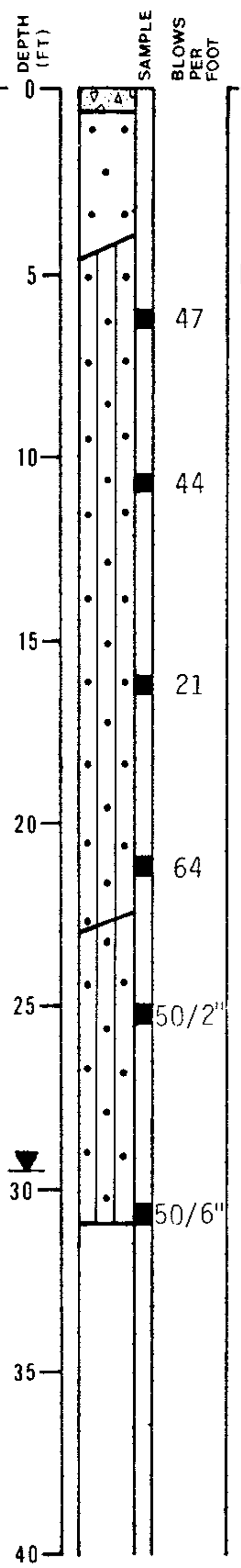
LOG OF TEST BORING 1A

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-6-88

ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



6" CONCRETE SLAB

BROWN SAND (SP)
loose, moist (fill)

BROWN SILTY SAND (SM)
dense, moist

becomes very dense, gasoline
oder noted

GREY BROWN SILTY SAND (SM/SP)
very dense, moist

groundwater level during drilling

boring backfilled with cement/
bentonite grout

Subsurface Consultants

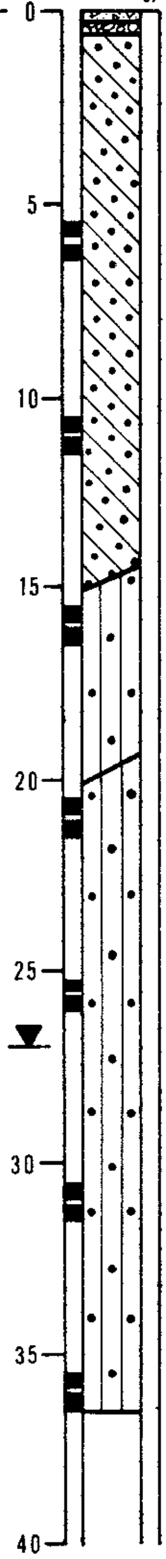
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED
430.001	6/30/88	

PLATE
3

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				3" THICK CONCRETE 3" BASE ROCK
				BROWN CLAYEY SAND (SC) medium dense to dense, moist
			26	
				becomes mottled brown and gray below 9'
UC = 1021	13.7	121	35	
				BROWN SILTY SAND (SM) dense, moist
			31	
				interbedded with some clayey sand
%-200 = 15.4	16.0	106	27	BROWN SILTY SAND (SM) medium dense to dense, moist
%-200 = 26.6			20	
				groundwater level 30 minutes after drilling
			36	
				boring backfilled with cement/bentonite grout upon completion of drilling

Subsurface Consultants

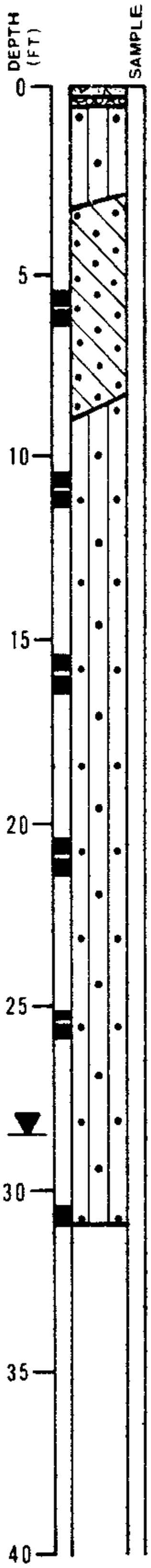
1330 MARTIN LUTHER KING, JR. WAY, OAK

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		4

LOG OF TEST BORING 3

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			27
%-200 = 37.3	12.9	118	33
%-200 = 18.3			29
%-200 = 13.5	17.0	105	29
			30
			16



3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM)
loose, moist, with numerous pieces of glass, brick, etc. (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM)
dense, moist

groundwater level 6/23/88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

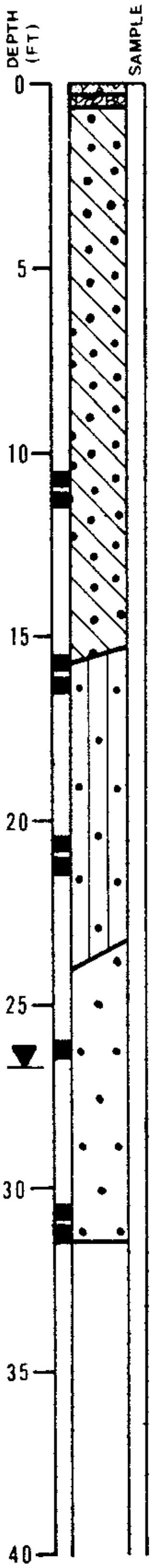
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		5

LOG OF TEST BORING 4

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
UC = 1329	13.1	123	32
			25
%-200 = 22.5	16.9	99	25
			17
			17



4" ASPHALTIC CONCRETE
3" BASE ROCK

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray brown below 8'

GRAY BROWN SILTY SAND (SM)
dense, moist

GRAY BROWN SAND (SP)
medium dense, saturated

groundwater level 6/24/88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

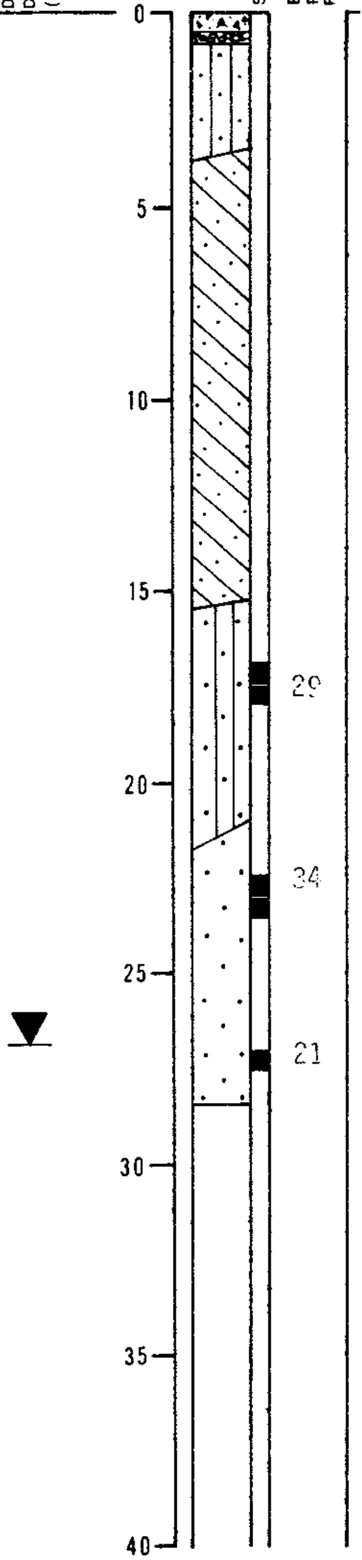
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE 6

LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



6" CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)
BROWN SILTY CLAYEY SAND (SC)
medium dense, moist

color change to mottled brown and gray below 10 feet

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

BROWN SAND (SP)
medium dense to dense, moist

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

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1330 MARTIN LUTHER KING, JR. WAY, OAK.

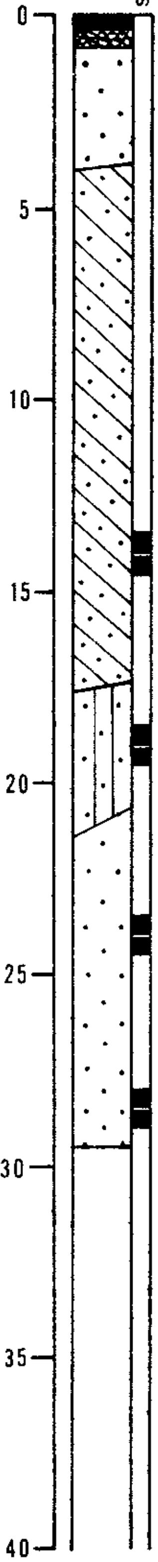
JOB NUMBER 430.002
DATE 7-11-88
APPROVED

PLATE **7**

LOG OF TEST BORING 7

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			24
%-200 = 25.5	14.4	103	31
%-200 = 5.6	12.4	104	34
		▼	
			22



4" ASPHALTIC CONCRETE
6" BASE ROCK
BROWN SAND (SP)
medium dense, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

color change to mottled gray and brown below 8 feet

GRAY BROWN SILTY SAND (SM)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

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1330 MARTIN LUTHER KING, JR. WAY, OAK.

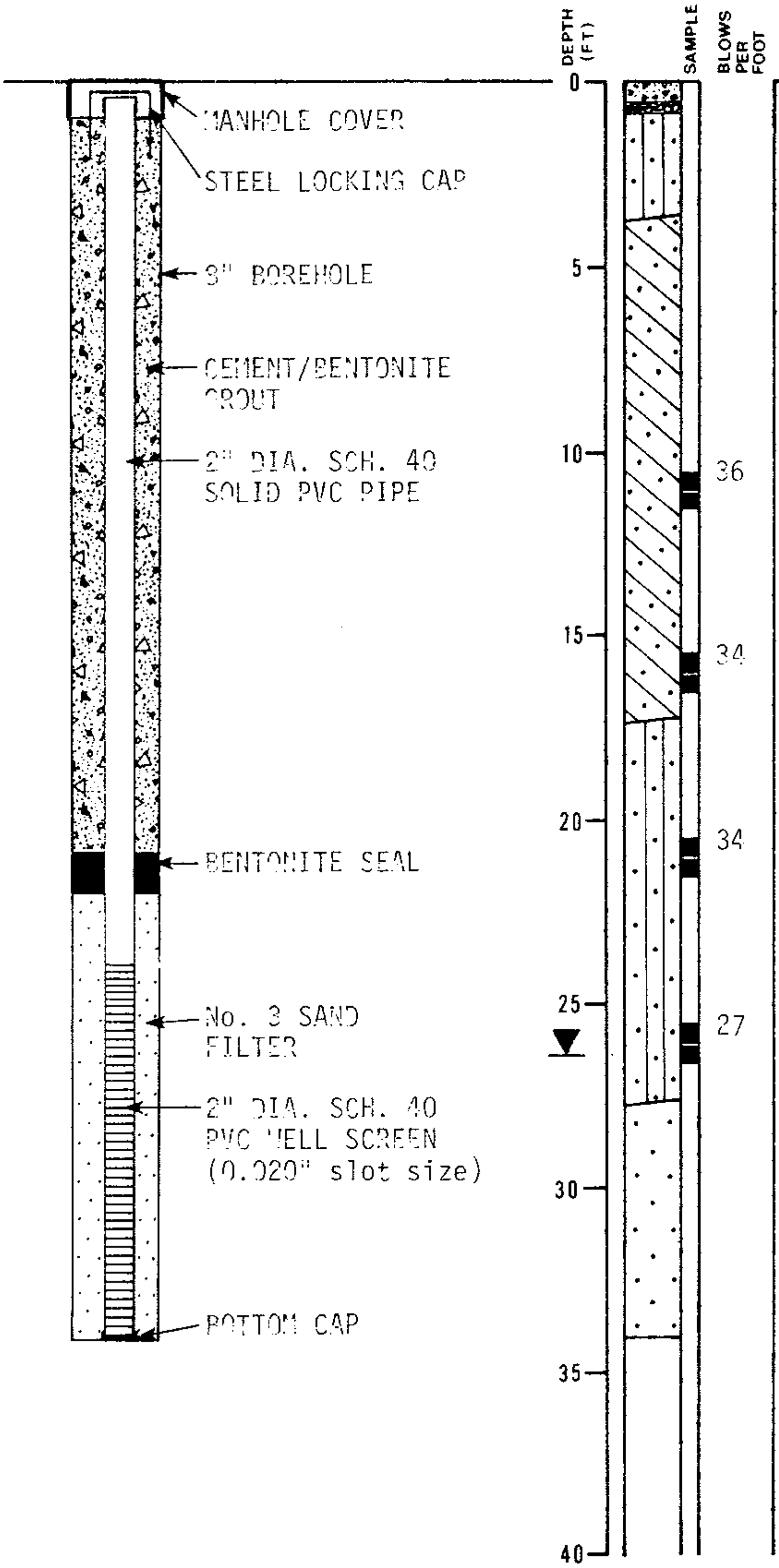
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		8

LOG OF TEST BORING 8

EQUIPMENT 3" Hollow Stem

DATE DRILLED 6-24-88

ELEVATION --



6" CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)
BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

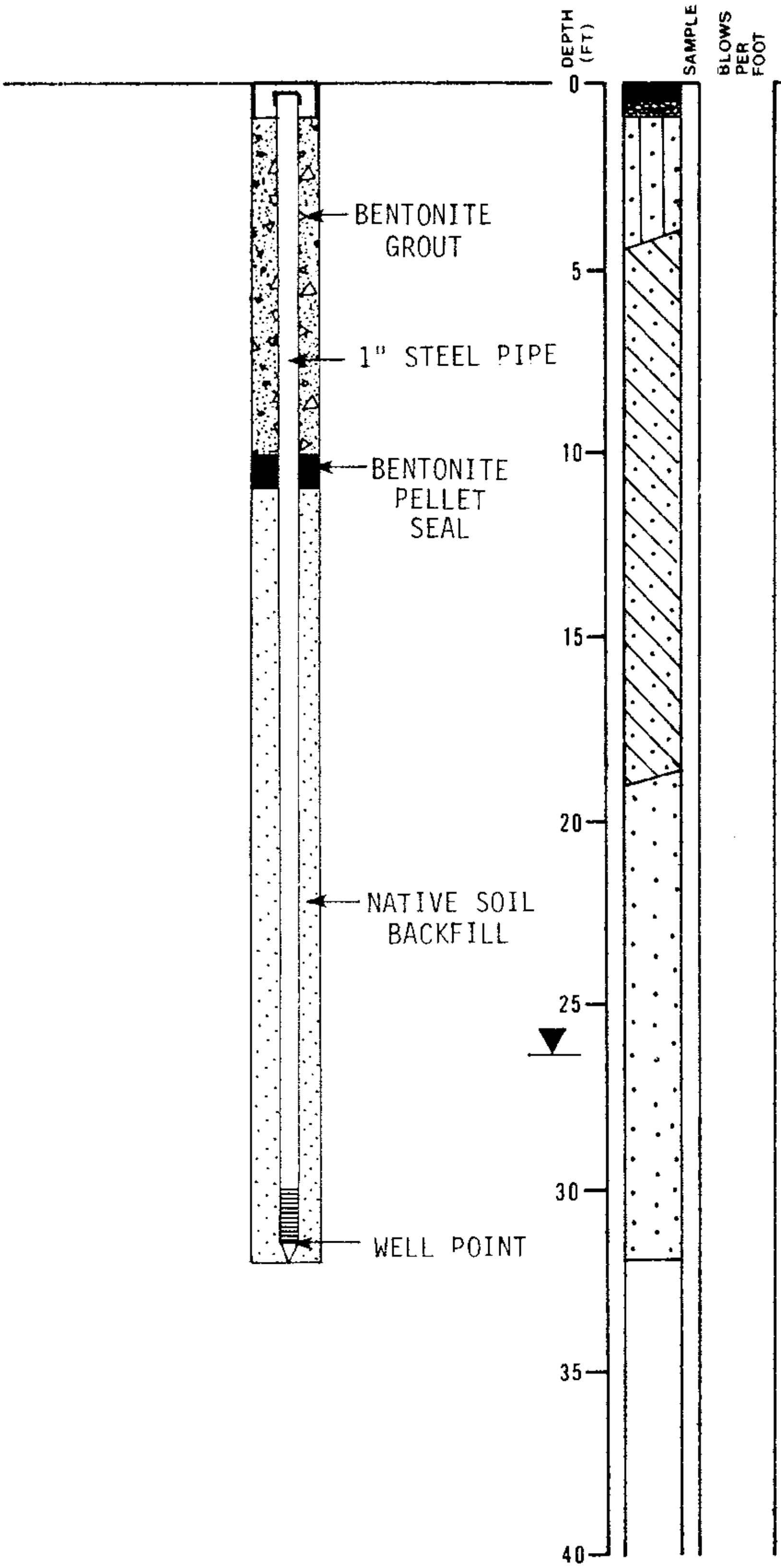
GROUNDWATER LEVEL 7-28-89

medium dense to dense, saturated, fine grained

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.	PLATE
	JOB NUMBER 430.002 / DATE 10/5/89 / APPROVED	9

LOG OF TEST BORING 9

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
3" BASE ROCK
BROWN SILTY SAND (SM)
medium dense to dense, moist, fine grained
BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

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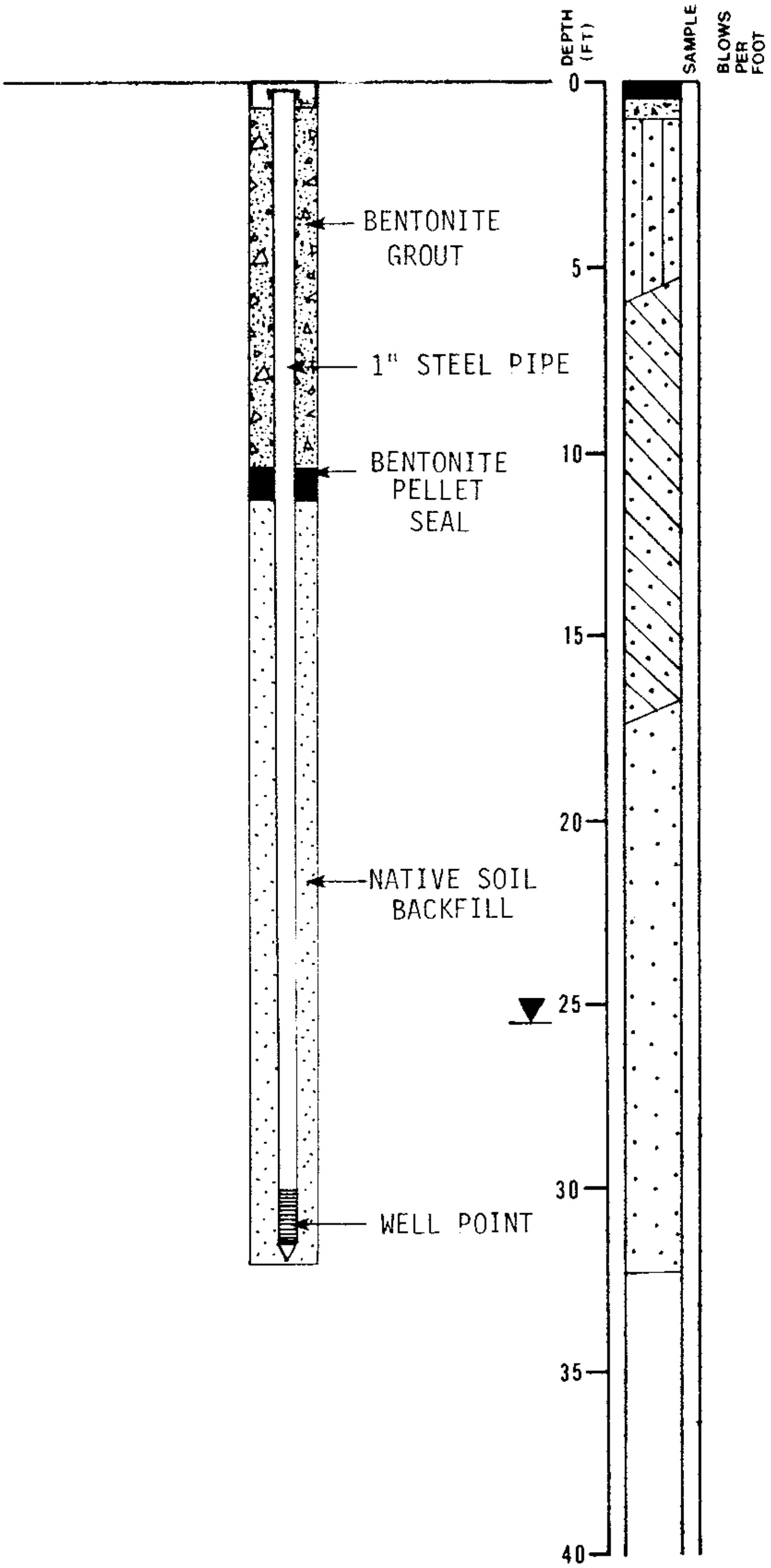
1330 MARTIN LUTHER KING JR. WAY, OAK.
JOB NUMBER 430.002
DATE 7-28-88
APPROVED
PLATE 10

LOG OF TEST BORING 10

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
4" CONCRETE
BROWN SILTY SAND (SM)
mediun dense, moist, fine grained

BROWN CLAYEY SAND (SC)
dense, moist, fine grained

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

Subsurface Consultants

1330 MARTIN LUTHER KING JR. WAY, OAK

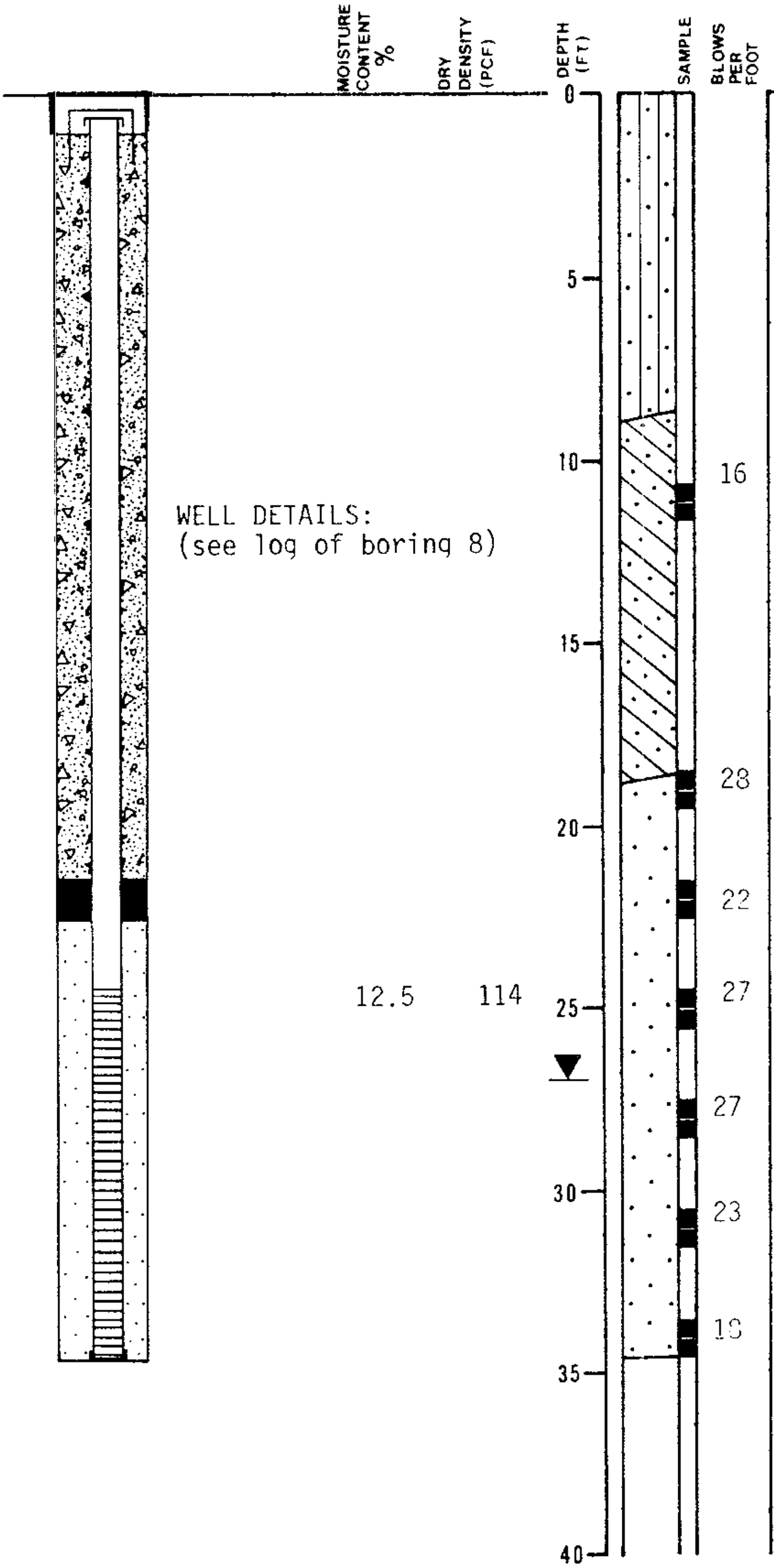
JOB NUMBER	DATE	APPROVED
430.002	7-28-88	

PLATE
11

LOG OF TEST BORING 11

LOG OF TEST BORING 11

EQUIPMENT 8" Hollow stem
DATE DRILLED 6-30-38
ELEVATION --



WELL DETAILS:
(see log of boring 8)

BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED GRAY AND BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY BROWN SAND (SP)
medium dense, moist, fine grained

GROUNDWATER LEVEL 9-28-89

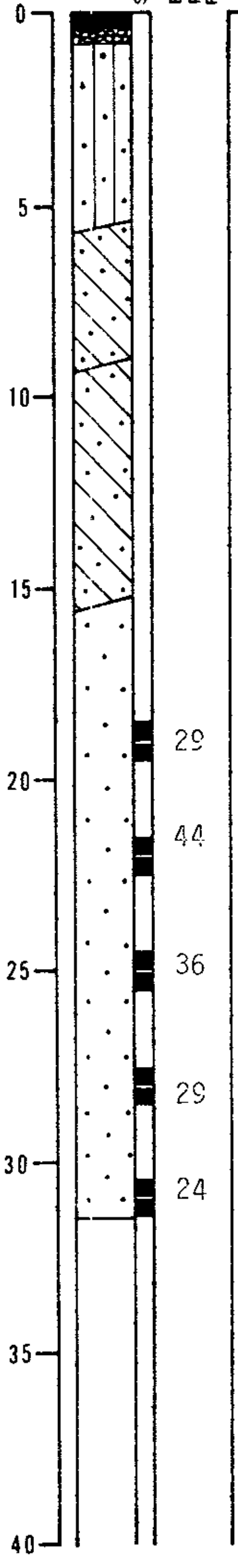
Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.	PLATE
	JOB NUMBER 430.002 · DATE 10/5/89 · APPROVED	12

LOG OF TEST BORING 14

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 7.2	10.8	106
%-200 = 5.9		

▼



4" ASPHALTIC CONCRETE
4" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED OLIVE GREEN AND BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER LEVEL 7-1-88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

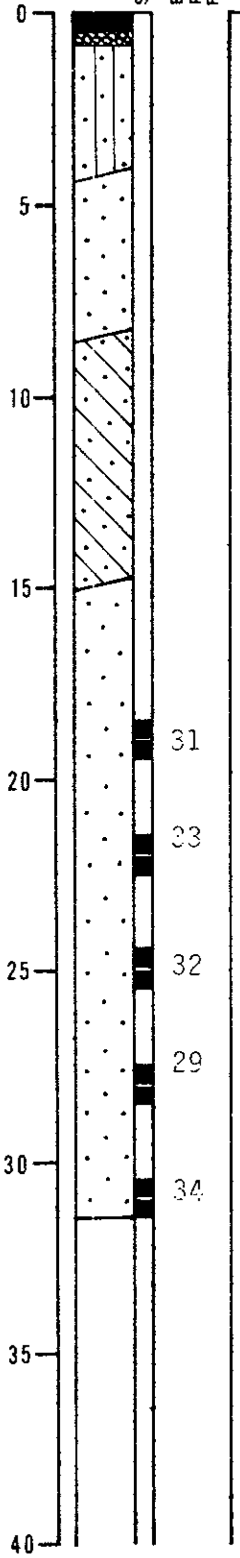
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002
DATE 7-11-88
APPROVED

PLATE 13

LOG OF TEST BORING 15

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-83
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				4" ASPHALTIC CONCRETE 4" BASE ROCK BROWN SILTY SAND (SM) medium dense, moist (fill)
				GRAY BROWN SAND (SP) medium dense, moist, fine grained
				DARK GRAY BROWN CLAYEY SAND (SC) medium dense, moist color change to brown below 10 feet
				BROWN SAND (SP) dense, moist, fine grained
			31	color change to gray brown below 20 feet
%-200 = 7.2			33	
	12.5	114	32	
		▼		GROUNDWATER LEVEL 7-1-83
			29	color change to brown below 26 feet
			34	
				boring backfilled with a cement/ bentonite grout upon completion of drilling

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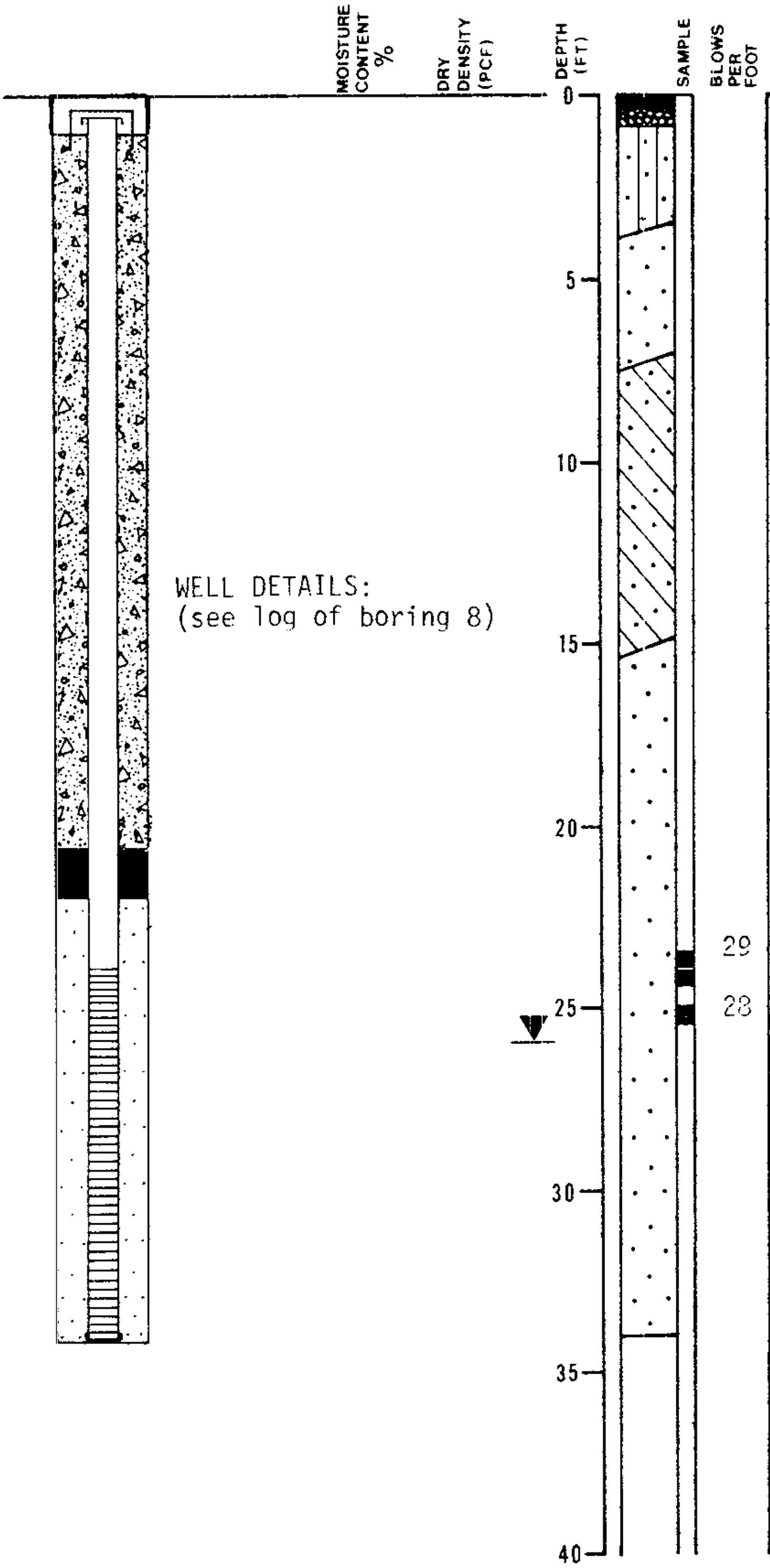
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002
DATE 7-11-83
APPROVED

PLATE 14

LOG OF TEST BORING 16

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --



WELL DETAILS:
(see log of boring 8)

4" ASPHALT CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

BROWN SAND (SP)
medium dense, moist
fine grained

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray and brown
below 12 feet

GRAY BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 7-28-89

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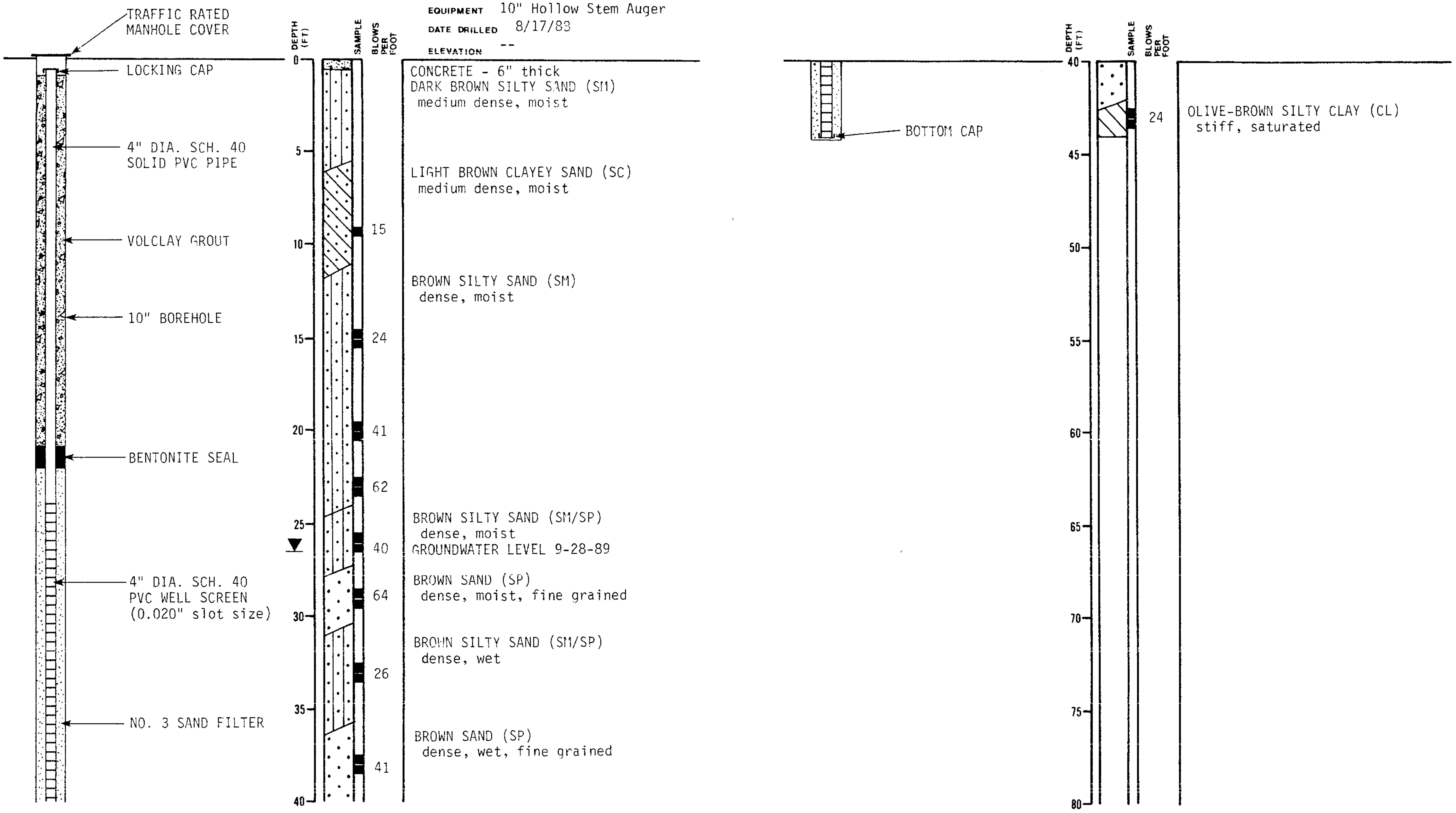
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	10/5/89	JB	15

LOG OF TEST BORING 28

EQUIPMENT 10" Hollow Stem Auger
DATE DRILLED 8/17/83
ELEVATION --



CONCRETE - 6" thick
DARK BROWN SILTY SAND (SM)
medium dense, moist

LIGHT BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
dense, moist

BROWN SILTY SAND (SM/SP)
dense, moist
GROUNDWATER LEVEL 9-28-89

BROWN SAND (SP)
dense, moist, fine grained

BROWN SILTY SAND (SM/SP)
dense, wet

BROWN SAND (SP)
dense, wet, fine grained

OLIVE-BROWN SILTY CLAY (CL)
stiff, saturated

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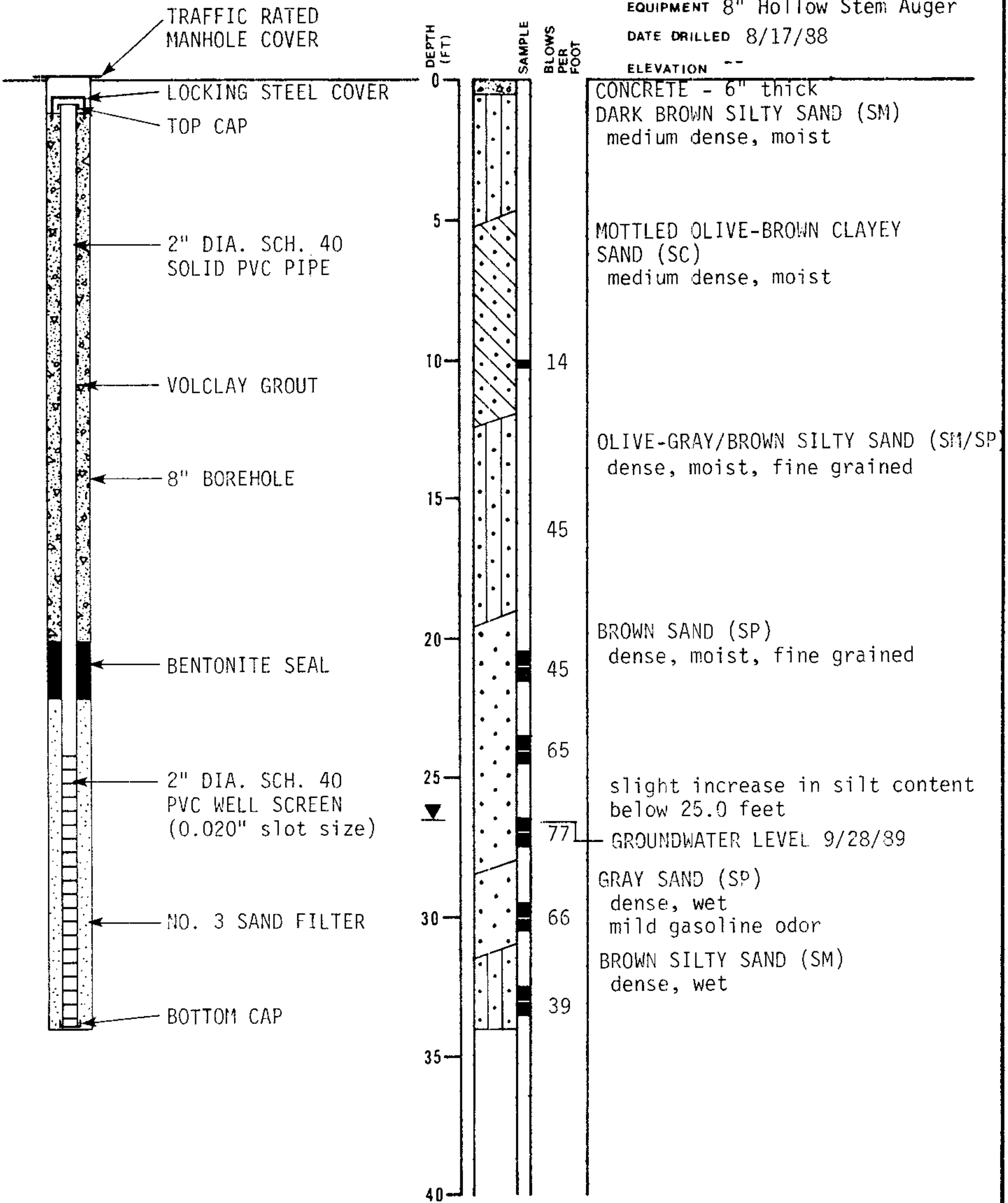
JOB NUMBER	DATE	APPROVED	PLATE
430.002	10/5/89		16

LOG OF TEST BORING 29

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 8/17/88
ELEVATION --



CONCRETE - 6" thick

DARK BROWN SILTY SAND (SM)
medium dense, moist

MOTTLED OLIVE-BROWN CLAYEY SAND (SC)
medium dense, moist

OLIVE-GRAY/BROWN SILTY SAND (SM/SP)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

slight increase in silt content below 25.0 feet

GROUNDWATER LEVEL 9/28/89

GRAY SAND (SP)
dense, wet
mild gasoline odor

BROWN SILTY SAND (SM)
dense, wet

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JOB NUMBER	DATE	APPROVED
430.002	9/6/88	

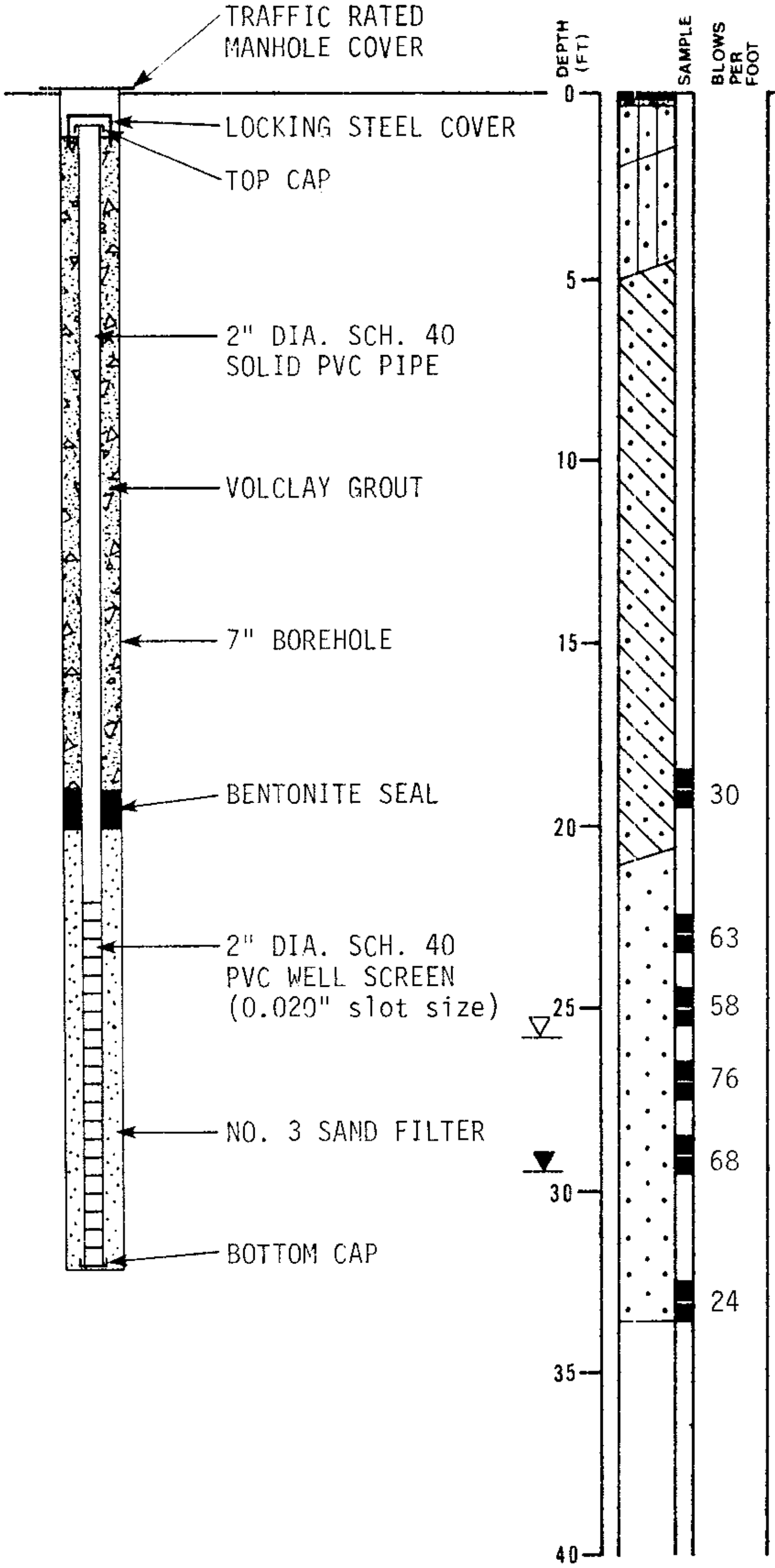
PLATE
17

LOG OF TEST BORING 30

EQUIPMENT 7" Hollow Stem Auger

DATE DRILLED 8/26/88

ELEVATION --



ASPHALTIC CONCRETE - 2" thick

CONCRETE SLAB - 2" thick

BLACK SILTY SAND (SM)
medium stiff, moist

BROWN SILTY SAND (SM)
medium stiff, moist

GRAY-BROWN CLAYEY SAND (SC)
medium dense, moist

color change to gray below 10.0 feet

color change to brown below 13.0 feet

color change to olive-green below 17.0 feet

GRAY SAND (SP)
very dense, moist

FREE PRODUCT SURFACE 9/28/89
44" thick

GROUNDWATER LEVEL 9/28/89

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JOB NUMBER	DATE	APPROVED
430.002	9/6/88	

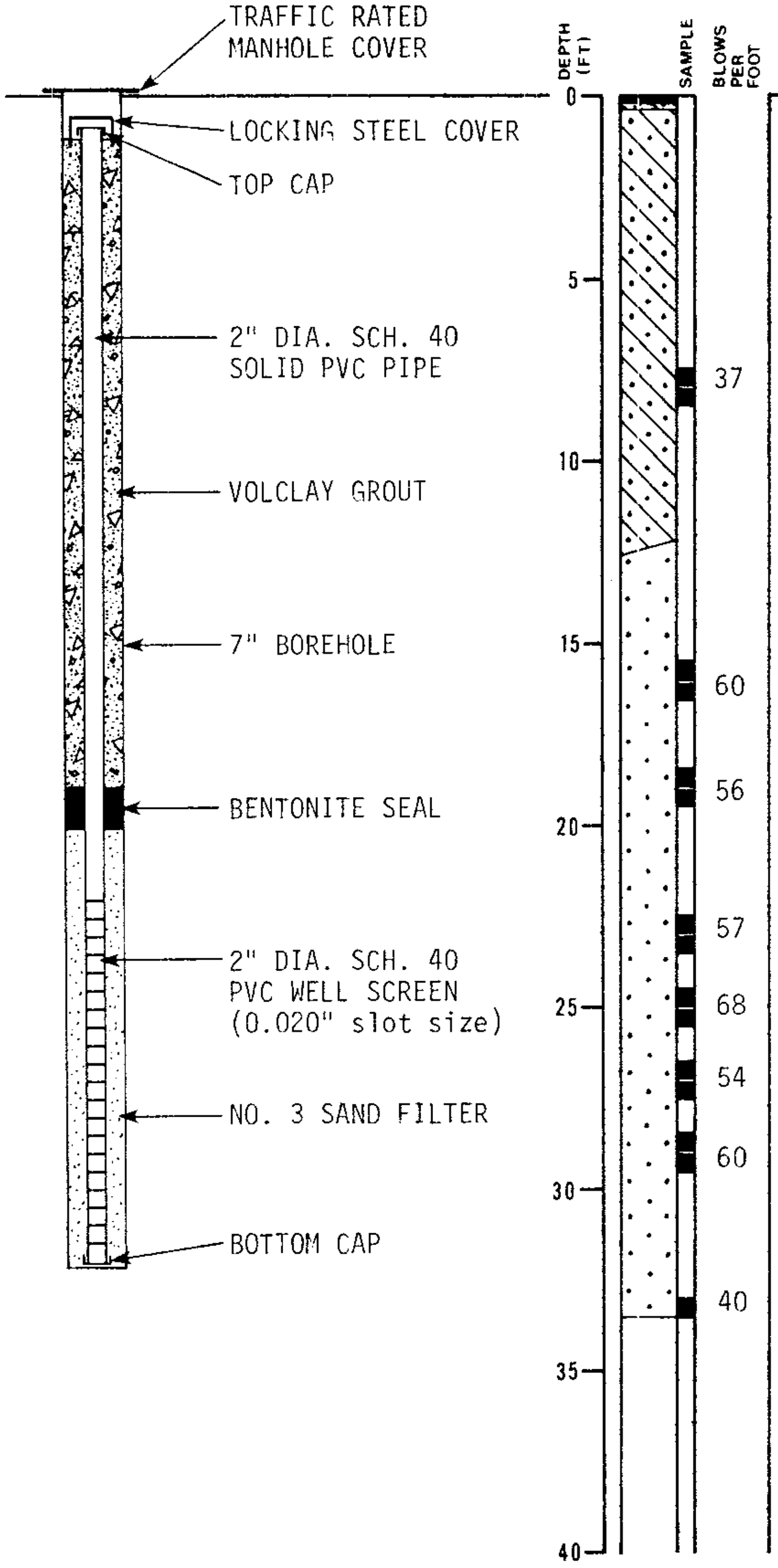
PLATE **18**

LOG OF TEST BORING 31

EQUIPMENT 7" Hollow Stem Auger

DATE DRILLED 8/26/88

ELEVATION --



ASPHALTIC CONCRETE - 2" thick
CONCRETE SLAB - 2" thick
DARK GRAY-BROWN CLAYEY SAND (SC)
medium dense, moist

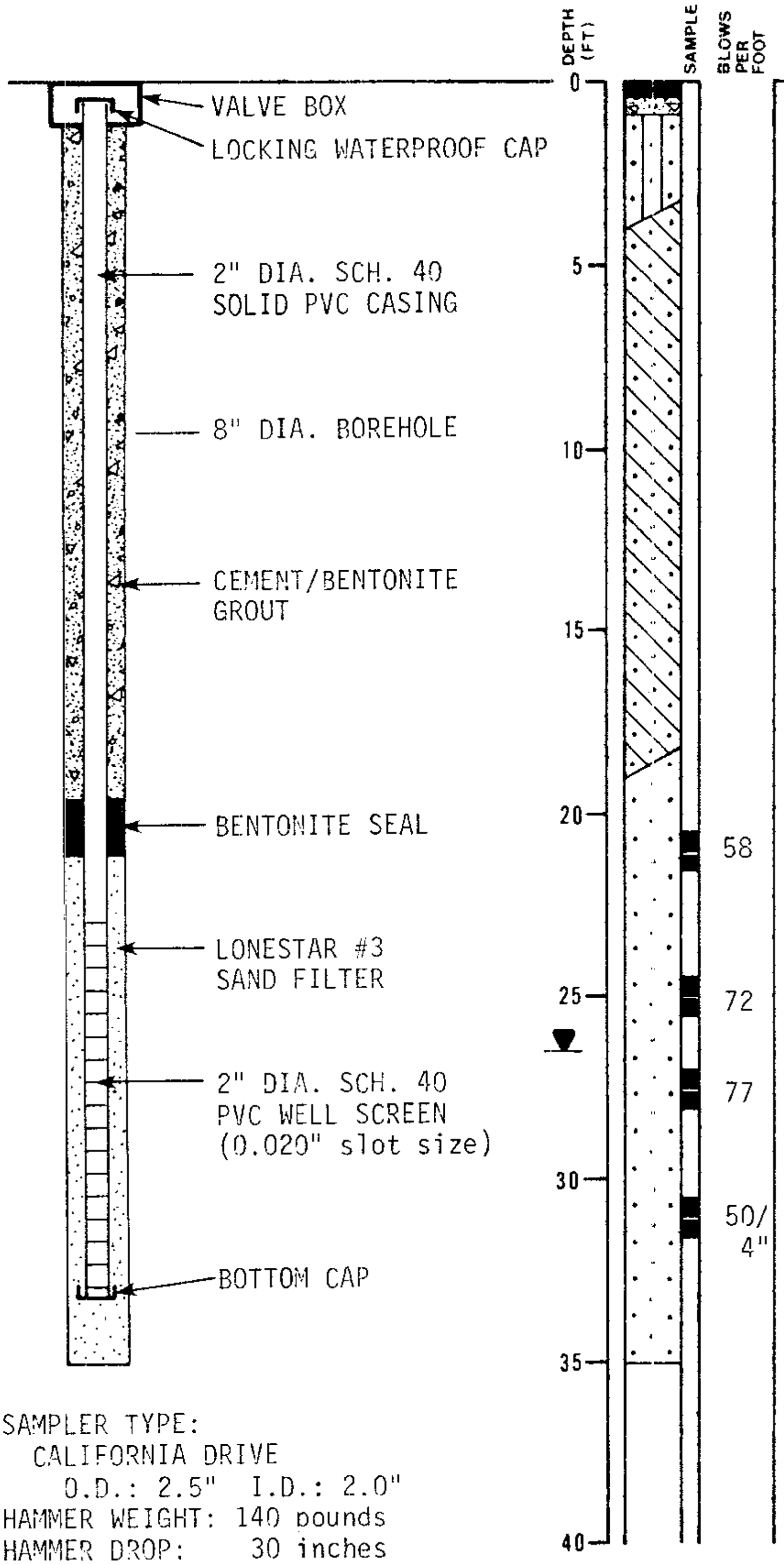
BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL 9/28/89

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY - OAK.		PLATE
	JOB NUMBER 430.002	DATE 9/6/88	APPROVED
			19

LOG OF TEST BORING 39

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --



ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
GRAY-GREEN SILTY SAND (SM)
medium dense, moist (fill)
GRAY-GREEN CLAYEY SAND (SC)
medium dense, moist

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL 9/28/89

SAMPLER TYPE:
CALIFORNIA DRIVE
O.D.: 2.5" I.D.: 2.0"
HAMMER WEIGHT: 140 pounds
HAMMER DROP: 30 inches

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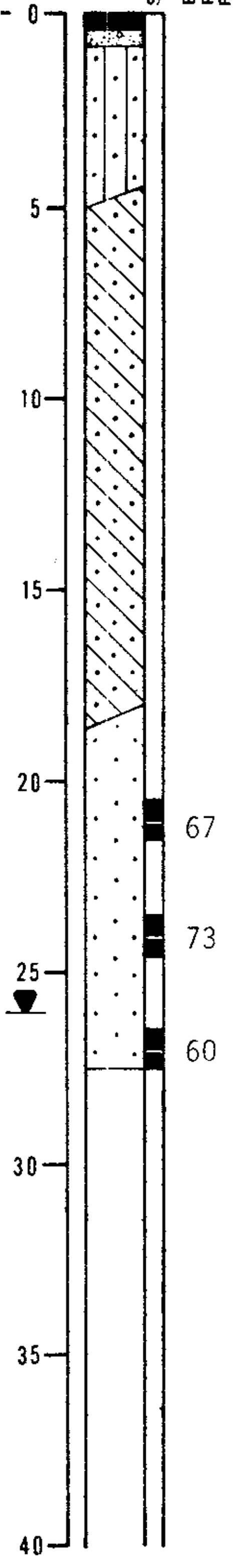
1330 MARTIN LUTHER KING, JR. WAY– OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		20

LOG OF TEST BORING 40

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --

LABORATORY TESTS
MOISTURE CONTENT %
DRY DENSITY (PCF)
DEPTH (FT)
SAMPLE
BLOWS PER FOOT



ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
GRAY-GREEN SILTY SAND (SM)
medium dense, moist

GRAY-GREEN CLAYEY SAND (SC)
medium dense, moist

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

(BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT UPON COMPLETION
OF DRILLING)

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1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED
430.002	7/7/89	

PLATE
21

LOG OF TEST BORING 41

EQUIPMENT 8" Hollow Stem Auger

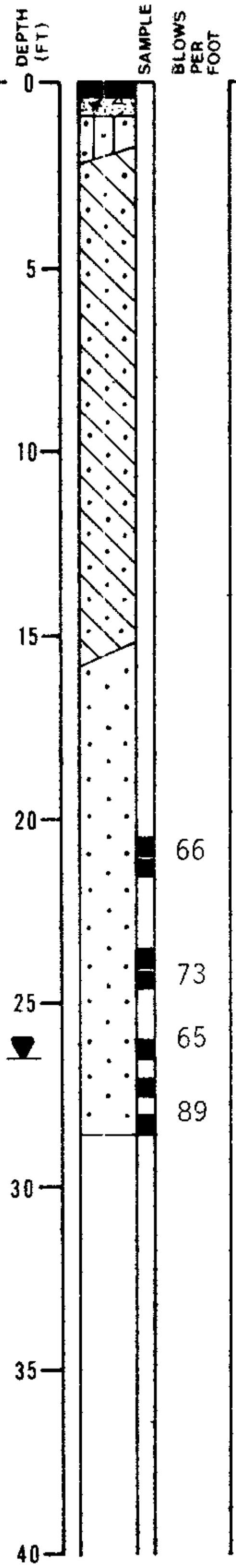
DATE DRILLED 3/29/89

ELEVATION --

LABORATORY TESTS

MOISTURE CONTENT %

DRY DENSITY (PCF)



ASPHALTIC CONCRETE - 4" thick

CONCRETE - 6" thick

DARK BROWN SILTY SAND (SM)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

color changes to green

color changes to brown

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

(BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT UPON COMPLETION
OF DRILLING)

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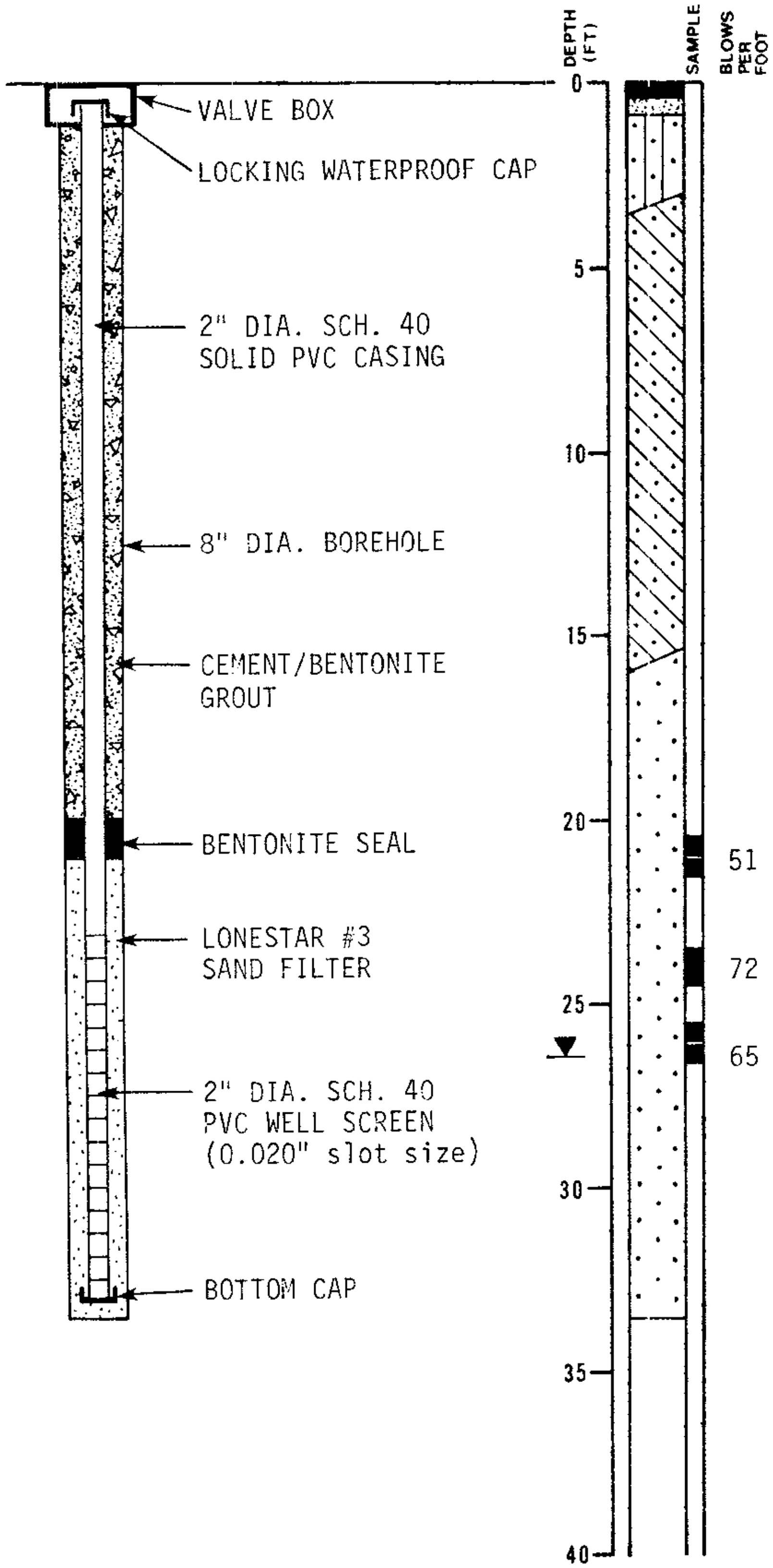
1330 MARTIN LUTHER KING, JR. WAY – OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		22

LOG OF TEST BORING 42

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/29/89
ELEVATION --



ASPHALTIC CONCRETE - 4" thick
CONCRETE - 6" thick
GRAY SILTY SAND (SM)
medium dense, moist
GRAY-GREEN CLAYEY SAND (SC)
medium dense, moist

BROWN SAND (SP)
dense, moist

GROUNDWATER LEVEL 9/28/89

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1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		23

GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

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1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
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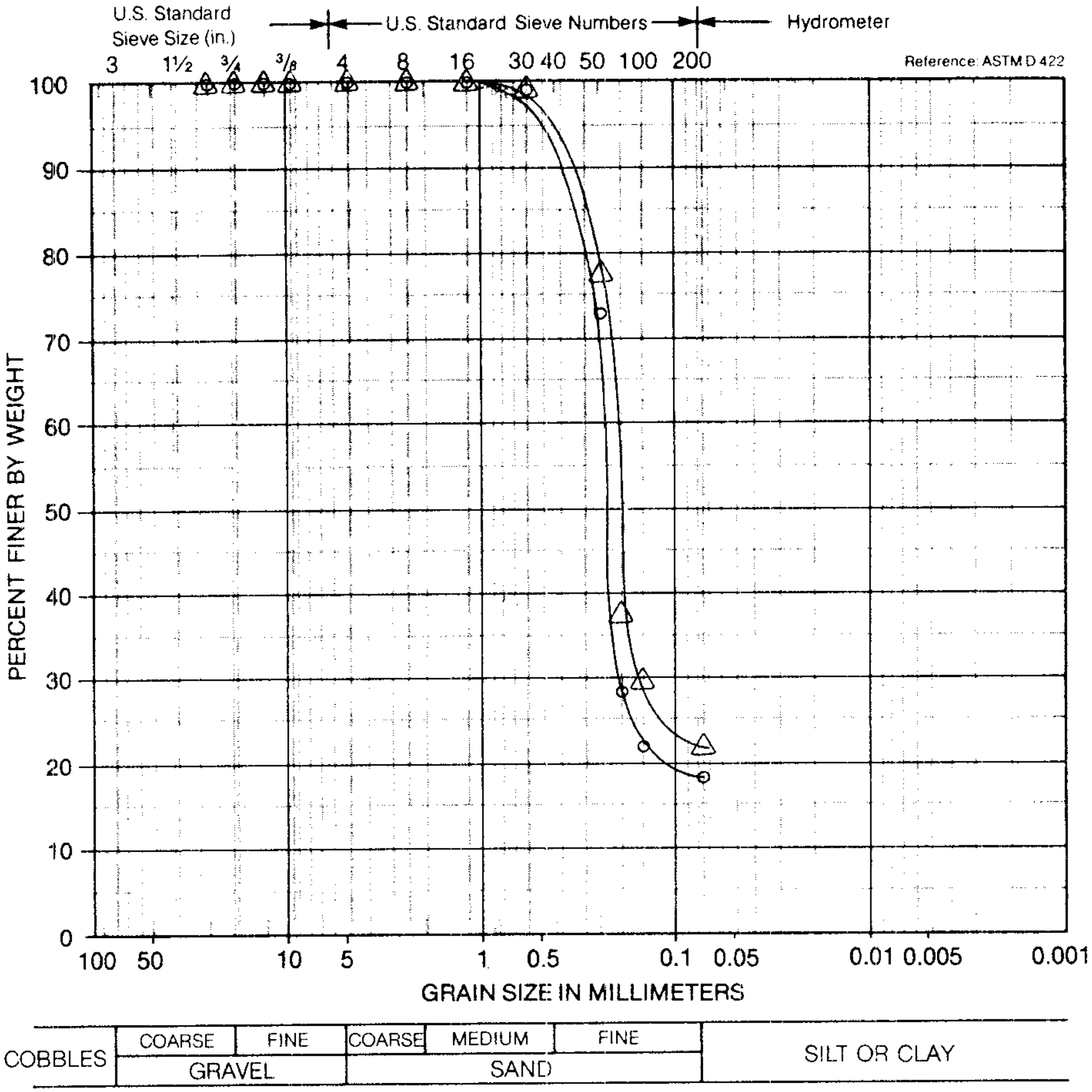

Symbol	Sample Source	Classification
○	BORING 3 @ 15.5	BROWN SILTY SAND (SM)
△	BORING 4 @ 20.5	GRAY SILTY SAND (SM)

PARTICLE SIZE ANALYSIS

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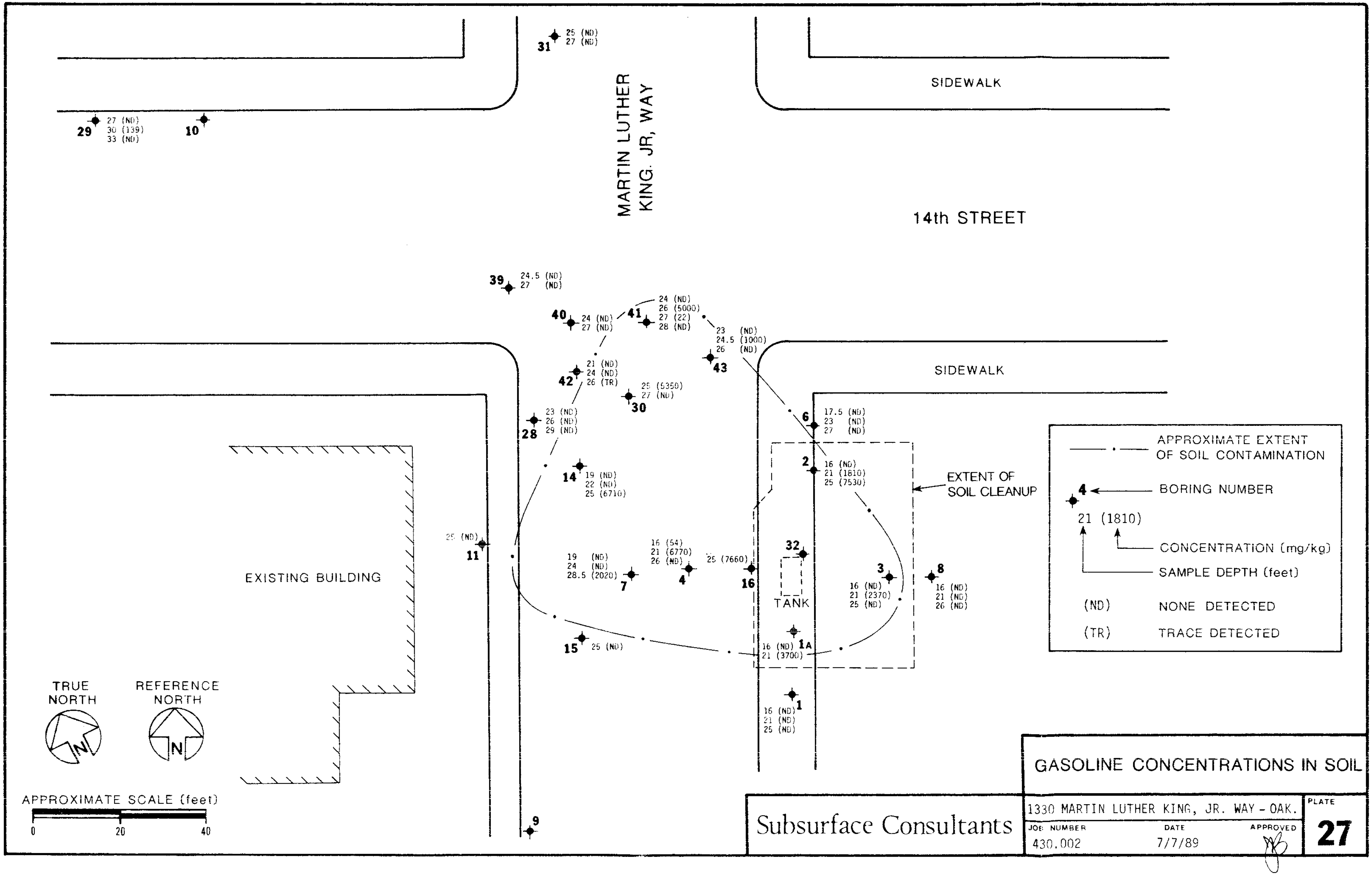
1330 MARTIN LUTHER KING JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88		26



GASOLINE CONCENTRATIONS IN SOIL

1330 MARTIN LUTHER KING, JR. WAY - OAK.

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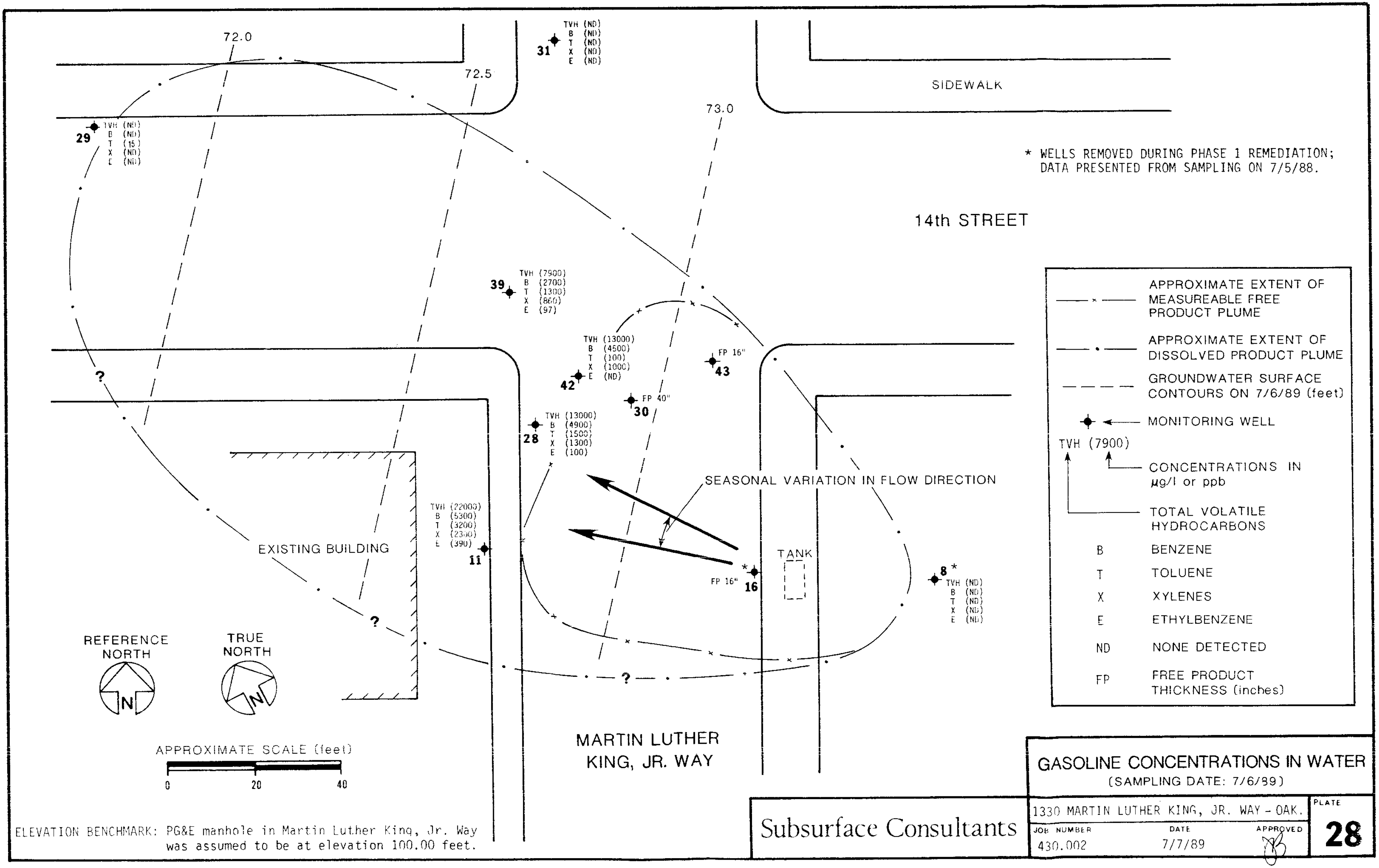
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89		27



* WELLS REMOVED DURING PHASE 1 REMEDIATION; DATA PRESENTED FROM SAMPLING ON 7/5/88.

ELEVATION BENCHMARK: PG&E manhole in Martin Luther King, Jr. Way was assumed to be at elevation 100.00 feet.

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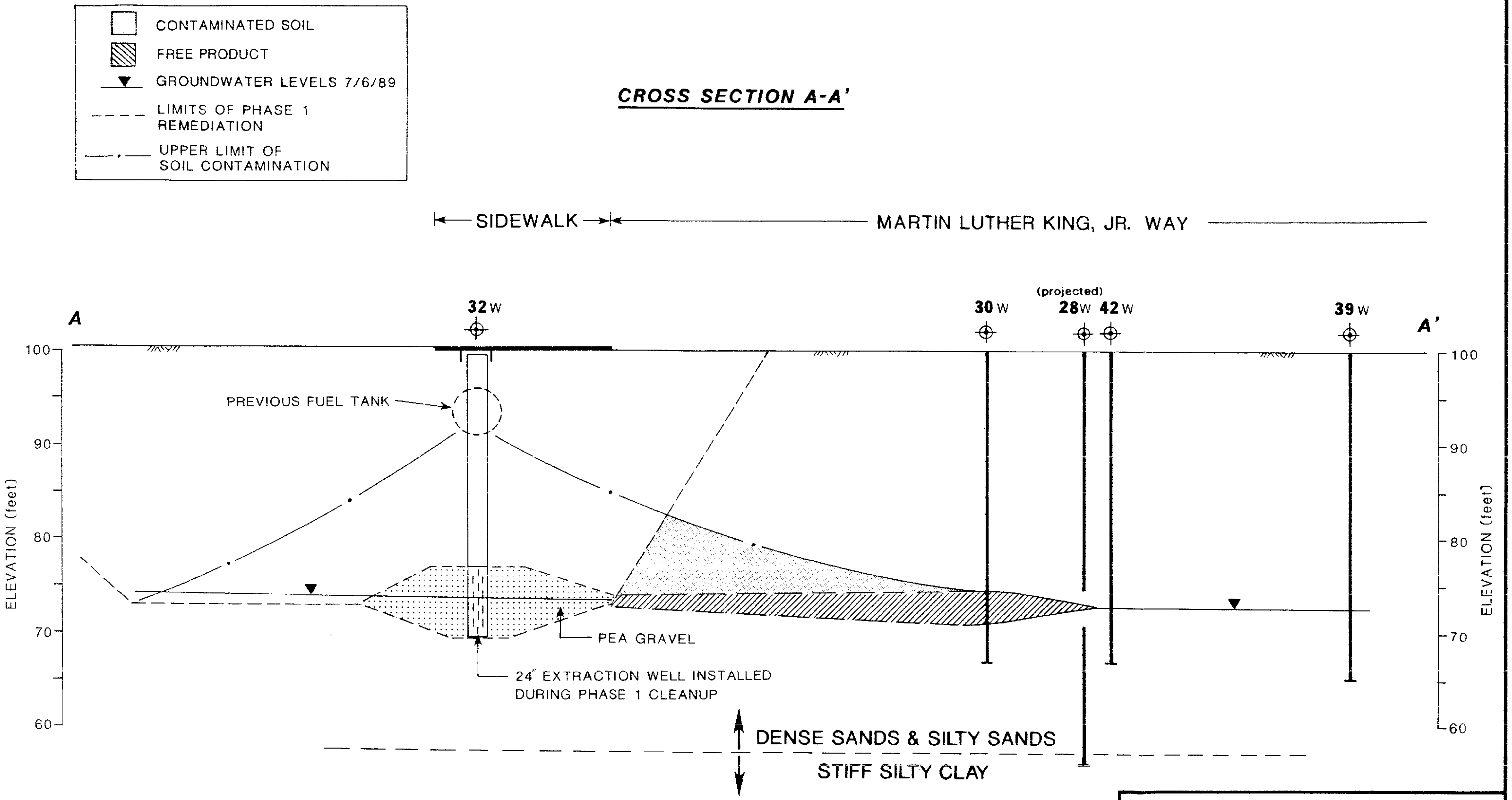
GASOLINE CONCENTRATIONS IN WATER

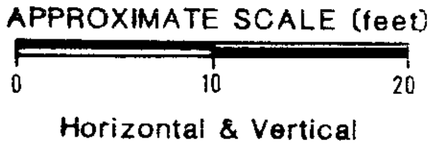
(SAMPLING DATE: 7/6/89)

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/7/89	RB	28

CROSS SECTION A-A'





CROSS SECTION

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY - OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/19/89		29

BORING 1A

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

JOB NUMBER: 14810
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK

DATE RECEIVED: 06/07/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	SAMPLE ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14810-1	1 @ 16′	ND(10)	ND(10)	ND(10)
14810-2	1 @ 21′	3,700	ND(10)	ND(10)

		GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
14810-3	BORING 1	68	ND(10)	ND(10)

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

Duplicate: Relative % Difference	4
Spike: % Recovery	112

Laboratory Director

Curtis & Tompkins, Ltd.

BORING 1A

LABORATORY NUMBER: 14810-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK
SAMPLE ID: BORING 1

DATE RECEIVED: 06/08/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	4,200	100
Toluene	4,800	500
Ethyl Benzene	1,700	100
Total Xylenes	12,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

%RPD	4
%RECOVERY	118

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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LABORATORY NUMBER: 14984A
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-1	1 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-2	1 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-3	1 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-4	2 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-5	2 @ 21.0	1,810	26.3	42.5	154	24.8
14984-6	2 @ 25.5	7,530	29.5	447	752	87.9
14984-7	3 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-8	3 @ 21.0	2,370	15.9	39.2	199	31.0
14984-9	3 @ 25.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

LABORATORY DIRECTOR

LABORATORY NUMBER: 14984
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 2 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-10	4 @ 16.0	54.0	ND(0.1)	ND(0.1)	3.0	0.5
14984-11	4 @ 21.0	6,770	21.9	158	598	101
14984-12	4 @ 26.0	ND(10)	ND(0.1)	0.2	ND(0.1)	ND(0.1)
14984-13	6 @ 17.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-14	6 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-15	6 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-16	7 @ 19.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-17	7 @ 28.5	2,020	32.8	74.6	152	26.5
14984-18	8 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-19	8 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-20	8 @ 26.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

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LABORATORY NUMBER: 14983
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 06-28-88
DATE REPORTED: 06-29-88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14983-1	7 @ 24.0	987	ND(1)	16	64	12

QA/QC SUMMARY

%RPD	<1
%RECOVERY	81

LABORATORY DIRECTOR

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LABORATORY NUMBER: 15050
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY, FUEL TANK

DATE RECEIVED: 07/05/88
DATE EXTRACTED: 07/12/88
DATE ANALYZED: 07/15/88
DATE REPORTED: 07/18/88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15050-1	11@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-2	12@ 23.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-3	14@ 19.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-4	14@ 22.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-5	14@ 25.0'	6,710	38.9	324	735	122
15050-6	15@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-7	16@ 25.0'	7,660	39.3	257	719	117

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	4	--	3	1	1
%RECOVERY	--	93	96	95	91

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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LABORATORY NUMBER: 15066
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-08-88
DATE REPORTED: 07-20-88
PAGE 1 OF 4

Total Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
15066-1	WELL #8	TRACE	ND(0.05)	ND(0.05)
15066-2	WELL #11	10	ND(0.05)	ND(0.05)
15066-3	WELL #16	90	ND(0.05)	ND(0.05)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	7
Spike: % Recovery	112

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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LABORATORY NUMBER: 15066-1
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #8

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

LABORATORY NUMBER: 15066-2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #11

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	1,800	100
Toluene	ND	100
Ethyl Benzene	ND	100
Total Xylenes	1,200	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

LABORATORY NUMBER: 15066-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #16

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	3,100	100
Toluene	2,700	100
Ethyl Benzene	ND	100
Total Xylenes	5,500	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

JOB NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-22-88
DATE REPORTED: 07-01-88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14932-1	1,000	ND(10)	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	21
Spike: % Recovery	87

Laboratory Director

LABORATORY NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-30-88
DATE REPORTED: 07-01-88
PAGE 2 OF 2

EPA 8020: Volatile Aromatic Hydrocarbons in Soils & Wastes
Extraction Method: EPA 5030 - Purge & Trap

COMPOUND	Result ug/Kg	LOD ug/Kg
Benzene	790	100
Toluene	1,200	500
Ethyl Benzene	7,300	100
Total Xylenes	38,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	6
Average Spike Recovery %	89

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15445
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/19/88
DATE ANALYZED: 08/29/88
DATE REPORTED: 08/30/88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15445-1	28 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-2	28 @ 26.0	ND(10)	0.2	0.2	4.0	ND(0.1)
15445-3	28 @ 29.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-4	29 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-5	29 @ 30.0	139 *	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15445-6	29 @ 33.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

* Fingerprint pattern does not match hydrocarbon standard. Quantitation based on gasoline standard.

QA/QC SUMMARY

%RPD	<1	8	16	<1	<1
%RECOVERY	98	95	96	101	100

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15445-5
CLIENT: SUBSURFACE CONSULTANTS
SAMPLE ID: 29 @ 30.0
JOB #: 430.002

DATE RECEIVED: 08-19-88
DATE ANALYZED: 08-29-88
DATE REPORTED: 09-07-88
PAGE 2 OF 2

EPA 8010: Volatile Halocarbons in Soil & Wastes
Extraction Method: EPA 5030 - Purge & Trap

Compound	Result ug/Kg	LOD ug/Kg
chloromethane	ND	25
bromomethane	ND	25
vinyl chloride	ND	25
chloroethane	ND	25
methylene chloride	ND	25
trichlorofluoromethane	ND	25
1,1-dichloroethene	ND	25
1,1-dichloroethane	ND	25
trans-1,2-dichloroethene	ND	25
chloroform	ND	25
freon 113	ND	25
1,2-dichloroethane	ND	25
1,1,1-trichloroethane	ND	25
carbon tetrachloride	ND	25
bromodichloromethane	ND	25
1,2-dichloropropane	ND	25
cis-1,3-dichloropropene	ND	25
trichloroethylene	ND	25
1,1,2-trichloroethane	ND	25
trans-1,3-dichloropropene	ND	25
dibromochloromethane	ND	25
2-chloroethylvinyl ether	ND	25
bromoform	ND	25
tetrachloroethene	ND	25
1,1,2,2-tetrachloroethane	ND	25
chlorobenzene	ND	25
1,3-dichlorobenzene	ND	25
1,2-dichlorobenzene	ND	25
1,4-dichlorobenzene	ND	25
1,2-dibromoethane (EDB)	ND	25

ND = None Detected. Limit of detection (LOD) in last column.

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15518
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/29/88
DATE ANALYZED: 09/09/88
DATE REPORTED: 09/12/88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15518-1	30 @ 25.0	5,350	36.4	120	383	71.4
15518-2	30 @ 27.0	ND(10)	0.3	0.3	0.1	ND(0.1)
15518-3	31 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15518-4	31 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

QA/QC SUMMARY

%RECOVERY	97	91	84	82	81

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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LABORATORY NUMBER: 15518
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK JR. WAY & 14th ST.

DATE RECEIVED: 08/29/88
DATE ANALYZED: 09/09/88
DATE REPORTED: 09/12/88
PAGE 2 OF 2

LAB ID	SAMPLE ID	1,2-dibromoethane (EDB) EPA 8010 (ug/Kg)
15518-1	30 @ 25.0	ND(100)

LAB ID	SAMPLE ID	Organic Lead DHS Method May 1988 LUFT Manual (mg/Kg)
15518-1	30 @ 25.0	ND(1.0)

ND = Not Detected; Limit of Detection in parentheses.

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LABORATORY NUMBER: 17124
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/07/89
DATE REPORTED: 04/20/89

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17124-1	39 @ 24.5	ND(10)
17124-2	39 @ 27.0	ND(10)
17124-3	40 @ 24.0	ND(10)
17124-4	40 @ 27.0	ND(10)
17124-5	41 @ 24.0	ND(10)
17124-6	41 @ 26.0	5,000
17124-7	41 @ 27.0	22
17124-8	41 @ 28.0	ND(10)
17124-9	42 @ 21.0	ND(10)
17124-10	42 @ 24.0	ND(10)
17124-11	42 @ 26.0	TRACE
17124-12	43 @ 23.0	ND(10)
17124-13	43 @ 24.5	1,000
17124-14	43 @ 26.0	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	6
Spike, % Recovery	114

for CBG
LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17135
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK & 14TH STREET

DATE RECEIVED: 04/04/89
DATE ANALYZED: 04/06/89
DATE REPORTED: 04/17/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17135-1	11	53,000	7,100	4,000	380	2,400
17135-2	29	450	ND(1.0)	2.0	2.0	6.7
17135-3	31	ND(50)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
17135-4	39	2,000	250	11	ND(1.0)	210

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	5
%RECOVERY	142

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street Berkeley CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17135
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK & 14TH STREET

DATE RECEIVED: 04/04/89
DATE ANALYZED: 04/06/89
DATE REPORTED: 04/17/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17135-1	11	53,000	7,100	4,000	380	2,400
17135-2	29	450	ND(1.0)	2.0	2.0	6.7
17135-3	31	ND(50)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
17135-4	39	2,000	250	11	ND(1.0)	210

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	5
%RECOVERY	142

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-12-88
DATE REPORTED: 09-22-88
PAGE 1 OF 3

ORGANIC LEAD IN AQUEOUS SOLUTIONS
DHS METHOD
MAY 1988 LUFT MANUAL

LAB ID	CLIENT ID	ORGANIC LEAD mg/L
15578-1	28	ND(0.1)
15578-2	29	ND(0.1)
15578-3	31	ND(0.1)

ND = NONE DETECTED; LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	<1
%RECOVERY	98

LABORATORY DIRECTOR

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-15-88
DATE REPORTED: 09-21-88
PAGE 2 OF 3

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	TOTAL XYLENES (ug/L)	ETHYL BENZENE (ug/L)
15578-1	28	890	431	75.4	84.0	ND(1)
15578-2	29	ND(50) *	ND(1)	8.1	ND(1)	ND(1)
15578-3	31	ND(50)	ND(1)	ND(1)	ND(1)	ND(1)

* Sample contains hydrocarbons not quantifiable as gasoline.

ND = NONE DETECTED; LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	24	2	6	8	<1
%RECOVERY	138	103	105	103	104

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15578
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002/ML KING TANK

DATE RECEIVED: 09-06-88
DATE ANALYZED: 09-06-88
DATE REPORTED: 09-22-88
PAGE 3 OF 3

1,2-Dibromoethane (EDB)
EPA 601

LAB ID	SAMPLE ID	EDB (ug/L)
15578-1	28	9.2
15578-2	29	ND(1)
15578-3	31	ND(1)

ND = None Detected. Limit of detection is indicated in parentheses.

QA/QC:

Duplicate: Relative % Difference	3
Average Spike Recovery %	132

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

RECEIVED
JUL 19 1989
AM 7,8,9,10,11,12,1,2,3,4,5,6 PM

DATE RECEIVED: 07/06/89
DATE REPORTED: 07/13/89
PAGE 1 OF 4

LAB NUMBER: 17785

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 6 WATER SAMPLES

JOB #: 430.002
LOCATION: MLK TANK

RESULTS: SEE ATTACHED

Laboratory Director

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/13/89
PAGE 2 OF 4

ANALYSIS: ORGANIC LEAD
METHOD REFERENCE: DHS LUFT MANUAL 1988

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17785-1	11	ND	mg/L	0.2
17785-2	28	ND	mg/L	0.2
17785-3	29	ND	mg/L	0.2
17785-4	31	ND	mg/L	0.2
17785-5	39	ND	mg/L	0.2
17785-6	42	ND	mg/L	0.2

ND = NOT DETECTED.

QA/QC:

RPD, %	2
RECOVERY, %	118

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.002
LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/13/89
DATE REPORTED: 07/17/89

ANALYSIS: ETHYLENE DIBROMIDE
METHOD REFERENCE: EPA 504

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17785-1	11	26	ug/L	0.05
17785-2	28	27	ug/L	0.05
17785-3	29	ND	ug/L	0.05
17785-4	31	ND	ug/L	0.05
17785-5	39	3	ug/L	0.05
17785-6	42	8	ug/L	0.05

ND = NOT DETECTED.

QA/QC:

RPD, %	2
RECOVERY, %	111

LABORATORY NUMBER: 17785
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: MLK TANK

DATE RECEIVED: 07/06/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/13/89
PAGE 4 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17785-1	11	22,000	5,300	3,200	390	2,300
17785-2	28	13,000	4,900	1,500	100	1,300
17785-3	29	ND(50)	ND(1)	15	ND(1)	ND(1)
17785-4	31	ND(50)	ND(1)	ND(1)	ND(1)	ND(1)
17785-5	39	7,900	2,700	1,300	97	860
17785-6	42	13,000	4,500	100	ND(25)	1,000

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	6
%RECOVERY	111

Subsurface Consu! ınts

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: BRAMALEA PACIFIC TANK

SCI Job Number: 430.001

Project Contact at SCI: JERIANN ALEXANDER

Sampled By: SEAN CARSON

Analytical Laboratory: CURTIS & TOMPKINS

Analytical Turnaround: VERBAL RESULTS BY FRI 6/10/88

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
1@16'	S	T	6/6/88		TPH	8015 w/SONICATION
1@21'	S	T	✓		TPH	8015 w/SONICATION
BORING 1	W	VOA-3	✓		TPH/BTXE	8015/602

* * * * * *

Released by: Date: 6/8/88

Released by Courier: Date:

Received by Laboratory: Gabriella Stephan Date: 6/8/88

Relinquished by Laboratory: Date:

Received by: Date:

[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: Martin Luther King Jr Way & 14th STREET FUEL TANK

SCI Job Number: 430 002

Project Contact at SCI: Jim Bowers / Tom TEBB

Sampled By: TT

Analytical Laboratory: Curtis & Tompkins, Ltd.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
24 @ 23.0'	S	T	8-17-88		TVH & BTX & E	
24 @ 26.0'	S	T	8-17-88		↓	
24 @ 29.0'	S	T	8-17-88		↓	
25 @ 27.0	S	T	8-17-88		TVH & BTX & E	} EPA 8010 + EDB
25 @ 30.0	S	T	8-17-88		↓	
25 @ 33.0	S	T	8-17-88		↓	

* * * * * *

Released by: Date: 8/19/88

Released by Courier: Date:

Received by Laboratory: Date: 8/19/86

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans

-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: MLK JR WAY AND 14th STREET FUEL TANK

SCI Job Number: 430.002

Project Contact at SCI: Jim Bowers / Tom TEBB

Sampled By: Juci A.

Analytical Laboratory: Curtis & Tompkins, Ltd

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
30 @ 25.0'	S	T	8-26-88		TVH & BTX & E, ORGANIC LEAD AND EDB	
30 @ 27.0'	S	T	8-26-88		TVH & BTX & E, ~~ORGANIC LEAD AND EDB~~	
31 @ 25.0'	S	T	8-26-88		TVH & BTX & E	
31 @ 27.0'	S	T	8-26-88		TVH & BTX & E	

* * * * * *

Released by: **Date:** 8/29/88

Released by Courier: **Date:**

Received by Laboratory: **Date:** 8/29/88

Relinquished by Laboratory: **Date:**

Received by: **Date:**

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[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: Mc King Tank
SCI Job Number: 430.002
Project Contact at SCI: JIM BOWERS
Sampled By: T. TEBB
Analytical Laboratory: Curtis + Thompsons, Ltd.
Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
28	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	
29	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	

* * * * * *

Released by: Jon Alexander Date: 9/6/88
Released by Courier: Date:
Received by Laboratory: Gabriella Stephan Date: 9/6/88
Relinquished by Laboratory: Date:
Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: ML KING TANK

SCI Job Number: 430.002

Project Contact at SCI: JIM BOWERS

Sampled By: T. TEBB

Analytical Laboratory: Curtis & Thompkins, Ltd.

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
31	W	4 - V	9/2/88		TVH	
		1 - G	9/2/88		BTX + E	
					EDB	
					TEL	

* * * * * *

Released by: Jim Alexander Date: 9/6/88

Released by Courier: Date:

Received by Laboratory: Gabriella Stephan Date: 9/6/88

Relinquished by Laboratory: Date:

Received by: Date:

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube,
O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: ML King TANK

SCI Job Number: 430.002

Project Contact at SCI: S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
39 @ 24.5' &c	S	T	3/29/89		TVH	
39 @ 27' &c	S	T	3/29/89		TVH	
40 @ 24'	S	T	3/29/89		TVH	
40 @ 27'	S	T	3/29/89		TVH	
[illegible]						
41 @ 24'	S	T	3/29/89		TVH	
41 @ 26	S	T	↓		TVH	
41 @ 27	S	T			TVH	
41 @ 28	S	T			TVH	

* * * * * *

Released by: ______ Date: 3/31/89

Released by Courier: ______ Date: ______

Received by Laboratory: ______ Date: 3/31/89 1700

Relinquished by Laboratory: ______ Date: ______

Received by: ______ Date: ______

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: ML King TANK

SCI Job Number: 430.002

Project Contact at SCI: S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
42 @ 21'	S	T	3/29/89		TVH	
42 @ 24'	S	T	↓		TVH	
42 @ 26	S	T	↓		TVH	
43 @ 23'	S	T	3/30/89		TVH	
43 @ 24.5'	S	T	↓		TVH	
43 @ 26	S	T	↓		TVH	

* * * * * *

Released by: Date: 3/31/89

Released by Courier: Date:

Received by Laboratory: Date: 3/31/89 1700

Relinquished by Laboratory: Date:

Received by: Date:

---

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: MLK + 14th Street

SCI Job Number: 430.001

Project Contact at SCI: Sean Carson

Sampled By: Chris O'Dea

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
11'	W	V	4/3/89		TVH/BTXE	[illegible]
29'	W	V	4/3/89		TVH/BTX	[illegible]/6[illegible]
31'	W	V	4/3/89		TVH/BTX	[illegible]/6[illegible]
29'	W	V	4/3/89		TVH/BTX	[illegible]/6[illegible]
*	T[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* * * * * *

Released by: Date: 4/4/89

Released by Courier: Date:

Received by Laboratory: Gabriella Stephan. Date: 4/4/89

Relinquished by Laboratory: Date:

Received by: Date:

---

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: MLK tank

SCI Job Number: 436.002

Project Contact at SCI: [illegible]

Sampled By: John Wolfe

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: 5 day

Sample ID	Sample Type^1	Container Type^2	Sampling Date	Hold	Analysis	Analytical Method
11	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
22	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
29	W	4 V 1 G	7/5/89		TVH-G BTXE EDB TEL	
31	W	4 V 1 G	7/5/89		TVH-G BTXE EDB TEL	
39	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
42	W	4 V 1 G	7/6/89		TVH-G BTXE EDB TEL	
*	*	*	*	*	*	

Released by: John Wolfe Date: 7/6/89

Released by Courier: Date:

Received by Laboratory: Nancy Wi[illegible] Date: 7/6/89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

8-22-89

■ Subsurface Consultants, Inc.

8/23/89

GASOLINE CONTAMINATION ASSESSMENT
13th & JEFFERSON STREETS
OAKLAND, CALIFORNIA
SCI 430.003

Prepared for:

Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

By:

R. William Rudolph

R. William Rudolph
Geotechnical Engineer 741 (expires 12/31/92)

Ross William Rudolph
No. GE 000741

James P. Bowers
Geotechnical Engineer 157 (expires 3/31/91)

James P. Bowers
No. GE 000157

Subsurface Consultants, Inc.
171 12th Street, Suite 201
Oakland, California 94607
(415) 268-0461

August 22, 1989

James P. Bowers, PE
R. William Rudolph, Jr., PE

8/23/89

LETTER OF TRANSMITTAL

TO:
Ms. Katherine Chesick
Alameda County Health Care Services Agency
80 Swan Way, Suite 200
Oakland, California 94621

DATE: August 23, 1989
PROJECT 13th & Jefferson Streets
SCI JOB NUMBER: 430.003

WE ARE SENDING YOU:
2 copies
☒ of our final report
☐ a draft of our report
☐ a Service Agreement
☐ a proposed scope of services
☐ specifications
☐ grading/foundation plans
☐ soil samples/groundwater samples
☐ an executed contract
☐ ____________________

☒ if you have any questions, please call
☐ for your review and comment
☐ please return an executed copy
☐ for geotechnical services
☐ with our comments
☐ with Chain of Custody documents
☒ for your use
☐ ____________________
☐ ____________________

REMARKS: Enclosed are 2 copies of our Gasoline Contamination assessment at 13th & Jefferson Streets in response to a violation letter regarding this project, received August 22, 1989.

~~COPIES TO:~~ Received by: Mendoza a.
Date: 8/23/89

BY: Sean O Carson
Sean Carson

Subsurface Consultants, Inc.

171 12th Street • Suite 201 • Oakland, California 94607 • Telephone 415-268-0461

I INTRODUCTION

This report records the results of a gasoline contamination assessment performed by Subsurface Consultants, Inc. (SCI) near the northwest corner of the intersection of 13th and Jefferson Streets in Oakland, California. The location of the site is shown on the Site Plan, Plate 1.

SCI performed a preliminary environmental assessment of the site and recorded the results in a report dated September 14, 1988. During that assessment, indications of petroleum hydrocarbon contamination (gasoline) were detected in the area of current study.

The purpose of our latest assessment was to further define the extent of soil contamination and investigate possible groundwater contamination. The scope of the investigation included drilling test borings, obtaining soil samples from within the borings, installing a groundwater monitoring well and performing analytical tests on soil and groundwater samples.

During this study, emphasis was placed on defining the extent of soil contamination. Groundwater contamination will be addressed in subsequent phases of study, once soil remediation is complete.

Lead and polynuclear aromatic hydrocarbons were detected in the surface soils near the northwest corner of the intersection of 13th and Jefferson Streets. These materials overlie areas containing gasoline contaminated soils. SCI's report dated January 16, 1989 records the results of studies addressing this problem.

II FIELD INVESTIGATION

Subsurface conditions were explored by drilling 40 test borings ranging from 25 to 35 feet deep. Boring locations are shown on Plate 2. Test Boring 44 was converted to a groundwater monitoring well. Test Borings 5, 12, 19 and 24 thru 27 were drilled during a previous investigation. Test Borings 34 thru 38, and 44 thru 71 were drilled during the latest phase of investigation. The test borings were drilled with a truck-mounted drill rig equipped with 8-inch-diameter, hollow-stem and solid flight augers.

A member of our engineering staff observed drilling operations and prepared detailed logs of the borings. Soil samples were obtained from the borings using a California Drive sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches. The sampler was driven with a 140-pound hammer having a drop of 30 inches. The blow counts required to drive the sampler the final 12 inches of an 18-inch penetration were recorded and are shown on the Boring Logs, Plates 3 through 35. Soils are classified in accordance with the Unified Soil Classification System described on Plate 36.

Soil samples were retained in brass sample liners. Samples for environmental analysis were capped and sealed with plastic tape. Aluminum foil or Teflon sheeting was placed between the caps and the soil samples. Upon sealing and labeling, the samples were promptly refrigerated on-site in ice chests. The samples remained under refrigeration until delivered to the laboratory.

All augers, drill rods, samplers, well casing, etc., that were placed into the test borings were steam-cleaned prior to their initial use and before each subsequent use to reduce the likelihood of cross contamination between borings. All borings near the PNA contaminated area were backfilled with a cement/bentonite grout.

The groundwater monitoring well was constructed of 2-inch-diameter, Schedule 40 PVC pipe having flush threaded joints. The lower portion of the well consists of machine-slotted well screen having 0.020 inch wide slots. The annular space around the screened section was backfilled with Lone Star #3 sand. A bentonite seal, approximately 12 inches thick, was placed above the sand. The annulus above the bentonite seal was backfilled with a cement/bentonite grout. The well was finished above grade and is secured by a locking steel cover. Specific details of the well are shown on the log for Test Boring 44.

The well was developed by removing water with a Teflon bailer until the water became relatively free of turbidity. After development, the well was sampled with a Teflon sampling device. The bailer and sampler were steam-cleaned prior to their use to limit the likelihood of cross contamination of the well. The water sample was promptly refrigerated on-site in an ice chest. All soil and water samples remained refrigerated until delivered to the analytical laboratory. Chain-of-custody documents accompanied all samples to the laboratory.

Groundwater levels were recorded in Well 44 and in two other wells to evaluate the groundwater gradient and flow direction. The other wells are #11 and #31; they were installed during a fuel leak assessment at 1330 Martin Luther King, Jr. Way. Well locations are shown on Plate 1.

III SITE CONDITIONS

A. Site History

The site was occupied by the 20th Century Garage from 1930 to 1943. According to individuals who lived in the area, the facility dispensed gasoline. The location and ultimate disposition of the fuel tanks is uncertain. We have been unable to locate any information documenting their location or removal. The property was subsequently purchased by the City of Oakland in the early 1940's and used as the Oakland Police Department (OPD) garage. The OPD garage was used to service/fuel city vehicles. Discussions with past city employees confirm the presence of gasoline storage/dispensing facilities. However, specific details of tank locations/capacities are unavailable. Unsubstantiated information suggests that as many as three, 300-

gallon fuel tanks existed beneath the sidewalk along 13th Street, near its intersection with Jefferson Street. Excavations made by SCI during past site demolition activities, revealed pipelines extending from the southeast corner of the property below the sidewalks along Jefferson and 13th Streets. The pipelines were typical of those used to dispense gasoline from underground tanks. However, no tanks were discovered.

B. Subsurface Conditions

1. Soil Conditions

Our test borings indicate that soil conditions in the area are relatively uniform. The upper 12 to 15 feet of soil consists of a clayey sand. These materials are medium dense and contain appreciable quantities of silt and clay. Below this surface layer are sands containing significantly less silt and clay. With depth, the silt and clay content in the sand decreases significantly. Boring 36 encountered clean sand fill within the upper 12 feet of the boring. We suspect that it may be associated with underground tank backfill. Gasoline odors were noted in the soils encountered in many of the test borings.

2. Groundwater

Groundwater was encountered at a depth of 26.5 feet below the groundsurface. This depth corresponds to an elevation[1] of 75.72 feet. Based on this data, and groundwater

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[1] Assumed datum: The elevation of the PG&E manhole in Martin Luther King, Jr. Way, near the northwest corner of the block, was assumed to have an elevation of 100 feet (see Plate 1). *

level data from other wells in the area, it is apparent that groundwater is flowing toward the northwest at a gradient of approximately 0.5 percent. Groundwater level data recorded in the wells are summarized in Table 1. The direction of groundwater flow is shown on Plate 1. The indicated groundwater flow direction and gradient are consistent with those documented during other previous studies in the area.

Table 1. GROUNDWATER ELEVATION DATA

		Well 11	**Well 31**	**Well 44**
Top of Casing (ft)		99.66	98.90	102.24
Date				
4/3/89	Depth	26.35	25.90	26.39
	Elevation	73.31	73.00	75.85
5/4/89	Depth	26.45	25.89	26.52
	Elevation	73.21	73.01	75.72
6/7/89	Depth	26.75	26.11	26.90
	Elevation	72.91	72.79	75.34
8/7/89	Depth	27.03	26.40	27.36
	Elevation	72.63	72.50	74.88

Gasoline odors were noted in water removed from Well 44. However, free floating product was not present. Water and gasoline sensitive pastes, applied to a metal tape, were used to check the well for free floating product.

IV ANALYTICAL TESTING

Soil and groundwater samples were transported to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services (DHS) to conduct hazardous waste and water testing. The samples were tested for total volatile hydrocarbons (TVH) and purgeable aromatic compounds (BTXE) in accordance with EPA Methods 8015/5030 and 8020, respectively. Laboratory test reports are presented in the Appendix. Several soil samples were also analyzed for total petroleum hydrocarbons in accordance with the EPA 8015/3550 (sonication) test method and for total oil and grease (O&G). In addition, selected soil samples were analyzed for tetraethyl lead (TEL) and ethyl dibromide (EDB). The analytical test results for soil samples are summarized in Table 2. Groundwater analysis results are presented in Table 3. The TVH analytical results are also summarized on Plate 2.

The engineering properties of the materials encountered were evaluated by laboratory tests. The testing program included moisture content/dry density determinations, shear strength, and percent passing a #200 sieve. The test results are presented on the boring logs.

Table 2. CONTAMINANT CONCENTRATIONS IN SOIL

Sample[2]	TVH (mg/kg[3])	Benzene (mg/kg)	Toluene (mg/kg)	Total Xylenes (mg/kg)	Ethyl Benzene (mg/kg)
12 @ 23	ND				
19 @ 27	21				
24 @ 18	ND[4]	ND	ND	ND	ND
24 @ 23	88.3	ND	ND	3.51	1.56
24 @ 27.5	2,310	ND	43.5	167.0	54.7
25 @ 23	19.9	ND	0.16	0.86	0.21
26 @ 23	ND	ND	ND	0.17	ND
27 @ 18	ND	ND	ND	0.11	ND
27 @ 23.5	516	ND	3.59	34.4	11.6
27 @ 28	ND	ND	ND	0.23	0.13
34 @ 21	ND	[5]			
34 @ 25	ND				
34 @ 28	ND				
35 @ 16	ND				
35 @ 21	ND				
35 @ 26	ND	ND	ND	ND	ND
36 @ 20.5	ND				
36 @ 25.5	1,800				
36 @ 30	79				
37 @ 20.5	ND				
37 @ 25	Trace				
37 @ 27.5	ND				
38 @ 20.5	ND				
38 @ 25.5	190	ND	ND	7.4	3.1
38 @ 28.5	ND				
44 @ 21	Trace	.036	.055	.34	1.2
44 @ 26	590				
44 @ 31	800				
45 @ 26	ND				
45 @ 16	ND				
45 @ 21	ND				

Sample[2]	TVH (mg/kg[3])	Benzene (mg/kg)	Toluene (mg/kg)	Total Xylenes (mg/kg)	Ethyl Benzene (mg/kg)
46 @ 20.5	83				
46 @ 24	470				
46 @ 27	ND				
47 @ 21	ND				
47 @ 25	404				
47 @ 28	12				
47 @ 31	ND				
48 @ 16	ND				
48 @ 21	ND				
48 @ 26	63				
49 @ 21	25				
49 @ 25.5	38				
49 @ 27.5	600				
50 @ 22.5	ND				
50 @ 25.5	160				
51 @ 26	ND	ND	ND	ND	ND
52 @ 26	ND	ND	.007	ND	ND
53 @ 26	ND	ND	.015	ND	ND
55 @ 24.5	30	ND	.023	.150	.033
57 @ 25.5	14	ND	.014	.075	.015
58 25.5	ND	ND	.018	ND	.013
59 @ 24	29				
59 @ 26	ND				
60 @ 25.5	ND				
61 @ 24.5	ND				
61 @ 26	Trace	.013	.051	.110	.026
62 @ 26	ND				
63 @ 26	ND				
65 @ 24	Trace				
65 @ 26	17				

Sample[2]	TVH (mg/kg[3])	Benzene (mg/kg)	Toluene (mg/kg)	Total Xylenes (mg/kg)	Ethyl Benzene (mg/kg)
66 @ 24.5	21				
66 @ 26	58	ND	.580	1.200	.570
67 @ 22.5	ND				
67 @ 25.5	ND				
69 @ 16	ND	ND	ND	ND	ND
69 @ 24	380				
67 25.5	ND				
70 @ 26	ND				
71 @ 22.5	ND				
71 @ 25.5	ND				

---

[1] TVH = Total Volatile Hydrocarbons, as gasoline

[2] Boring number and sample depth (feet)

[3] mg/kg = milligrams per kilograms or parts per million (ppm)

[4] ND = not detected at concentrations above detection limits; see test reports for detection limits

[5] Blank space indicates test not requested

[6] Oil and grease, SMWW 503

TOTAL EXTRACTABLE HYDROCARBONS
(Sonication Extraction)

Sample	Gasoline	Kerosene	Diesel	Other	O+G[6]
45 @ 16	ND	ND	ND	ND	ND
45 @ 21	ND	ND	ND	ND	ND

Sample	Ethyldibromide (mg/kg)	Tetraethyl Lead (mg/kg)
51 @ 26	ND	ND
52 @ 26	ND	ND
57 @ 25.5	ND	ND
61 @ 26	ND	ND
66 @ 26	ND	ND

Table 3. CONTAMINANT CONCENTRATIONS IN WATER

Sample	Date	TVH (ug/L)	Benzene (ug/L)[7]	Toluene (ug/L)	Total Xylenes (ug/L)	Ethyl Benzene (ug/L)
44W	5/16/89	25	840	910	2230	480

---

[6] Oil and grease, SMWW 503

[7] ug/L = micrograms per liter or parts per billion (ppb)

V DISCUSSION AND CONCLUSIONS

A. General

Our investigation indicates that elevated concentrations of gasoline and the volatile constituents of gasoline, i.e., benzene, toluene, xylene and ethylbenzene (BTXE) are present in the soil and groundwater at the site. The source of these chemicals is believed to be underground fuel tanks that existed previously at the site. The tanks have not been encountered during our field studies and likely have been removed.

In brief, we conclude that the gasoline concentrations are sufficiently high that remediation is appropriate. Current cleanup criteria imposed by County and State regulations typically require that soils containing gasoline concentrations in excess of 100 ppm be remediated. As the data on Plate 2 indicates, concentrations in excess of this value exist in an area extending into Jefferson Street, and across 13th Street.

B. Soil Contamination

The analytical test data indicates that fuel tank leakage has occurred in the past. Gasoline concentrations in the soil (see Plate 2) varied up to 2310 mg/kg (ppm). BTXE concentrations in the soil were found to vary in concentration up to about 167 ppm in the samples analyzed. The approximate extent of soil contamination is shown on Plate 2, and is shown as the extent of contamination at its greatest depth, which is about 27 feet below the groundsurface. Gasoline concentrations significantly exceed

100 ppm and hence, we conclude that remediation of fuel contaminated soil will likely be required. Based on the information generated to date, it appears that soil remediation will be necessary within the area indicated on Plate 2.

The area shown on Plate 2 encompasses areas along the south side of 13th Street where gasoline concentrations are documented to be below 100 ppm. We are recommending that these areas be remediated at this time because of future development plans for the block bounded by 12th, 13th and Jefferson Streets, and Martin Luther King, Jr. Way. We understand that a relatively large, below-ground parking garage will be constructed in the area. Construction is scheduled to begin early next year. We understand that the structure will extend to depths of 30 feet or so and will occupy the entire block, including the area currently occupied by 13th Street. It is our opinion that it would be most appropriate to remediate even the mildly contaminated soils within the confines of the future basement excavation. By doing so, we will be able to minimize health and safety concerns during garage construction.

The analytical test data indicate that over most of the area, contamination exists within a zone of soil situated between depths of about 23 and 28 feet. We suspect that gasoline contaminated soils will exist at shallower depths in areas beneath and near the previous tanks.

For the given site conditions, we conclude that the soil contamination can be most efficiently remediated by excavating and aerating the contaminated soils on site. Once the soils are aerated satisfactorily, we believe that it will be acceptable to utilize the materials to backfill the resulting excavation. However, approval from the Alameda County Health Care Agency to do so, will be necessary. The lateral limits of the contaminated soil requiring remediation are indicated on Plate 2. Our engineer should be present to confirm the extent of remediation during excavation.

The area defined on Plate 2 represents our best estimate of the area containing or potentially containing TVH concentrations in excess of 100 ppm. As the data on Plate 2 indicates, low levels of gasoline contamination, (i.e., up to about ~~20~~ 58 ppm) will remain in the soil below Jefferson Street. Given the fact that (1) these materials are situated at depths of 20 feet or more, (2) relatively small quantities of soil are involved, and (3) significant costs will be incurred to remediate these soils, we conclude that the potential environmental benefits of further remediation are minor. Further, because the area is and will be covered by pavements, sidewalks and buildings, we conclude that it is highly unlikely that the mildly contaminated materials left in-place, will represent a health hazard or a significant, if any, future threat to groundwater quality. For these reasons, we conclude that it will not be necessary to remediate these soils.

C. Groundwater Contamination

Petroleum hydrocarbons, as gasoline, and BTXE were detected in groundwater as a result of past tank leakage. Floating product was not observed in Well 44, which was installed near the area of highest gasoline concentrations. The lateral and vertical extent of the dissolved product plume has not been defined by the data generated to date. We recommend that these studies be conducted after soil remediation is complete.

BTXE concentrations in the groundwater exceed DHS action levels for drinking water. However, we judge that the area will likely not be considered a particularly sensitive groundwater area by the RWQCB. Although unconfirmed, we suspect that groundwater in the area is likely not used as a drinking water source. For this reason, we judge that drinking water standards will not be used to establish clean up levels; some other standard will likely be applicable. The need for and/or scope of any groundwater remediation will have to be negotiated with the RWQCB.

If groundwater cleanup is necessary, we judge that the most appropriate method will involve installing groundwater extraction wells, removing water from the wells by pumping, and treating the contaminated groundwater at a facility utilizing activated carbon filtering methods.

List of Attached Plates:

Plate 1	Site Plan
Plate 2	Gasoline Concentrations in Soil
Plates 3 thru 35	Logs of Borings 34 thru 38, and 44 thru 71
Plate 36	Unified Soil Classification System

Appendix:

Logs of Borings 5, 12, 19 and 24 thru 27
Laboratory Test Reports
Chain of Custody Documents

Distribution:

2 copies:
Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

2 copies:
Ms. Lois Parr
City of Oakland
Office of Economic Development and Employment
1417 Clay Street
Oakland, California 94612

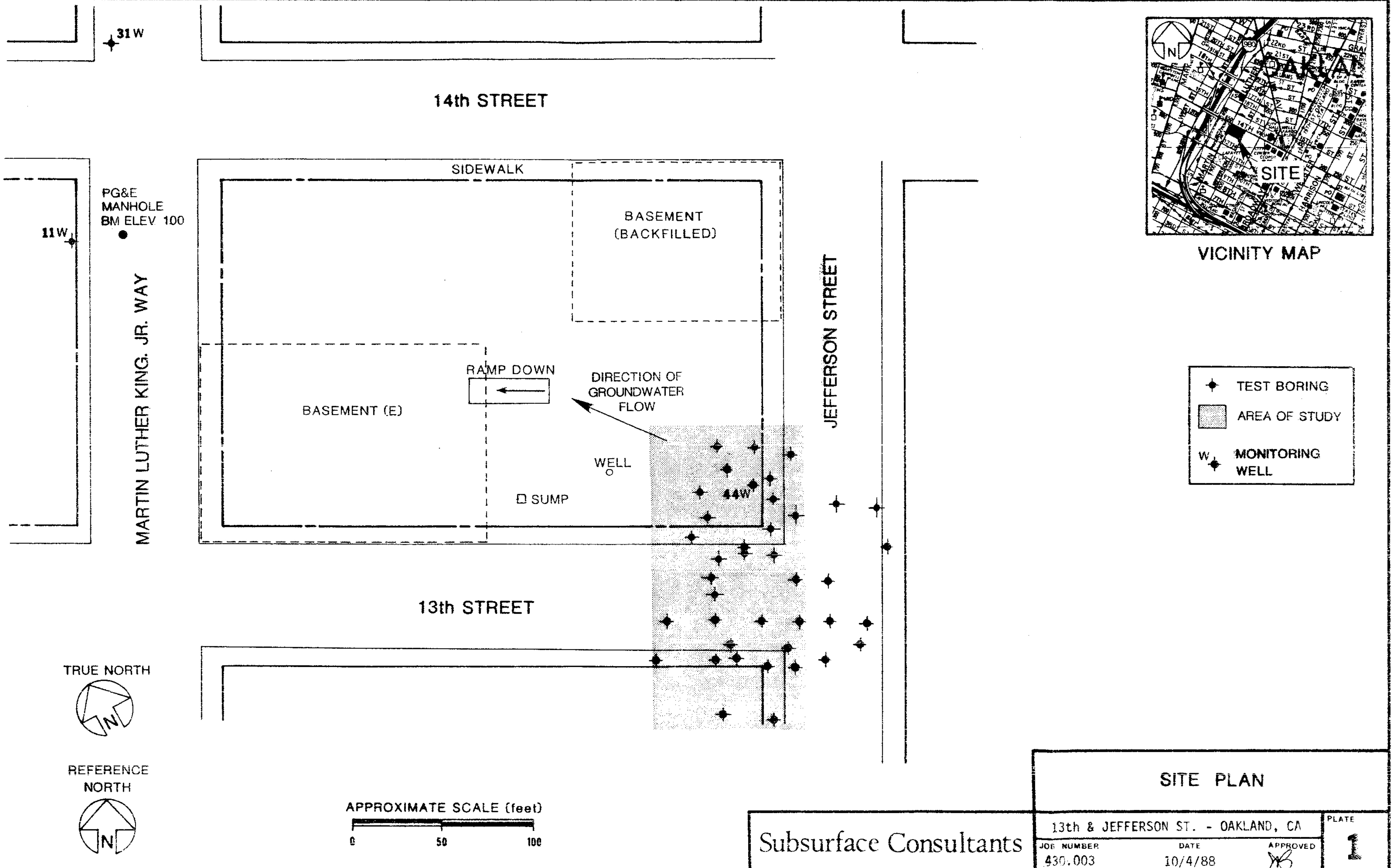
2 copies:
Ms. Katherine Chesick
Alameda County Health Care Services Agency
890 Swan Way, Suite 200
Oakland, California 94621

1 copy:
Mr. Lester Feldman
Regional Water Quality Control Board
1111 Jackson Street, Room 6040
Oakland, California 94607

1 copy:
Mr. Donnell Choy
City of Oakland
One City Hall Plaza
Oakland, California 94612

1 copy:
Mr. Tim Brown
Crosby, Heafey, Roach & May
1999 Harrison Street
Oakland, California 94612

SOC:JPB:RWR:clh

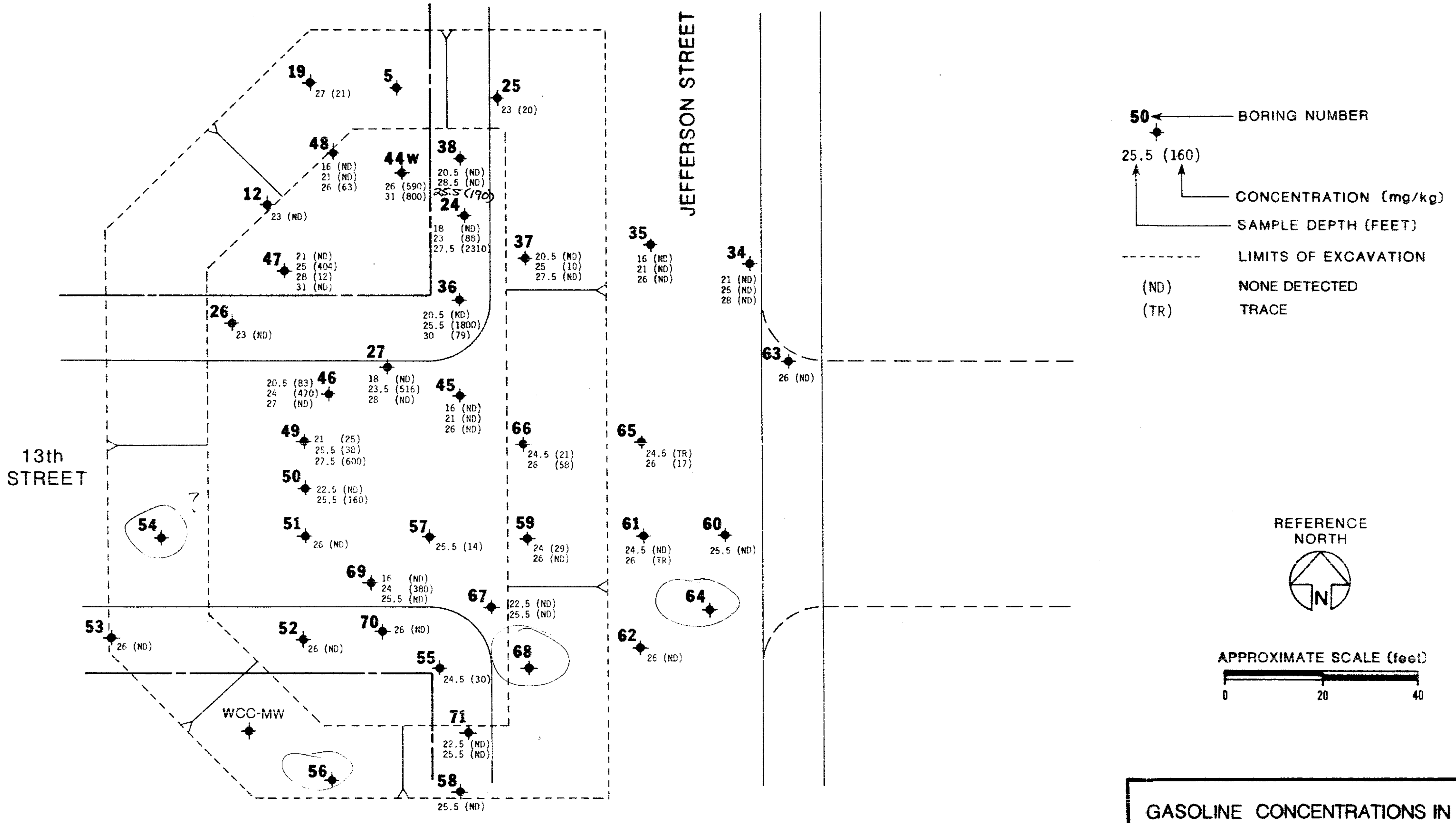


SITE PLAN

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	10/4/88		1



GASOLINE CONCENTRATIONS IN SOIL

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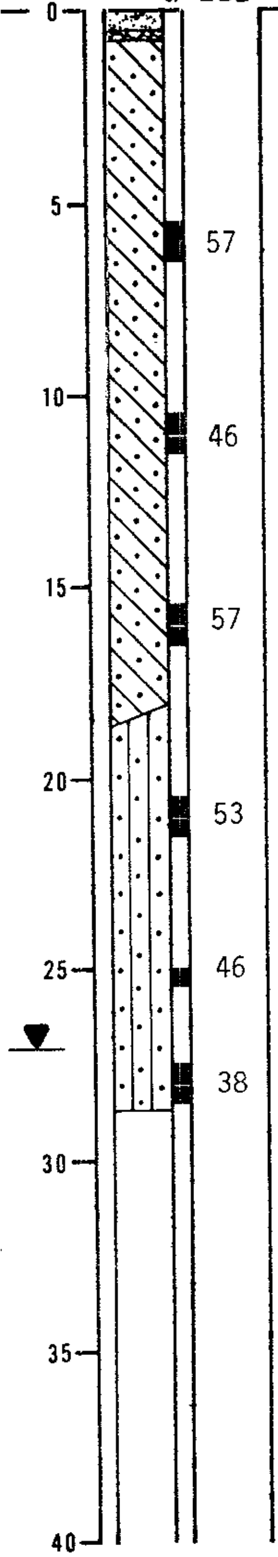
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/11/89		2

LOG OF TEST BORING 34

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 10/12/88
ELEVATION *

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



CONCRETE - 6" thick
BASE ROCK - 3" thick
BROWN CLAYEY SAND (SC)
dense, moist

color change to mottled brown
below 9.0 feet

GRAY-GREEN SILTY SAND (SM/SP)
dense, moist

color change to brown
below 24.5 feet

GROUNDWATER LEVEL 10/12/88

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

*ALL BORINGS ARE SITUATED AT ABOUT
THE SAME ELEVATION

SAMPLER TYPE:
CALIFORNIA DRIVE SAMPLER
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES
HAMMER WEIGHT: 140 POUNDS
HAMMER DROP: 30 INCHES

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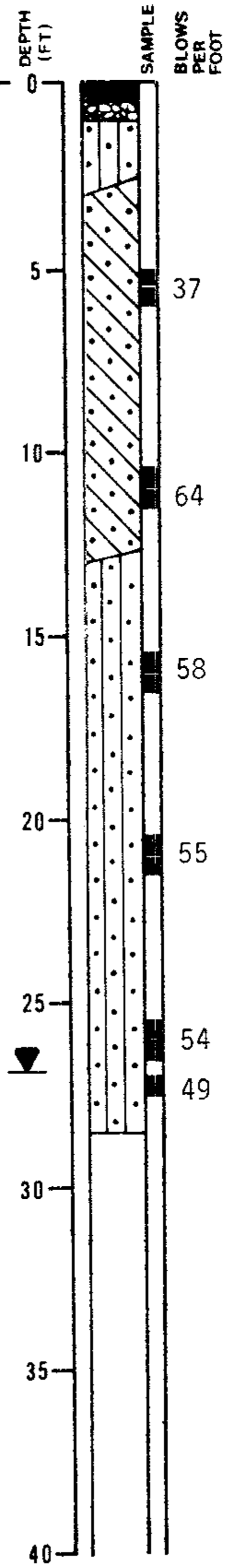
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	10/31/88		3

LOG OF TEST BORING 35

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 10/12/88
ELEVATION --

LABORATORY TESTS
MOISTURE CONTENT %
DRY DENSITY (PCF)



ASPHALTIC CONCRETE - 6" thick
BASE ROCK - 6" thick
DARK BROWN-BLACK SILTY SAND (SM)
medium dense, moist
BROWN CLAYEY SAND (SC)
dense, moist

GRAY CLAYEY SILTY SAND (SM)
dense, moist

grades to (SP) below 18.0 feet

color change to mottled brown
below 24.0 feet

GROUNDWATER LEVEL 10/12/88

BORING BACKFILLED WITH
A BENTONITE GROUT UPON
COMPLETION OF DRILLING

Subsurface Consultants

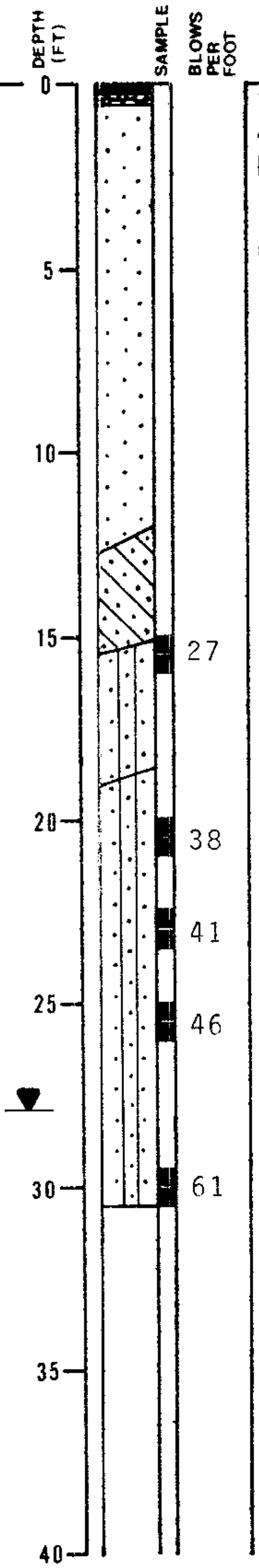
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	10/31/88	Sl	4

LOG OF TEST BORING 36

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/21/89
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



1" ASPHALT CONCRETE
4" BASEROCK
BROWN SAND (SP)
medium dense, moist, (fill)

building debris at 4½ feet

BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY GREEN SILTY SAND(SM)
medium dense, moist

GRAY BROWN SILTY SAND (SP-SM)
medium dense, moist

GROUNDWATER LEVEL DURING DRILLING

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

-200=% PASSING #200 SIEVE
(0.074mm)
SAMPLER TYPE:
CALIFORNIA DRIVE SAMPLER
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES
HAMMER WEIGHT: 140 POUNDS
HAMMER DROP: 30 INCHES

Subsurface Consultants

13th & JEFFERSON, OAKLAND, CA

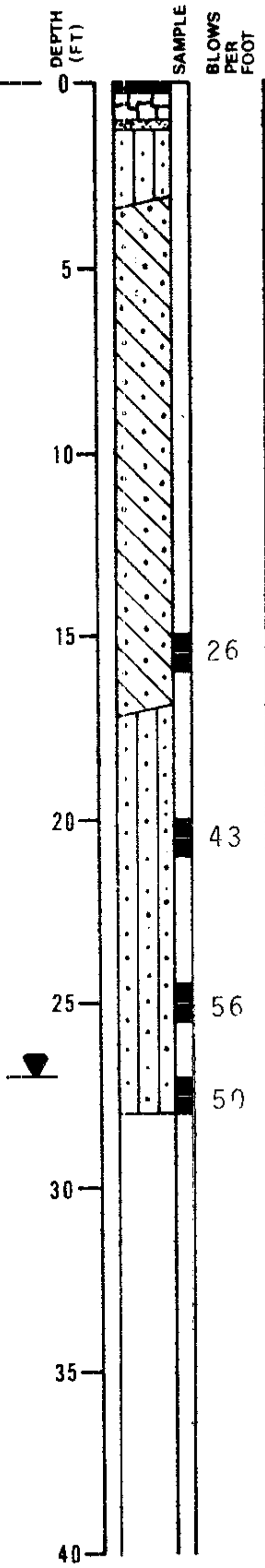
JOB NUMBER 430.003
DATE 5/18/89
APPROVED

PLATE 5

LOG OF TEST BORING 37

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/28/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
	15.1	114	26
	12.7	100	43
	21.0	106	56
	19.1	101	50



4" ASPHALTIC CONCRETE
8" COBBLESTONES
4" CONCRETE SLAB
DARK BROWN SILTY SAND (SM)
medium dense, moist
BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP-SM)
dense, moist

GROUNDWATER LEVEL (3 hours)
AFTER DRILLING

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

Subsurface Consultants

13th & JEFFERSON, OAKLAND, CA
JOB NUMBER 430.003
DATE 5/18/89
APPROVED

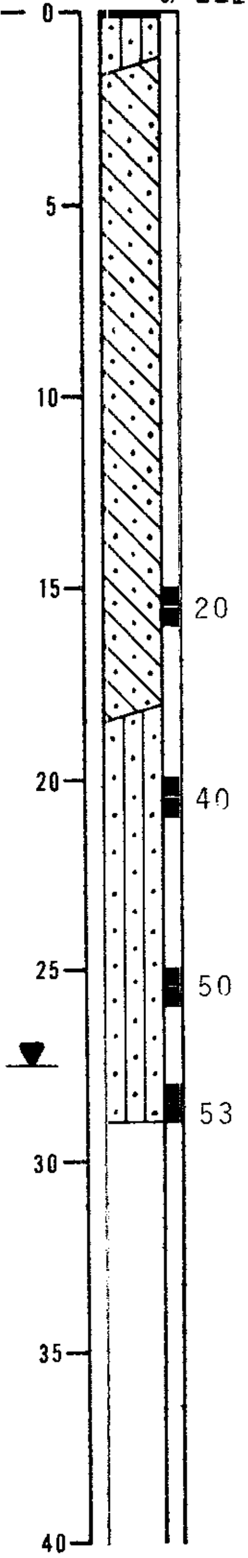
PLATE 6

LOG OF TEST BORING 38

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/28/89
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT

-200=11.4%



1½" ASPHALT CONCRETE
DARK BROWN SILTY SAND (SM)
medium dense, moist
BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP-SM)
dense, moist

contains silty lenses
becomes wet

GROUNDWATER LEVEL AFTER DRILLING

BORING BACKFILLED WITH CEMENT/ BENTONITE GROUT

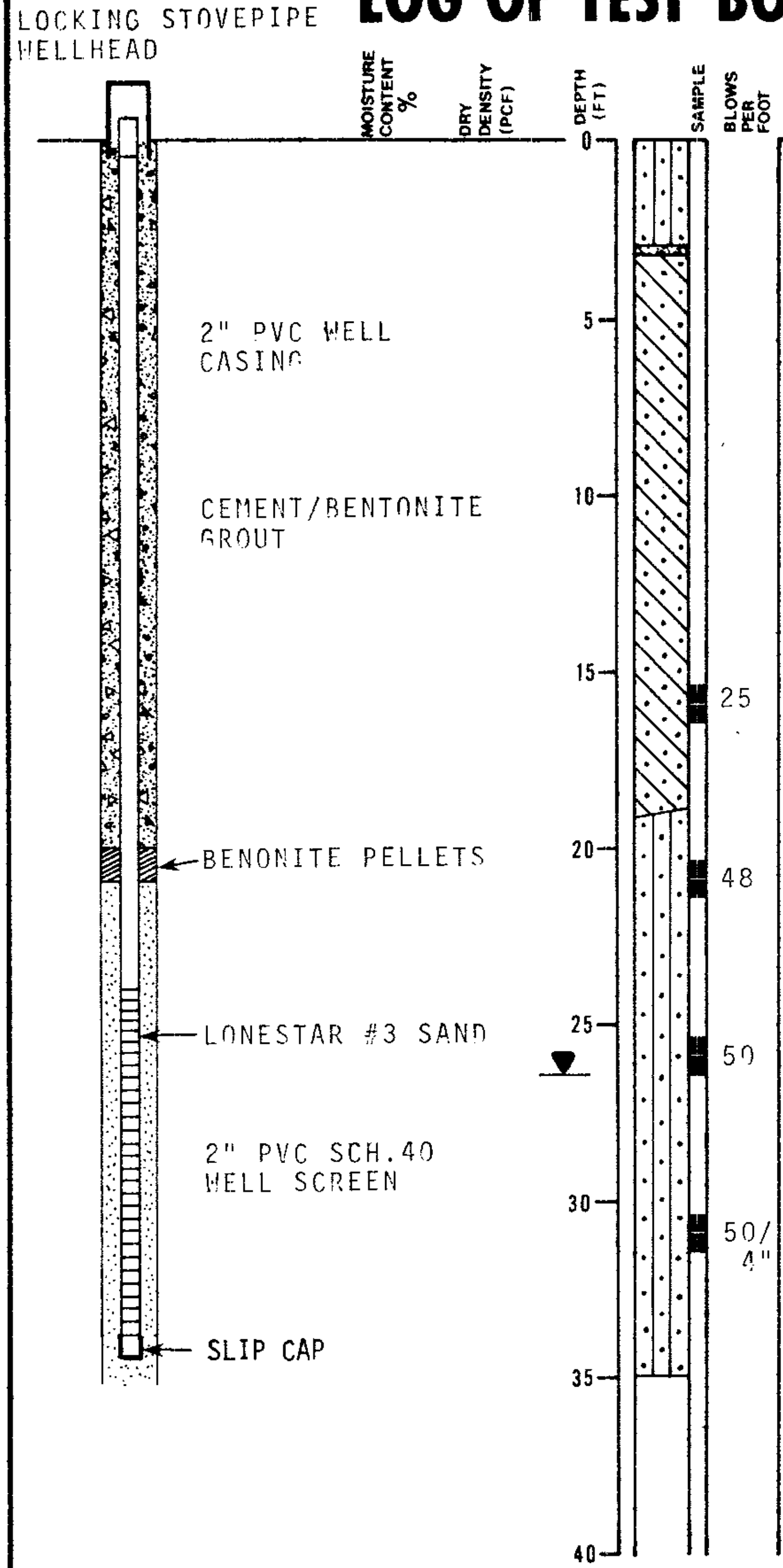
Subsurface Consultants	13th & JEFFERSON, OAKLAND, CA	**PLATE**
	JOB NUMBER 430.003 **DATE** 5/18/89 **APPROVED**	**7**

LOG OF TEST BORING 44

EQUIPMENT 8" Hollow Stem Auger

DATE DRILLED 3/30/89

ELEVATION --



GREY BROWN SILTY SAND (SM)
medium dense, moist (fill)
contains brick rubble
3" CONCRETE SLAB

BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP-SM)
dense, moist

GROUNDWATER LEVEL 5/16/89

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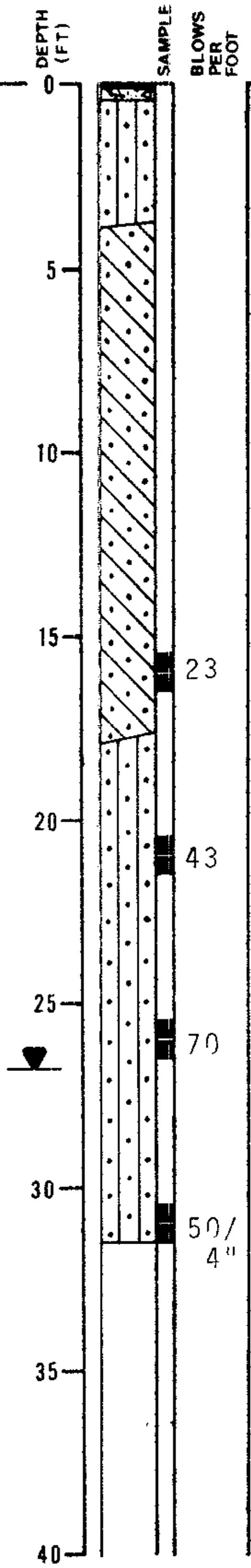
13th & JEFFERSON - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	5/18/89		8

LOG OF TEST BORING 45

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 3/30/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
-200=19.6%		



1" ASPHALT CONCRETE
4" CONCRETE
BROWN SILTY SAND (SM)
medium dense, moist
BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP-SM)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

Subsurface Consultants

13th & JEFFERSON, OAKLAND, CA

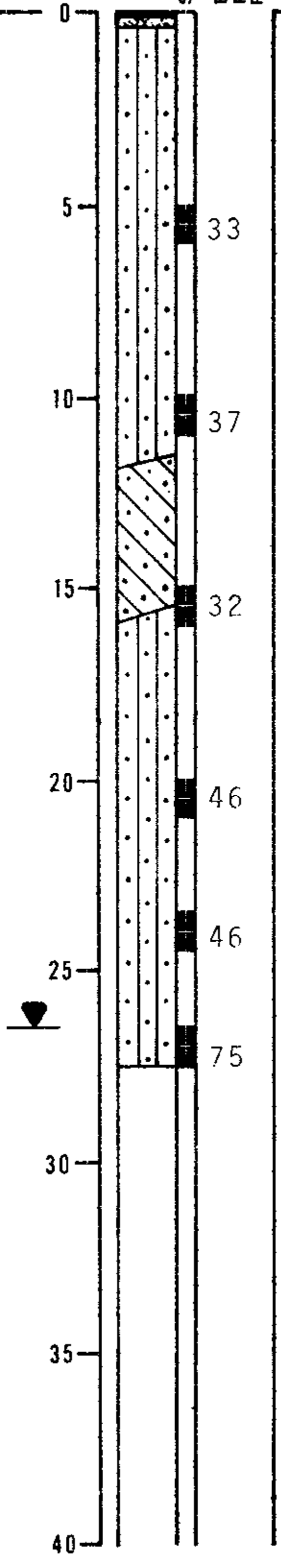
JOB NUMBER 430.003
DATE 5/18/89
APPROVED

PLATE 9

LOG OF TEST BORING 46

EQUIPMENT 6" Hollow Stem Auger
DATE DRILLED 4/20/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			33
			37
	16.8	114	32
			46
	19.1	107	46
			75



1" ASPHALT CONCRETE
4" CONCRETE

BROWN SILTY SAND (SM)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SM)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

BORING BACKFILLED WITH CEMENT/ BENTONITE GROUT

Subsurface Consultants

13th & JEFFERSON, OAKLAND, CA

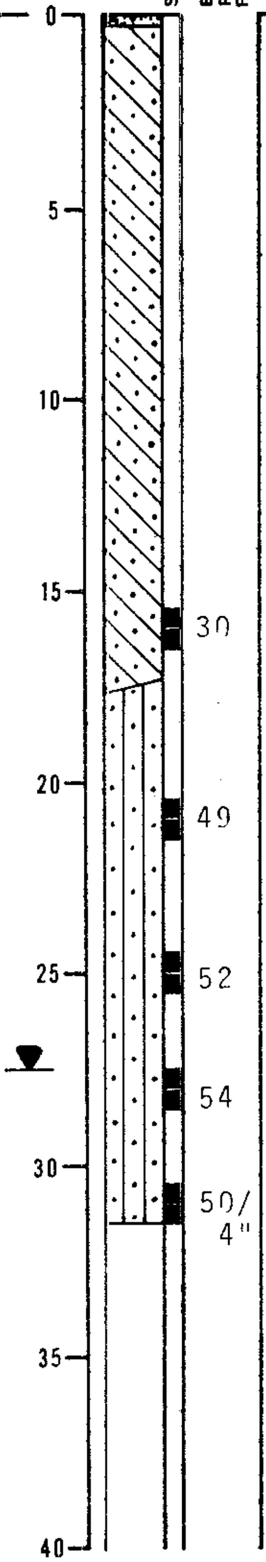
JOB NUMBER 430.003
DATE 5/18/89
APPROVED

PLATE 10

LOG OF TEST BORING 47

EQUIPMENT 6" HOLLOW STEM AUGER
DATE DRILLED 4/20/89
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



3" CONCRETE SLAB
BROWN CLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP-SM)
dense, moist

-200=7.1%

GROUNDWATER LEVEL DURING DRILLING

becomes wet

BORING BACKFILLED WITH CEMENT/ BENTONITE GROUT

Subsurface Consultants

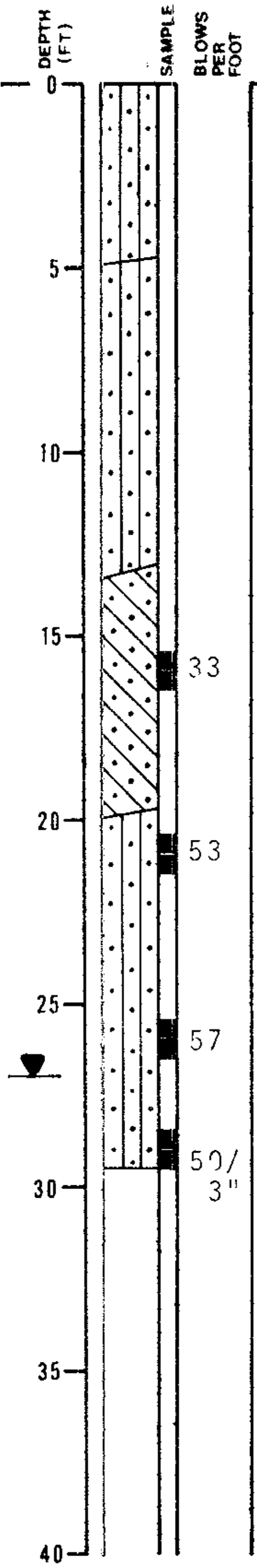
13th & JEFFERSON, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	5/18/89		11

LOG OF TEST BORING 48

EQUIPMENT 6" HOLLOW STEM AUGER
DATE DRILLED 4/20/89
ELEVATION

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



BLACK SILTY SAND (SM)
loose, moist (fill)

BROWN SILTY SAND (SM)
medium dense, moist

BROWN SLAYEY SAND (SC)
medium dense, moist

GREY SILTY SAND (SP)
dense, moist

contains silty lenses

GROUNDWATER LEVEL DURING DRILLING

BORING BACKFILLED WITH CEMENT/ BENTONITE GROUT

Subsurface Consultants

13th & JEFFERSON, OAKLAND, CA

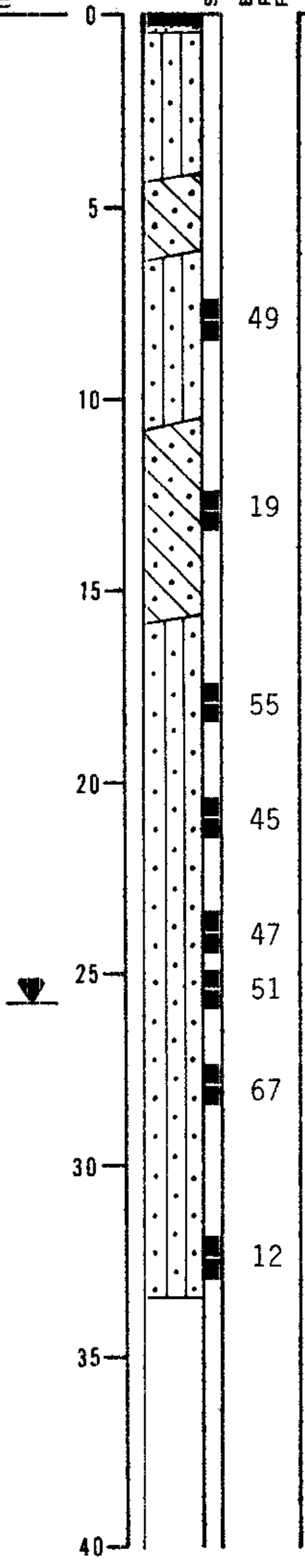
JOB NUMBER 430.003
DATE 5/18/89
APPROVED

PLATE 12

LOG OF TEST BORING 49

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/23/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 2" thick
CONCRETE SLAB - 4" thick
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)
color change to brown at 3.5 feet
GREEN-GRAY CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

GREEN-GRAY SILTY SAND (SM-SP)
dense, moist

GROUNDWATER LEVEL DURING DRILLING

Subsurface Consultants

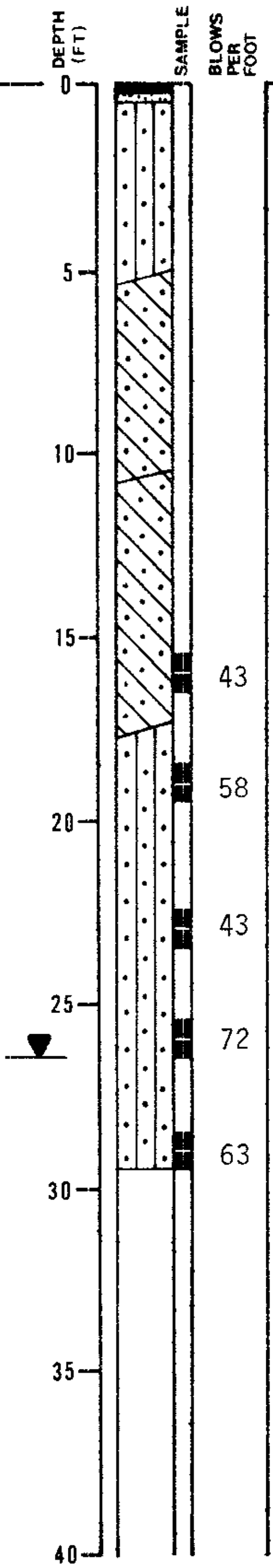
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	5/30/89	SE	13

LOG OF TEST BORING 50

EQUIPMENT 8" Hollow Stem Auger
DATE DRILLED 5/23/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 2" thick
CONCRETE SLAB - 4" thick
BROWN SILTY SAND (SM)
medium dense, moist (fill)

GREEN-GRAY CLAYEY SAND (SC)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM-SP)
dense, moist

color change to gray-green

GROUNDWATER LEVEL DURING DRILLING

Subsurface Consultants

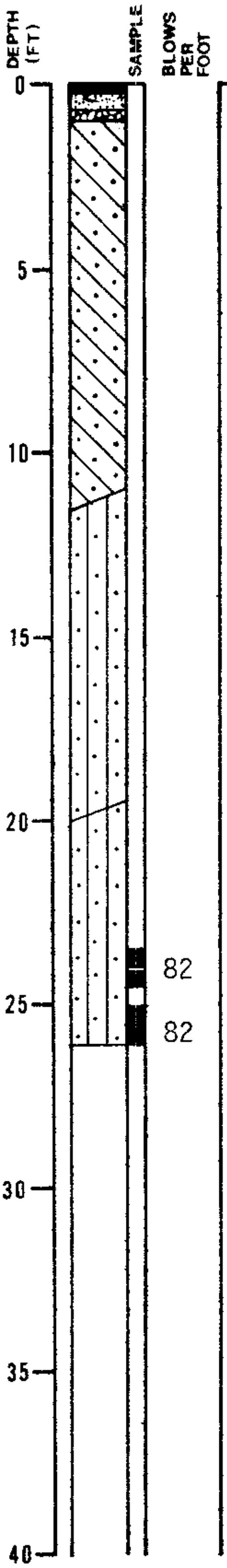
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	5/30/89	SE	14

LOG OF TEST BORING 51

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BASE ROCK - 3" thick
BROWN AND GRAY MOTTLED CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED DURING DRILLING

Subsurface Consultants

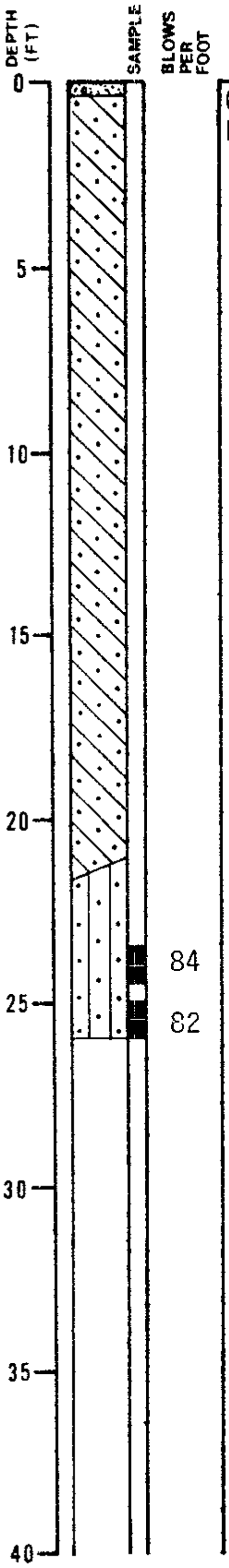
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		15

LOG OF TEST BORING 52

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



CONCRETE - 4" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

easier drilling at 12 feet

GRAY-BROWN SILTY SAND (SM)
dense, moist

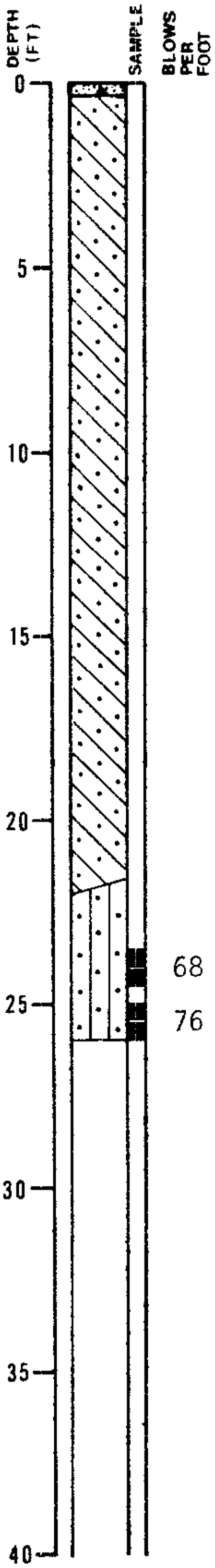
NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants	13th & JEFFERSON ST. - OAKLAND, CA			PLATE
	JOB NUMBER 430.003	DATE 8/10/89	APPROVED	16

LOG OF TEST BORING 53

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



CONCRETE - 4" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

LIGHT BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

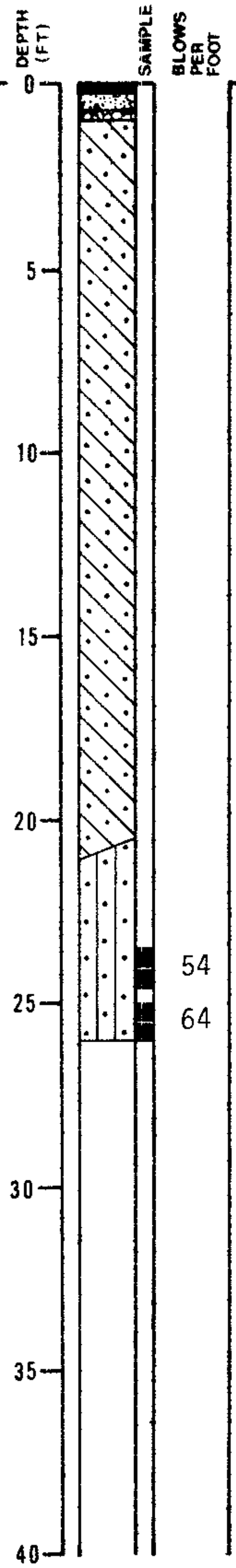
JOB NUMBER 430.003
DATE 8/10/89
APPROVED

PLATE 17

LOG OF TEST BORING 54

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BASE ROCK - 3" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		**18**

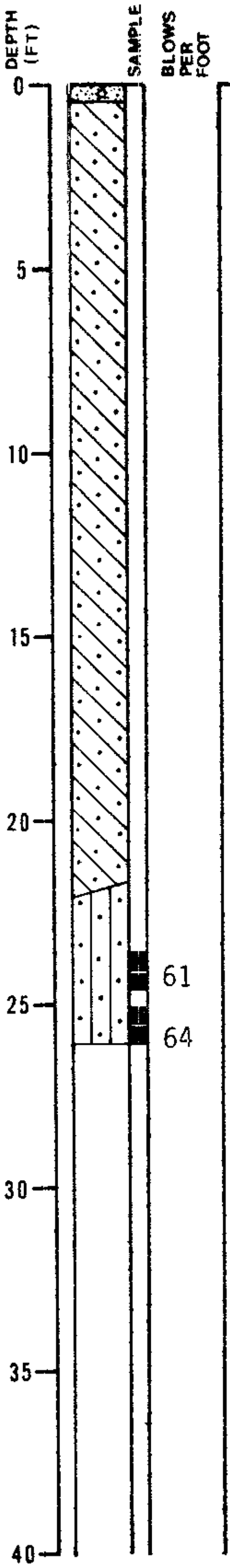
LOG OF TEST BORING 55

EQUIPMENT 6" Solid Flight Auger

DATE DRILLED 6/27/89

ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT



CONCRETE - 4" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

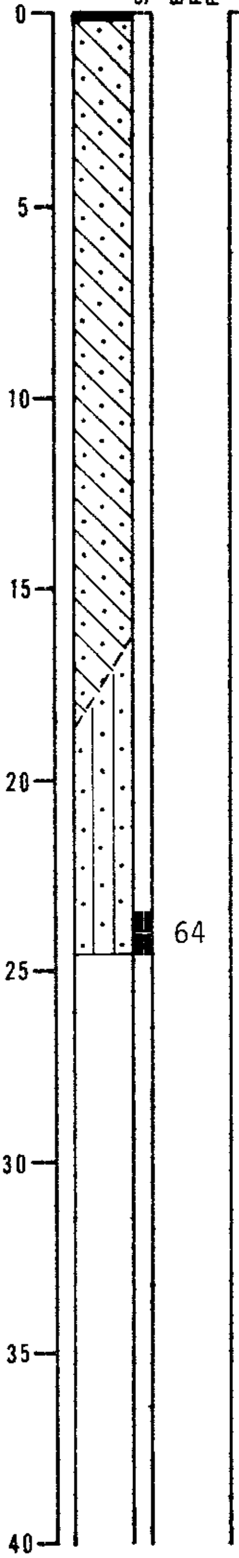
NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants	13th & JEFFERSON ST. - OAKLAND, CA			PLATE
	JOB NUMBER 430.003	**DATE** 8/10/89	**APPROVED**	19

LOG OF TEST BORING 56

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT



ASPHALTIC CONCRETE - 2" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		20

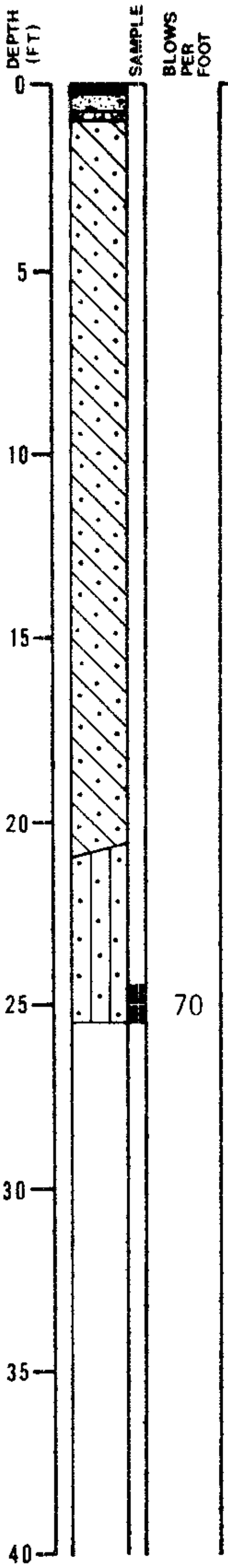
LOG OF TEST BORING 57

EQUIPMENT 6" Solid Flight Auger

DATE DRILLED 6/27/89

ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BASE ROCK - 3" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

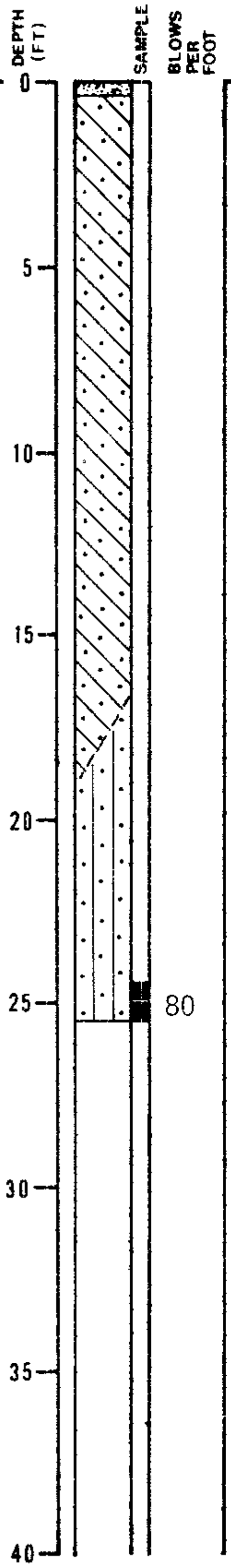
JOB NUMBER	DATE	APPROVED
430.003	8/10/89	

PLATE
21

LOG OF TEST BORING 58

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/27/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



CONCRETE - 4" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

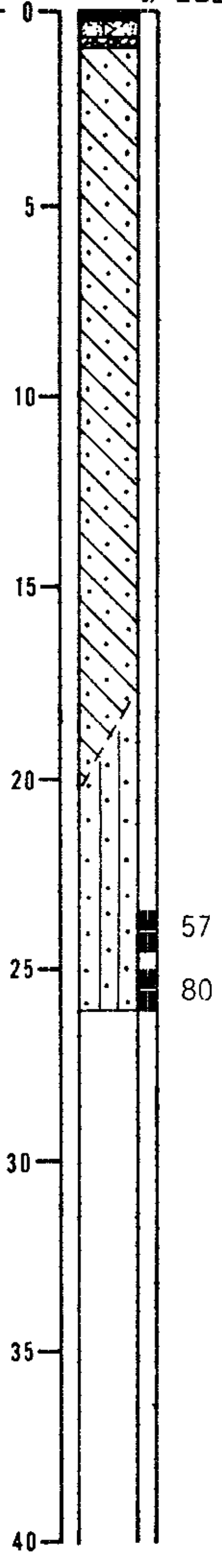
13th & JEFFERSON ST. - OAKLAND, CA
JOB NUMBER 430.003
DATE 8/10/89
APPROVED

PLATE 22

LOG OF TEST BORING 59

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BASE ROCK - 3" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

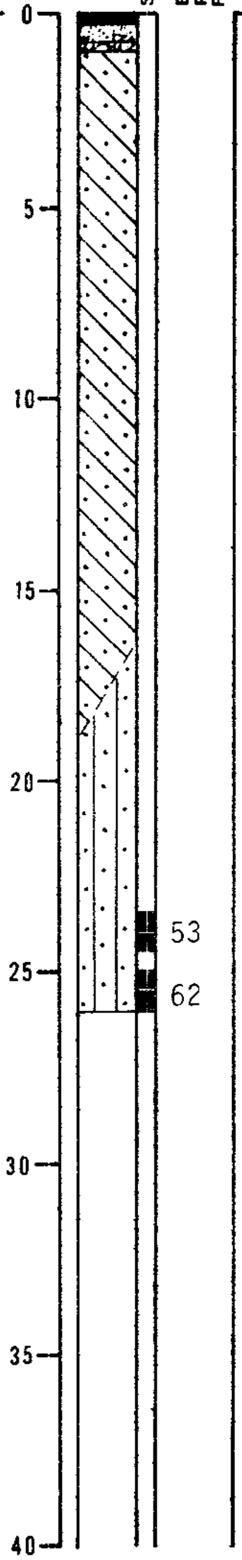
JOB NUMBER 430.003
DATE 8/10/89
APPROVED

PLATE 23

LOG OF TEST BORING 60

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BASE ROCK - 3" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

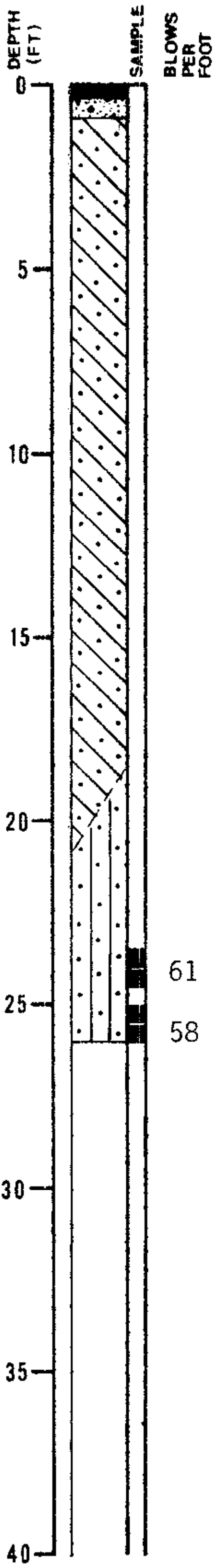
JOB NUMBER	DATE	APPROVED
430.003	8/10/89	

PLATE
24

LOG OF TEST BORING 61

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER 430.003
DATE 8/10/89
APPROVED

PLATE 25

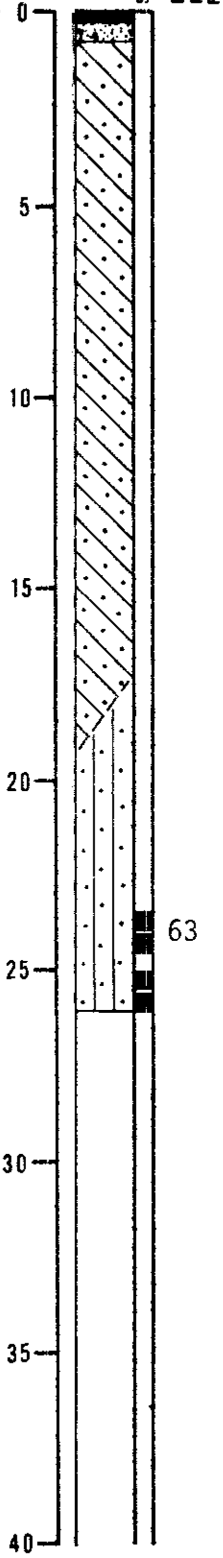
LOG OF TEST BORING 62

EQUIPMENT 6" Solid Flight Auger

DATE DRILLED 6/30/89

ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick

CONCRETE - 5" thick

BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

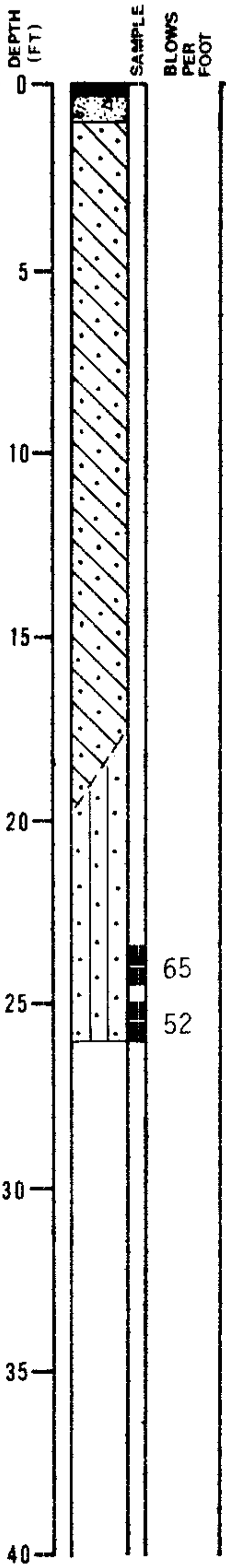
NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants	13th & JEFFERSON ST. - OAKLAND, CA	PLATE 26
	JOB NUMBER 430.003 · DATE 8/10/89 · APPROVED	

LOG OF TEST BORING 63

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 4" thick
BASE ROCK - 8" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

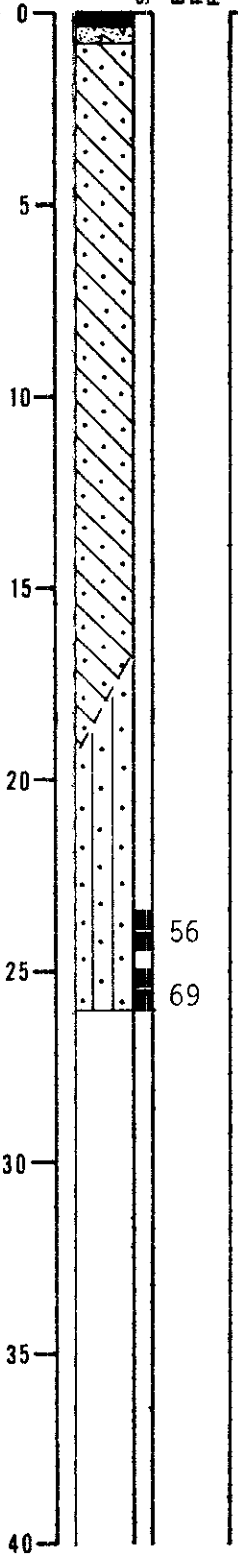
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		27

LOG OF TEST BORING 64

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

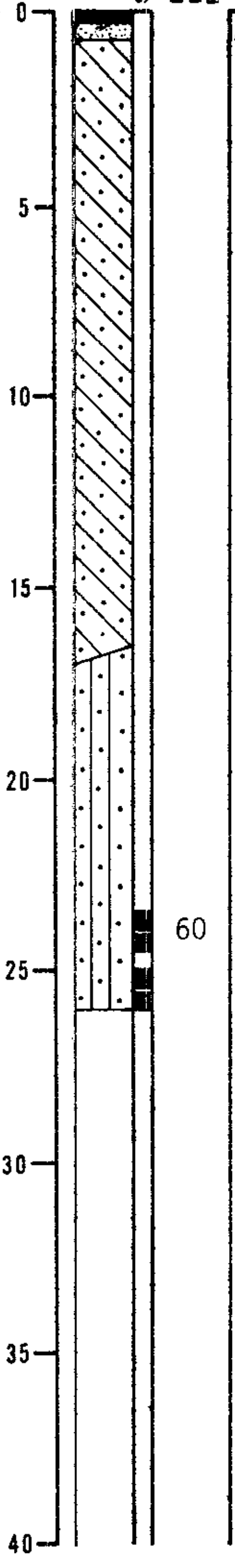
JOB NUMBER 430.003
DATE 8/10/89
APPROVED

PLATE 28

LOG OF TEST BORING 65

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

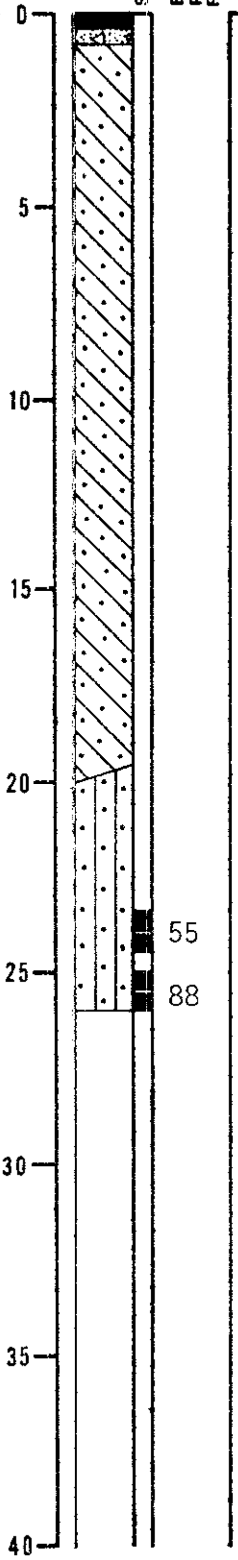
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		29

LOG OF TEST BORING 66

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 6/30/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

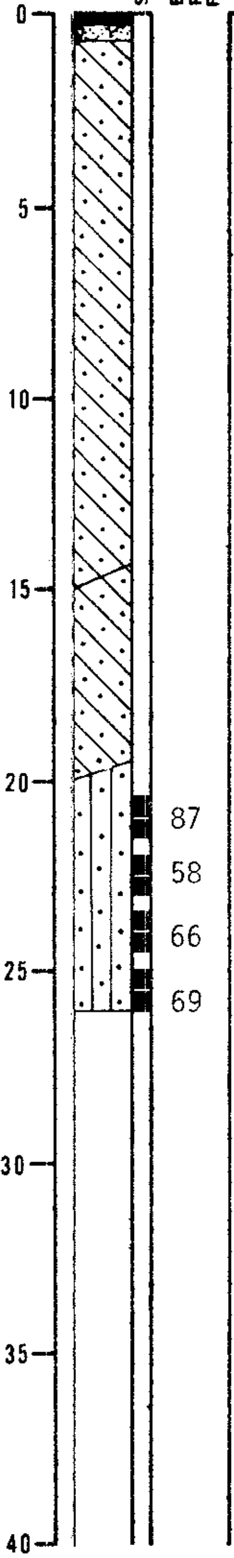
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89	SOL	30

LOG OF TEST BORING 67

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 7/20/89
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

MOTTLED GRAY AND BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED DURING DRILLING

Subsurface Consultants

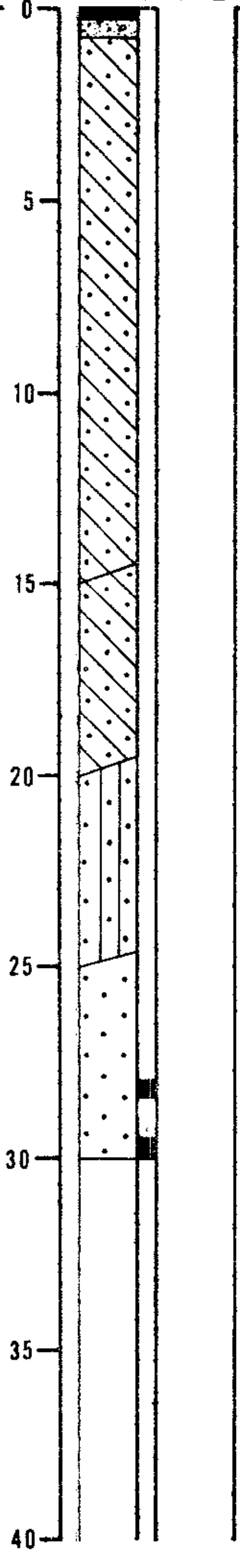
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		31

LOG OF TEST BORING 68

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 7/20/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN CLAYEY SAND (SC)
dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

BROWN SAND (SP)
dense, wet

Subsurface Consultants

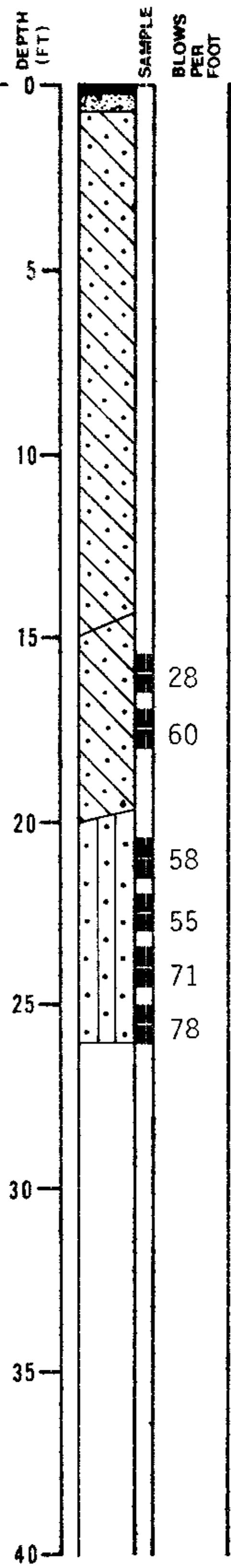
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		32

LOG OF TEST BORING 69

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 7/20/89
ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

MOTTLED GRAY AND BROWN CLAYEY SAND (SC)
medium dense, moist

becomes dense

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED DURING DRILLING

Subsurface Consultants

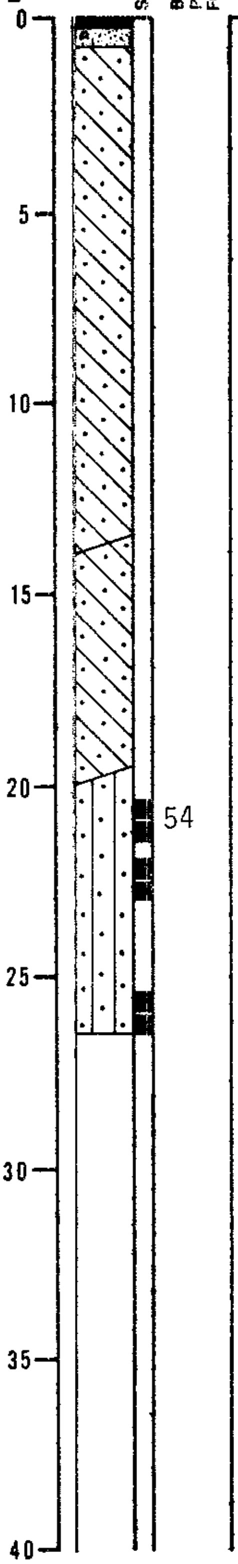
13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		**33**

LOG OF TEST BORING 70

EQUIPMENT 6" Solid Flight Auger
DATE DRILLED 7/20/89
ELEVATION --

LABORATORY TESTS
MOISTURE CONTENT %
DRY DENSITY (PCF)
DEPTH (FT)
SAMPLE
BLOWS PER FOOT



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY-BROWN CLAYEY SAND (SC)
dense, moist

GRAY-BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED
430.003	8/10/89	

PLATE
34

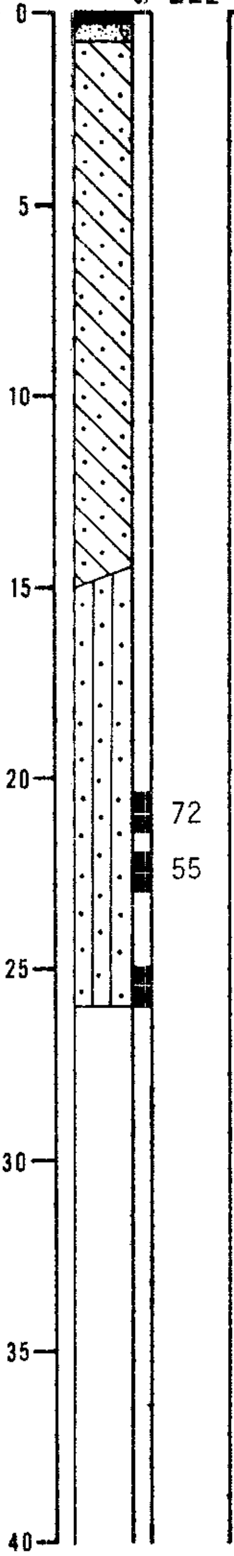
LOG OF TEST BORING 71

EQUIPMENT 6" Solid Flight Auger

DATE DRILLED 7/20/89

ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT



ASPHALTIC CONCRETE - 3" thick
CONCRETE - 5" thick
BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	8/10/89		35

GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

Subsurface Consultants

13th & JEFFERSON ST. - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.003	5/24/89	SOC	36

GTEL Environmental Laboratories
A division of Groundwater Technology, Inc.

Western Region
4080-C Pike Lane
Concord, CA 94520

(415) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*

06/14/88 rw
PROJECT MGR: Michael Wray
Groundwater Technology, Inc.
4080 Pike Ln.
Concord, CA 94520
PROJECT #:203-799-5078-3

SAMPLED: 05/25/88 BY: R. Box
RECEIVED: 05/25/88 BY: J. Floro
ANALYZED: 06/03/88 BY: K. Patton
MATRIX: Oil
UNITS: ug/mL

TEST RESULTS

COMPOUNDS	MDL	LAB # I.D.#	23841 Drum #1	23842 Drum #2
PCB-1016	1.0		<1.0	<1.0
PCB-1221	1.0		<1.0	<1.0
PCB-1232	1.0		<1.0	<1.0
PCB-1242	1.0		<1.0	<1.0
PCB-1248	1.0		<1.0	<1.0
PCB-1254	1.0		<1.0	<1.0
PCB-1260	1.0		<1.0	<1.0

MDL = Method Detection Limit; compound below this level would not be detected.

METHOD:
EPA Method 8080

SAFY KHALIFA, Ph.D., Director

GTEL
Environmental
Laboratories
A division of Groundwater Technology, Inc.

Western Region
4080-C Pike Lane
Concord, CA 94520

(415) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*

06/14/88 rw
PROJECT MGR: Michael Wray
Groundwater Technology, Inc.
4080 Pike Ln.
Concord, CA 94520
PROJECT #:203-799-5078-3

SAMPLED: 05/25/88 BY: R. Box
RECEIVED: 05/25/88 BY: J. Floro
ANALYZED: 06/03/88 BY: K. Patton
MATRIX: Water
UNITS: ug/L (ppb)

TEST RESULTS

	MDL	LAB #	23843
COMPOUNDS		I.D. #	TROUGH
PCB-1016	0.1		<0.1
PCB-1221	0.1		<0.1
PCB-1232	0.1		<0.1
PCB-1242	0.1		<0.1
PCB-1248	0.1		<0.1
PCB-1254	0.1		<0.1
PCB-1260	0.1		0.4

MDL = Method Detection Limit; compound below this level would not be detected.

METHOD:
EPA Method 8080

SAFY KHALIFA, Ph.D., Director

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15965
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: JEFFERSON STREET TANK

DATE RECEIVED: 10/17/88
DATE ANALYZED: 10/26/88
DATE REPORTED: 10/31/88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
15965-1	34 @ 21.0	ND(10)	N/R	N/R	N/R	N/R
15965-2	34 @ 25.0	ND(10)	N/R	N/R	N/R	N/R
15965-3	34 @ 28.0	ND(10)	N/R	N/R	N/R	N/R
15965-4	35 @ 16.0	ND(10)	N/R	N/R	N/R	N/R
15965-5	35 @ 21.0	ND(10)	N/R	N/R	N/R	N/R
15965-6	35 @ 26.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.
N/R = NOT REQUESTED.

QA/QC SUMMARY

%RPD	<1	<1	<1	<1	<1
%RECOVERY	103	96	95	92	94

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17123
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: JEFFERSON ST. TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/12/89
DATE REPORTED: 04/19/89
PAGE 1 OF 4

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17123-1	36 @ 20.5	ND(10)
17123-2	36 @ 25.5	1,800
17123-3	36 @ 30.0	79
17123-4	37 @ 20.5	ND(10)
17123-5	37 @ 25.0	TRACE
17123-6	37 @ 27.5	ND(10)
17123-7	38 @ 20.5	ND(10)
17123-9	38 @ 28.5	ND(10)
17123-11	44 @ 26.0	590
17123-12	44 @ 31.0	800
17123-15	45 @ 26.0	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	2
Spike, % Recovery	91

LABORATORY DIRECTOR

LABORATORY NUMBER: 17123
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.003
JOB LOCATION: JEFFERSON STREET TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/13/89
DATE REPORTED: 04/19/89
PAGE 2 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17123-8	38 @ 25.5	190	ND(100)	ND(100)	3,100	7,400
17123-10	44 @ 21.0	TRACE	36	55	120	340

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	20
%RECOVERY	108

LABORATORY NUMBER: 17123
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: JEFFERSON STREET TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/06/89
DATE REPORTED: 04/19/89
PAGE 3 OF 4

Extractable Petroleum Hydrocarbons in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 3550

LAB ID	CLIENT ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)	OTHER (mg/Kg)
17123-13	45 @ 16.0	ND(10)	ND(10)	ND(10)	ND(10)
17123-14	45 @ 21.0	ND(10)	ND(10)	ND(10)	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	2
Spike: % Recovery	102

Curtis & Tompkins, Ltd.

LAB NUMBER: 17123
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.003
LOCATION: JEFFERSON STREET TANK

DATE RECEIVED: 03/31/89
DATE ANALYZED: 04/13/89
DATE REPORTED: 04/19/89
PAGE 4 OF 4

ANALYSIS: OIL AND GREASE
METHOD: SMWW 503E

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17123-13	45 @ 16.0	ND	mg/Kg	50
17123-14	45 @ 21.0	ND	mg/Kg	50

ND = NONE DETECTED.

QA/QC SUMMARY

RPD, %	<1
RECOVERY, %	96

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2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17248
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: 13th & JEFFERSON

DATE RECEIVED: 04/21/89
DATE ANALYZED: 04/25/89
DATE REPORTED: 05/08/89

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17248-1	46 @ 20.5	83
17248-2	46 @ 24	470
17248-3	46 @ 27	ND(10)
17248-4	47 @ 21	ND(10)
17248-5	47 @ 25	404
17248-6	47 @ 28	12
17248-7	47 @ 31	ND(10)
17248-8	48 @ 16	ND(10)
17248-9	48 @ 21	ND(10)
17248-10	48 @ 26	63

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	4
Spike, % Recovery	100

Jon Wong for CBG
LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17461
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 05/23/89
DATE ANALYZED: 06/04/89
DATE REPORTED: 06/07/89

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17461-1	49 @ 21	25
17461-2	49 @ 27.5	600
17461-3	50 @ 22.5	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	<1
Spike, % Recovery	96

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17460
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: 13th & JEFFERSON

DATE RECEIVED: 05/23/89
DATE ANALYZED: 05/25/89
DATE REPORTED: 05/31/89

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17460-1	49 @ 25.5	38
17460-2	50 @ 25.5	160

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	2
Spike, % Recovery	109

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17414
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: OAKLAND, CA

DATE RECEIVED: 05/16/89
DATE ANALYZED: 05/17/89
DATE REPORTED: 05/19/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
17414-1	44W	25	840	910	480	2,230

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	4
%RECOVERY	87

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 06/30/89
DATE REPORTED: 07/14/89
PAGE 1 OF 4

RECEIVED
JUL 27 1989
AM 7 8 9 10 11 12 1 2 3 4 5 6 PM

LAB NUMBER: 17745

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 3 SOIL SAMPLES

JOB #: 430.003
LOCATION: 13th & JEFFERSON

RESULTS: SEE ATTACHED

Jon Wong for CBG
Laboratory Director

LABORATORY NUMBER: 17745
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: 13th & JEFFERSON

DATE RECEIVED: 06/30/89
DATE ANALYZED: 07/13/89
DATE REPORTED: 07/17/89
PAGE 2 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17745-1	51 @ 26′	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)
17745-2	52 @ 26′	ND(10)	ND(5)	7	ND(5)	ND(5)
17745-3	53 @ 26′	ND(10)	ND(5)	15	ND(5)	ND(5)

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	3
%RECOVERY	97

LABORATORY NUMBER: 17745
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.003
LOCATION: 13th & JEFFERSON

DATE RECEIVED: 06/30/89
DATE ANALYZED: 07/03/89
DATE REPORTED: 07/17/89
PAGE 3 OF 4

ANALYSIS: ETHYLENE DIBROMIDE
METHOD REFERENCE: EPA 8010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17745-1	51 @ 26'	ND	mg/Kg	5
17745-2	52 @ 26'	ND	mg/Kg	5

ND = NOT DETECTED.

QA/QC:

RPD, %	6
RECOVERY, %	96

LABORATORY NUMBER: 17745
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.003
LOCATION: 13th & JEFFERSON

DATE RECEIVED: 06/30/89
DATE ANALYZED: 07/05/89
DATE REPORTED: 07/17/89

ORGANIC LEAD IN SOIL
DHS METHOD
MAY 1988 LUFT MANUAL

LAB ID	CLIENT ID	ORGANIC LEAD	UNITS	DETECTION LIMIT
17745-1	51 @ 26'	ND	mg/Kg	2.0
17745-2	52 @ 26'	ND	mg/Kg	2.0

QA/QC SUMMARY

%RPD	<1
%RECOVERY	102

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DATE RECEIVED: 06/29/89
DATE REPORTED: 07/13/89
PAGE 1 OF 4

LAB NUMBER: 17743

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 3 SOIL SAMPLES

JOB #: 430.003
LOCATION: 13TH & JEFFERSON

RESULTS: SEE ATTACHED

Laboratory Director

LABORATORY NUMBER: 17743
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 06/29/89
DATE REQUESTED:06/30/89
DATE ANALYZED: 07/05/89
DATE REPORTED: 07/13/89
PAGE 2 OF 4

ANALYSIS: ORGANIC LEAD
METHOD REFERENCE: DHS LUFT MANUAL 1988

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17743-2	57 @ 25 1/2'	ND	mg/Kg	2.0

ND = NOT DETECTED.

QA/QC:

RPD, %	<1
RECOVERY, %	102

LABORATORY NUMBER: 17743
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 06/29/89
DATE REQUESTED:06/30/89
DATE ANALYZED: 07/03/89
DATE REPORTED: 07/13/89

ANALYSIS: ETHYLENE DIBROMIDE
METHOD REFERENCE: EPA 8010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17743-2	57 @ 25 1/2'	ND	ug/Kg	5

ND = NOT DETECTED.

QA/QC:

RPD, %	6
RECOVERY, %	96

LABORATORY NUMBER: 17743
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 06/29/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/13/89
PAGE 4 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17743-1	55 @ 24 1/2'	30	ND(5)	23	33	150
17743-2	57 @ 25 1/2'*	ND(10)	ND(5)	ND(5)	12	44*
17743-3	58 @ 25 1/2'	ND(10)	ND(5)	18	13	ND(5)

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	6
%RECOVERY	111

* Retested, see lab. no. 17820 test report.

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DATE RECEIVED: 06/29/89
DATE REPORTED: 07/14/89
PAGE 1 OF 2

LAB NUMBER: 17820

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 1 SOIL SAMPLE

JOB #: 430.003
LOCATION: 13TH & JEFFERSON

RESULTS: SEE ATTACHED

Stephen L. Jensen for CBL
Laboratory Director

RECEIVED
JUL 19 1989
AM
7,8,9,10,11,12,1,2

Berkeley Wilmington Los Angeles

LABORATORY NUMBER: 17820
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 06/29/89
DATE REQUESTED: 07/13/89
DATE ANALYZED: 07/13/89
DATE REPORTED: 07/14/89
PAGE 2 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17743-2	57 @ 25 1/2	14	ND(5)	14	15	75

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	3
%RECOVERY	97

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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DATE RECEIVED: 07/05/89
DATE REPORTED: 07/18/89
PAGE 1 OF 5

RECEIVED
JUL 27 1989
AM 7 8 9 10 11 12 1 2 3 4 5 6 PM

LAB NUMBER: 17769

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 11 SOIL SAMPLES

JOB #: 430.003
LOCATION: 13TH & JEFFERSON

RESULTS: SEE ATTACHED

Laboratory Director

Berkeley Wilmington Los Angeles

LABORATORY NUMBER: 17769
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003/13TH & JEFFERSON

DATE RECEIVED: 07/05/89
DATE ANALYZED: 07/12/89
DATE REPORTED: 07/18/89

ORGANIC LEAD IN SOIL
DHS METHOD
MAY 1988 LUFT MANUAL

LAB ID	CLIENT ID	ORGANIC LEAD	UNITS	DETECTION LIMIT
17760-10	61 @ 26	ND	mg/Kg	2.0
17760-11	66 @ 26	ND	mg/Kg	2.0

ND = NONE DETECTED.

QA/QC SUMMARY

%RPD	2
%RECOVERY	101

LABORATORY NUMBER: 17769
CLIENT: SUBSURFACE CONSULTANTS
PROJECT #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 07/05/89
DATE ANALYZED: 07/06/89
DATE REPORTED: 07/18/89
PAGE 3 OF 5

ANALYSIS: ETHYLENE DIBROMIDE
METHOD REFERENCE: EPA 8010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
17769-10	61 @ 26	ND	ug/Kg	5.0
17769-11	66 @ 26	ND	ug/Kg	5.0

ND = NOT DETECTED.

QA/QC:

RPD, %	2
RECOVERY, %	98

LABORATORY NUMBER: 17769
CLIENT: SUBSURFACE CONSULATNTS
JOB #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 07/05/89
DATE ANALYZED: 07/17/89
DATE REPORTED: 07/18/89
PAGE 4 OF 5

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17769-1	59 @ 26	ND(10)
17769-2	59 @ 24	29
17769-3	60 @ 25 1/2	ND(10)
17769-4	61 @ 24 1/2	ND(10)
17769-5	62 @ 26	ND(10)
17769-6	63 @ 26	ND(10)
17769-7	65 @ 24	TRACE
17769-8	65 @ 26	17
17769-9	66 @ 24 1/2	21

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	5
Spike, % Recovery	100

LABORATORY NUMBER: 17769
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 07/05/89
DATE ANALYZED: 07/14/89
DATE REPORTED: 07/18/89
PAGE 5 OF 5

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17769-10	61 @ 26	TRACE	13	51	26	110
17769-11	66 @ 26	58	ND(50)	580	570	1,200

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	6
%RECOVERY	103

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
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DATE RECEIVED: 07/24/89
DATE REPORTED: 07/28/89
PAGE 1 OF 3

RECEIVED
JUL 31 1989
AM 7 8 9 10 11 12 1 2 3 4 5 6 PM

LAB NUMBER: 17878

CLIENT: SUBSURFACE CONSULTANTS

REPORT ON: 8 SOIL SAMPLES

JOB #: 430.003
LOCATION: 13TH & JEFFERSON

RESULTS: SEE ATTACHED

Jim Wong for CBG
Laboratory Director

LABORATORY NUMBER: 17878
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.003
LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 07/24/89
DATE ANALYZED: 07/25/89
DATE REPORTED: 07/28/89
PAGE 2 OF 3

Total Volatile Hydrocarbons as Gasoline in Soils & Wastes
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)
17878-1	67 @ 22 1/2'	ND(10)
17878-2	67 @ 25 1/2'	ND(10)
17878-4	69 @ 24'	380
17878-5	69 @ 25 1/2	ND(10)
17878-6	70 @ 26'	ND(10)
17878-7	71 @ 22 1/2'	ND(10)
17878-8	71 @ 25 1/2'	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

%RPD	5
Spike, % Recovery	105

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 17878
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.003
JOB LOCATION: 13TH & JEFFERSON

DATE RECEIVED: 07/24/89
DATE ANALYZED: 07/25/89
DATE REPORTED: 07/28/89
PAGE 3 OF 3

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 602/8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
17878-3	69 @ 16'	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	5
%RECOVERY	104

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: JEFFERSON ST. TANK

SCI Job Number: 430.003

Project Contact at SCI: J. BOWERS / S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS + TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
36 @ 20.5'	S	T	3/28/89		TVH	
36 @ 25.5'	S	T	3/28/89		TVH	
36 @ 30'	S	T	3/28/89		TVH	
37 @ 20.5'	S	T	3/28/89		TVH	
37 @ 25'	S	T	↓		TVH	
37 @ 27.5'	S	T	↓		TVH	
38 @ 20.5'	S	T	3/28/89		TVH	
38 @ 25.5'	S	T	↓		TVH + BTXE	
38 @ 28.5	S	T	↓		TVH	

* * * * * *

Released by: Date: 3/31/89

Released by Courier: Date:

Received by Laboratory: Date: 3/31/89 170

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: JEFFERSON ST. TANK

SCI Job Number: 430.003

Project Contact at SCI: J. BOWERS / S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS + TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
36 @ 20.5'	S	T	3/28/89		TVH	
36 @ 25.5'	S	T	3/28/89		TVH	
36 @ 30'	S	T	3/28/89		TVH	
37 @ 20.5'	S	T	3/28/89		TVH	
37 @ 25'	S	T	↓		TVH	
37 @ 27.5'	S	T	↓		TVH	
38 @ 20.5'	S	T	3/28/89		TVH	
38 @ 25.5'	S	T	↓		TVH + BTXE	
38 @ 28.5	S	T	↓		TVH	

* * * * * *

Released by: Date: 3/31/89

Released by Courier: Date:

Received by Laboratory: Date: 3/31/89 1700

Relinquished by Laboratory: Date:

Received by: Date:

[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: 13th + JEFFERSON

SCI Job Number: 430.003

Project Contact at SCI: J. BOWERS / S. CARSON

Sampled By: S. CARSON

Analytical Laboratory: CURTIS + TOMPKINS

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
46 @ 20.5	S	T	4/20/89		TVH	
✓ 46 @ 24	S	T			TVH	
46 @ 27	S	T			TVH	
✓ 47 @ 21	S	T			TVH	
47 @ 25	S	T			TVH	
47 @ 28	S	T			TVH	
✓ 47 @ 31	S	T			TVH	
48 @ 16	S	T			TVH	
✓ 48 @ 21	S	T			TVH	
48 @ 26	S	T			TVH	

PLEASE TAKE SAMPLE TO BE ANALIZED AT LEAST 1/2" INTO BRASS TUBE

Released by: Jeri Alexander Date: 4/21/89

Released by Courier: Date:

Received by Laboratory: Date: 4/21/89

Relinquished by Laboratory: Date:

Received by: Date:

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans

-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Jim Bowers

Sampled By: Sean Carson

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
49@21	S	T	5/23/89		TVH	EPA 8015/5030
49@27½	S	T	"		TVH	EPA 8015/5030
50@22½	S	T	"		TVH	EPA 8015/5030

* * * * * *

Released by: Date: 5/23/89

Released by Courier: Date:

Received by Laboratory: Date: 5-23-89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: Dennis Alexander

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
S1@26'	S	T	6/27/89		TVH-Gas	EPA 8015/5030
S2@26'	〃	〃	〃		〃	〃
S3@26'	〃	〃	〃		〃	〃

* * * * * *

Released by: Date: 6/30/89

Released by Courier: Date:

Received by Laboratory: Nancy A Patten Date: 6/30/89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans

-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: Dennis Alexander

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
55 @ 24½'	S	T	6/27/89		TVH-Gas	EPA 8015/5030
57 @ 25½'	"	"	"		"	"
58 @ 25½'	"	"	"		"	"

* * * * * *

Released by: J. Thomas — Date: 6/29/89

Released by Courier: — Date:

Received by Laboratory: — Date: 6/29/89

Relinquished by Laboratory: — Date:

Received by: — Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: Dennis Alexander

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
59@26	S	T	6/30/89		TVH-G	EPA 8015/5030
59@24	|	|	|		|	|
60@25½	|	|	|		|	|
61@24½	|	|	|		|	|
62@26	|	|	|		|	|
63@26	|	|	|		|	|
65@24	|	|	|		|	|
65@26	|	|	|		|	|
66@24½	↓	↓	↓		↓	↓

* * * * * *

Released by: Dennis Alexander Date: 7-5-89

Released by Courier: Date:

Received by Laboratory: Date: 7/5/89 12:

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: Dennis Alexander

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: Normal

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
61 @ 26	S	T	6/30/89		TVH-G/BTXE	EDB and TEL
66 @ 26	S	T	6/30/89		TVH-G/BTXE	EDB and TEL

* * * * * *

Released by: Dennis Alexander **Date:** 7-5-89

Released by Courier: **Date:**

Received by Laboratory: **Date:** 7/5/89 12:40

Relinquished by Laboratory: **Date:**

Received by: **Date:**

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: 13th + JEFFERSON

SCI Job Number: 430.003

Project Contact at SCI: JIM BOWERS / SEAN CARSON

Sampled By: D. ALEXANDER

Analytical Laboratory: CURTIS + TOMPKINS, LTD.

Analytical Turnaround: 5 DAY - NEED BY

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
67 @ 22½'	S	T	7/20/89		TVH	
67 @ 25½	S	T	7/20/89		TVH	
69 @ 16'	S	T	7/20/89		TVH + BTXE	
69 @ 24'	S	T	7/20/89		TVH	
69 @ 25½'	S	T	7/20/89		TVH	
70 @ 26'	S	T	7/20/89		TVH	
71 @ 22½'	S	T	7/20/89		TVH	
71 @ 25½'	S	T	7/20/89		TVH	

(*) PLEASE ANALIZE MATERIAL SITUATED 1 INCH OR (*)
* * * * * *
MORE FROM END OF SAMPLE

Released by: Date: 7/24/89

Released by Courier: Date:

Received by Laboratory: Date: 7/24/89 11:25

Relinquished by Laboratory: Date:

Received by: Date:

[1] Sample Type: W = water, S = soil, O = other (specify)
[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD & ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson St

SCI Job Number: 430.003

Project Contact at SCI: Sean Carson

Sampled By: John Wolfe

Analytical Laboratory: Curtis + Tompkins Ltd.

Analytical Turnaround: 24 hr.

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
44W	W	V	5/16/89		TVH/BTXE	8015/602 EPA 5030

* * * * * *

Released by: John Wolfe Date: 5/16/89

Released by Courier: Date:

Received by Laboratory: Date: 5/16/89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans

-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: 13th + Jefferson

SCI Job Number: 430.003

Project Contact at SCI: Jim Bowers

Sampled By: Sean Carson

Analytical Laboratory: Curtis + Tompkins

Analytical Turnaround: 24 hr

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
49@25½	S	T	5/23/89		TVH	EPA 8015/5030
50@25½	S	T	5/23/89		TVH	EPA 8015/5030

* * * * * *

Released by: Date: 5/23/89

Released by Courier: Date:

Received by Laboratory: Nancy A Patten Date: 5-23-89

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

9-14-88

■ Subsurface Consultants, Inc.

PRELIMINARY ENVIRONMENTAL ASSESSMENT
BLOCK BOUNDED BY 13TH & 14TH STREETS
& MARTIN LUTHER KING, JR. WAY
& JEFFERSON STREET
OAKLAND, CALIFORNIA
SCI 430.004

Prepared for:

Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

By:

R. William Rudolph

R. William Rudolph
Geotechnical Engineer 741 (expires 12/31/88)

RUSS WILLIAM RUDOLPH
No. CE 000741
12/31/88

James P. Bowers
Geotechnical Engineer 157 (expires 3/31/91)

JAMES P. BOWERS
No. GE 000157
Exp. ________

Subsurface Consultants, Inc.
171 12th Street, Suite 201
Oakland, California 94607
(415) 268-0461

September 14, 1988

TABLE OF CONTENTS

I INTRODUCTION

This report presents the results of our preliminary environmental assessment for the block bounded by 13th & 14th Streets, Martin Luther King, Jr. Way, and Jefferson Street in Oakland, California. The location of the site is shown on the Site Plan, Plate 1.

The purpose of the preliminary assessment was to check for indications of contamination by performing analytical tests on soil and groundwater samples obtained from test borings. Specifically, our services were limited to:

1. Drilling 11 test borings,
2. Obtaining soil samples from within test borings,
3. Obtaining "grab" groundwater samples from within the hollow stem of the drilling augers,
4. Performing analytical tests on composited soil and groundwater samples, and
5. Developing conclusions regarding the significance of the contaminant levels encountered, if necessary.

Subsurface Consultants, Inc. (SCI) is currently conducting a study of a gasoline tank leak at the corner of 14th Street and Martin Luther King Jr. Way. The fuel tank was situated near the northern ~~northeast~~ corner of the block described above. This problem is being investigated under a separate contract and will not be addressed in detail in this report. A progress report has been prepared and submitted to the appropriate agencies. The report is dated July 29, 1988; a copy of the report is presented in the Appendix.

II SITE HISTORY

The site has been part of the downtown area of Oakland and as a result, has been developed for a long period of time. Information regarding the past use of the property is limited. However, we were able to obtain a significant amount of information by researching several sources. These sources included:

1. Oakland History Room, Oakland City Library,
2. Sanborn Fire Insurance Maps,
3. Historic telephone directories,
4. Building permit department, City of Oakland,
5. Available building plans, and
6. The City of Oakland Fire Department.

Details obtained from the Sanborn Fire Insurance Maps were particularly helpful in establishing the general use of the property from the late 1800's. For convenience, this data is summarized on Plates 2 thru 4.

In summary, prior to the 1920's, the block was occupied by numerous residential dwellings, small retail/service oriented stores, and the Hotel Metropole. The Hotel Metropole burned down in 1918. In the 1920's and 1930's, the use of the block changed, being occupied primarily by commercial structures/businesses. A partial summary of the businesses on the site during the 1920's and 40's is summarized below. This list is not complete, but reflects the information available to date.

	Date of Use/ Construction	Address
20th Century Market	1928	no address available
20th Century Garage (operated until 1943)	1930-33	1301 Jefferson Street
Safeway Stores Warehouse (operated until 1940)	1933-34	601 14th Street
Oakland Ice Rink (operated until 1948)	1934-35	625 14th Street
Eastern Outfitting Company	1922	617 14th Street
Cloak & Suit House	1926	617 14th Street

In the 1940's, much of the property was purchased by the City of Oakland. Firehouse No. 1 and the associated garage/repair facility were constructed on the western half of the site (see Plate 4). Similarly, the Oakland Police Department (OPD) garage was constructed in the southeast corner of the property. A 550 gallon gasoline storage tank existed below the sidewalk on Martin Luther King Jr. Way (previously Grove Street) in front of the firehouse. As stated previously, the tank leaked in the past. The results of studies investigating the problem are recorded in other SCI reports.

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The OPD garage property was previously occupied by the 20th Century Garage, a vehicle garage/service station. Discussions with individuals having lived in the area confirmed that the facility dispensed gasoline, prior to the property being converted to the OPD garage. Information regarding the location/status of the gasoline tanks is unavailable. The

Oakland Police Department garage was used to service/refuel city vehicles. Discussions with past city employees confirm the presence of gasoline storage/dispensing facilities. However, specific details of tank locations/capacities are unavailable. Unsubstantiated information suggests that as many as three, 300-gallon fuel tanks existed beneath the sidewalk along 13th Street, near its intersection with Jefferson Street. Data regarding tank removal is also unavailable. Excavations made during recent site demolition activities, revealed pipelines extending from the southeast corner of the property into Jefferson and 13th Streets. The pipelines were typical of those used to dispense gasoline from underground tanks.

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The Sanborn Fire Insurance Maps provided information regarding the location of several other previous gasoline service stations in the area. For completeness, their locations are indicated on Plate 4.

III FIELD INVESTIGATION

Subsurface conditions were explored by drilling 11 test borings ranging from 2-1/2 to 34 feet deep. These borings are numbered 17 thru 27. Borings 5 and 12 were drilled during a previous study. For completeness, the logs of these borings are presented herein. Boring locations are shown on Plate 1. The borings were drilled with a truck-mounted rig equipped with 8-inch diameter, hollow-stem augers. The drilling and sampling equipment was thoroughly steam-cleaned prior to introduction into each borehole to reduce the likelihood of cross-contamination between borings. Test Boring 23 was drilled through the basement floor slab using hand sampling techniques. The boring extended about 2.5 feet below the groundsurface.

Our geologist observed drilling operations, prepared a detailed log of each boring, and obtained undisturbed soil samples from each boring. Boring logs are presented on Plates 5 thru 18. Soil samples were retained in 2-inch diameter brass sample liners. A California Drive Sampler was used to obtain the samples; sampler dimensions are presented on the Boring Logs. Teflon sheeting was placed over the ends of the soil samples; the liners were subsequently capped and sealed with plastic tape. Soil samples were refrigerated on-site in ice chests and remained so until delivery to the analytical laboratory.

Groundwater samples were obtained from within the hollow-stem of the augers in Test Borings 18, 19, 20, 21 and 22. Because of the proximity of Boring 17 to an existing groundwater monitoring well[1], a groundwater sample was obtained from this well in lieu of Boring 17. In brief, the well is constructed of 2-inch diameter, Schedule 40 PVC pipe having flush threaded joints. The lower portion of the well consists of machine slotted well screen having 0.020-inch slots. The annular space around the screened section is backfilled with Lonestar #3 sand.

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[1] Test Boring 8 was drilled and converted to a groundwater monitoring well as part of the Martin Luther King Jr. Way gasoline tank leakage study.

A bentonite plug, approximately 12-inches thick, was placed above the sand. The annulus above the plug was backfilled with bentonite grout. The well was finished flush with the groundsurface. The well head is secured by a locking cover. A Teflon sampling device was used to obtain the groundwater samples. The water samples were refrigerated on-site in ice chests, and remained under refrigeration until delivery to the analytical laboratory. Monitoring Well 8 was purged prior to sampling by removing 25 gallons of water using a Teflon bailing device. The deep water well (see following section) was purged prior to sampling by removing 275 gallons of water using a submersible pump. Water samples were obtained using a Teflon sampling device.

Upon completion of drilling, all boreholes were backfilled with a bentonite grout.

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Chain-of-custody documents were maintained for all samples delivered to the analytical laboratory for testing.

IV SITE CONDITIONS

A. Surface Conditions

The study area encompasses an entire city block, and measures approximately 200- by 300-feet in plan. The site is currently surrounded by a chain link fence. The site has recently been cleared of all above grade structures. Concrete slab-on-grades exist in most areas. The southwestern corner of the block is occupied by a basement measuring approximately 100-by 175-feet in plan. It is about 15-feet deep; access to the basement is provided by a ramp situated near the middle of the property. Slab-on-grades exist in all areas except in the northeastern corner where soil is exposed at the groundsurface. This unpaved area represents a basement that has been filled in. Its approximate location is shown on the site plan. The lot is essentially level and void of vegetation.

A water well was discovered on the property during the investigation, about 100 feet west of the intersection of 13th and Jefferson Streets. The well is about 215 feet deep and appears to have a 6-inch-diameter steel well casing. Specific details of the well are unknown. The Alameda County Flood Control and Water Conservation District has no record of the wells existence. The well head is set in a concrete structure about 3 feet below the groundsurface. When discovered, a steel plate had been welded to the top of the concrete structure. The wells location is indicated on the Site Plan. *

A concrete sump exists on the property adjacent to 13th Street. The sump measures approximately 30 inches square in plan; its depth is currently unknown. A black oily sludge currently exists in lower portions of the sump. *

In the existing basement, near Test Boring 23, the concrete floor slab was observed to be deeply etched (up to about 3/4 inch) by what is suspected to have been acid. The etched surface suggested that the acid flowed along the slab surface and into a nearby floor drain inlet. Test Boring 23 was drilled adjacent to the inlet. We are currently uncertain of where the drain piping system discharges.

B. Subsurface Conditions

Soil conditions on the property consist of surface fills which are underlain by naturally deposited sandy soils. The fills are generally about 1 to 3 feet thick. However, they are locally thicker where basements, and basement and sump walls have been backfilled. Six feet of fill was encountered adjacent to the sump (Boring 18). Eleven feet of fill was encountered in the backfilled basement area (Boring 20). We judge that fills up to 15 or 16 feet thick exist in areas adjacent to the existing basement walls. The fill consists predominantly of sandy soils; however, clayey soils were also encountered. Below the fill and extending to depths of 13 to 20 feet, are dense clayey sands. Below these materials are dense sands containing low to nominal quantities of silt and clay. These comparatively clean sands extend to the depths explored, about 34 feet. Deeper test borings drilled during other investigations indicate that stiff clayey soils exist at depths of about 42 feet.

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Groundwater was encountered at a depth of approximately 26-1/2 feet below the groundsurface.

V ANALYTICAL TESTING

Soil and groundwater samples were collected and transmitted to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services to conduct hazardous waste and water testing. Soil/water composites were prepared by the laboratory. The approach of compositing samples provides an economical method of generally assessing whether contaminants exist. However, the analytical test results from the composited samples only provide a qualitative evaluation of contamination.

In general, Composite 1 consists of fill and natural soils, Composite 2 consists of soils adjacent to and below the sump, Composite 3 consists of fill and natural soils near the eastern end of the property, and Composite 4 consists of natural soils from below the basement slab. A summary of the samples making up the composites is presented in Table 1.

Table 1. SOIL AND GROUNDWATER SAMPLE COMPOSITES

SOIL

	Boring	Sample Depth (feet)
Composite 1	17	1.0
	17	8.0
	21	1.0
	21	5.0
Composite 2	18	4.0
	18	7.0
	18	12.0
	18	17.0
Composite 3	19	2.0
	19	13.0
	20	4.0
	20	10.0
Composite 4	22	24.0
	23	2.0

GROUNDWATER

Composite 1W	Well 8, and Borings 18 & 22
Composite 2W	Borings 19, 20 & 21

The composited soil and groundwater samples were analyzed for substances presently classified as priority pollutants by the U.S. Environmental Protection Agency (EPA), excluding dioxins and cyanide. The testing program included analysis for volatile organic compounds according to EPA Method 8240 (soil) and Method 624 (water), base/neutral and acid extractables according to EPA Method 8270 (soil) and Method 625 (water), and heavy metals (CAM 17). Samples of the fill materials were also checked for the presence of asbestos. Gasoline odors were noted in samples from Borings 12, 19 and 24 thru 27; they were subsequently analyzed to check for the presence of volatile petroleum hydrocarbons in accordance with EPA Method 8015 (purge & trap) and benzene, toluene, xylene and ethylbenzene (BTXE). Because of the suspected presence of acids, the pH of a soil sample from Boring 23 was also checked.

Analytical test results are summarized in Tables 2 thru 6. Since many of the soil and groundwater samples analyzed were composited, many of the results presented do not represent chemical concentrations at specific locations, but instead, represent an average chemical concentration within the samples included in each composite.

Table 2. ORGANIC CHEMICAL CONCENTRATIONS IN SOIL

Chemical/Chemical Analysis	Concentration
Composite 1	
EPA Method 8240[1] chemicals	ND[2]
EPA Method 8270[3] chemicals	ND
Composite 2	
EPA Method 8240 chemicals	ND
EPA Method 8270 chemicals	ND
Composite 3	
EPA Method 8240 chemicals	ND
EPA Method 8270 chemicals	
Naphthalene	1,100[4] ppm
Acenaphthylene	330
Fluorene	65
Phenanthrene	830
Anthracene	110
Fluoranthene	590
Pyrene	730
Benzo(a)anthracene	120
Chrysene	170
Benzo(b)fluoranthene	98
Benzo(k)fluoranthene	21
Indeno(1, 2, 3-cd)pyrene	150
2 - Methylnaphthalene	43
Other EPA Method 8270 chemicals	ND
Composite 4	
EPA Method 8240 chemicals	ND
EPA MEthod 8270 chemicals	ND

---

[1] Method includes the 35 chemicals listed on the test reports in the Appendix

[2] ND = None detected, chemicals not present at concentrations above detection limits

[3] Method includes the 68 chemicals listed on the test reports in the Appendix

[4] Mg/kg = Milligrams per kilogram or ppm

Table 3. METAL CONCENTRATIONS IN SOIL

Metal	Composite 1	Composite 2	Composite 3	Composite 4	Regulatory Criteria	
					STLC[1]	TTLC[2]
Barium	67[3]	38	57	0.19	100[4]	10,000[5]
Chromium[6]	30	28	20	ND	560	2,500
Cobalt	4.1	5.8	6.5	ND	80	8,000
Copper	14	4.5	35	0.02	25	2,500
Lead	11	3.9	73	ND	5	1,000
Mercury	0.13	ND	0.27	ND	0.2	20
Molybdenum	ND	0.5	ND	ND	350	3,500
Nickel	22	19	26	ND	20	2,000
Vanadium	18	11	23	ND	24	2,400
Zinc	27	13	178	0.02	250	5,000
Other CAM 17 metals	ND[7]	ND	ND	ND		

---

[1] Soluble Threshold Limit Concentration (22CAC66699), mg/kg

[2] Total Threshold Limit Concentration (22CAC6699), mg/kg

[3] Concentrations in mg/kg or (ppm)

[4] Excluding Barite

[5] Excluding Barite and Barium Sulfate

[6] Total Chromium compounds

[7] ND = None detected, chemicals not present at concentrations above the detection limits

Table 4. CHEMICAL CONCENTRATIONS IN GROUNDWATER

Chemical/Metal/Chemical Analysis	Concentration
Composite 1W: Well 8, Borings 18 and 22	
EPA Method 624 chemicals [1]	ND[2]
EPA Method 625 chemicals[3]	ND
Barium	0.10[4] ppm
Other CAM 17 metals[5]	ND
Composite 2W: Borings 19, 20 and 21	
EPA Method 624 chemicals	ND
EPA Method 625 chemicals	ND
Barium	0.09
Molybdenum	0.02
Other CAM 17 metals	ND
Well Water	
EPA Method 624 chemicals	ND
EPA Method 625 chemicals	ND
Barium	0.19
Copper	0.02
Zinc	0.02
Other CAM 17 metals	ND

---

[1] Method includes the 35 chemicals listed on the test reports in the Appendix

[2] ND = none detected, chemicals not present at concentrations above detection limits

[3] Method includes the 68 chemicals listed on the test reports in the Appendix

[4] mg/L = milligrams per liter = ppm

[5] Method includes the 17 metals listed in the California Assessment Manual

Table 5. PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL

Sample[3]	TVH[1] mg/kg[2]	Benzene mg/kg	Toluene mg/kg	Total Xylenes mg/kg	Ethyl Benzene mg/kg
12 @ 23.0	ND	ND	ND	ND	ND
19 @ 27.0	20.9	-	-	-	-
24 @ 18.0	ND	ND	ND	ND	ND
24 @ 23.0	88.3	ND	ND	3.51	1.56
24 @ 27.5	2310	ND	43.5	167	54.7
25 @ 23.0	19.9	ND	0.16	0.86	0.21
26 @ 23.0	ND	ND	ND	0.17	ND
27 @ 18.0	ND	ND	ND	0.11	ND
27 @ 23.5	516	ND	3.59	34.4	11.6
27 @ 28.0	ND	ND	ND	0.23	0.13

---

[1] TVH = total volatile hydrocarbons, as gasoline

[2] mg/kg = milligrams per kilogram or part per million (ppm)

[3] Boring number and sample depth (feet)

[4] ND = Not detected at concentrations above detection limit; see test reports for detection limits

Table 6. ASBESTOS AND pH TEST RESULTS

Sample Identification	pH
23 @ 2.0 feet	5.1
18 @ 22.0 feet	7.5
19 @ 18.0 feet	7.4
21 @ 17.5 feet	7.5
22 @ 17.0 feet	6.8
	Asbestos[1]
17 @ 1.0 foot	ND
19 @ 2.0 feet	ND[2]
20 @ 4.0 feet	ND
21 @ 1.0 foot	ND

---

[1] Polarized light microscopy, includes chrysotile, amosite, and crocidolite

[2] ND = Not detected at concentrations above detection limits

VI DISCUSSION AND CONCLUSIONS

In general, the studies to date have revealed several areas where elevated concentrations of priority pollutant chemicals exist in the soil. Numerous organic chemicals, known as polynuclear aromatic hydrocarbons (PNA's) exist in the composite made up of soils from Borings 19 and 20. Priority pollutant organic chemicals were not encountered in the composites from the other test borings. Low concentrations of numerous heavy metals were detected in the soil composites. Elevated concentrations of gasoline, and toluene, xylene and ethlybenzene, were detected in soil samples from borings situated near the corner of Jefferson and 13th Streets. Based upon analytical tests performed by others, the sump near Test Boring 18 contains an oily sludge, contaminated with several heavy metals, polychlorinated biphenyls (PCB's), petroleum hydrocarbons, methylene chloride and xylenes. Our conclusions and findings are discussed in more detail below.

A. Soil

1. Organic Chemicals

The analytical tests reveal the presence of numerous PNA's in the soils from Test Borings 19 and 20. The compounds encountered are summarized in Table 2. PNA's or other priority pollutant organic chemicals were not encountered in soil samples from the other test borings.

Many of the chemicals detected are coal tar derivatives and/or are produced by the incomplete combustion of organic materials.

The source of the fill on the property is currently uncertain, as well as the industry associated with the chemicals detected. However, although unconfirmed to date, we suspect that the PNAs exist within the fills encountered in Borings 19 and/or 20. We judge that the past use of the property suggests that the source of the chemicals was not on-site. Contaminated fill was likely brought onto the site to raise grades.

The PNAs detected are regulated by the US EPA as priority pollutants. They are known or suspected carcinogens, and are considered hazardous under state and federal regulations. The appropriate remedial response will depend significantly on several factors, including (1) the health risks associated with human exposure to the chemicals, and (2) the potential risk of groundwater quality degradation due to migration of the compounds. The concentrations detected are sufficiently high that we conclude that remediation will likely be appropriate. It is also important to note that the concentrations of the chemicals in the soil could be substantially higher than those reported because of the limitations associated with compositing soil samples. The composite sample analyzed was made up of 4 individual samples. Under the most severe conditions, the concentrations in any individual sample could be up to four times as high as those reported in Table 2.

The lateral and vertical extent of the PNA contamination is currently uncertain. Additional field and analytical study is required to characterize the problem.

2. Heavy Metals

Detectable concentrations of several heavy metals (barium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, vanadium, and zinc) were encountered in the soil composites. The concentrations are summarized in Table 3.

The significance of the metal concentrations in the soil composites can be put into perspective by comparing the detected concentrations to the total threshold limit concentrations (TTLC) and to the soluble threshold limit concentrations (STLC) of the metals, as defined in Title 22 of California Administrative Code. If the total concentration of metal in a soil sample exceeds the metals corresponding TTLC value, the soil meets the criteria for classification as a hazardous waste. Likewise, if the soluble concentration of a metal in a soil sample exceeds the metals corresponding STLC value, the soil will also be classified as a hazardous waste. The soluble concentration is determined by analyzing extract from a waste extraction test (22 CAC66700) during which a 10:1 dilution of the extract is performed. These analyses were not performed during the study. However, as a rule of thumb, the maximum possible soluble concentration for any soil sample can be approximated by dividing the total metal concentration by a factor of 10, since a 10:1 dilution is required during the waste extraction test.

The TTLC and STLC values for the metals encountered in the composited soil samples are presented in Table 3. The metal concentrations in the table are total concentrations, not soluble concentrations.

In all cases, the metal concentrations detected are well below TTLC hazardous waste regulatory criteria. However, it is possible that the metal concentrations in the individual samples making up the composites could be higher than those detected due to the limitations associated with analyzing composited samples. Because the composites were made up of four individual samples, metal concentrations could, under the most critical conditions, be as high as four times the values presented in Table 3. If this condition is assumed to exist, the concentrations will still be significantly below TTLC values. However, if we apply the 10:1 dilution and composite factors discussed previously to the reported total metal concentrations, we find that the STLC values could be exceeded for lead. The fact that lead was not detected in the groundwater samples may indicate that the metal is not readily mobilized and hence, may in part be chemically bound in the soil.

Many of the metals that were encountered in the soil samples are in general, not naturally occurring elements in the soil in the area. However, concentrations of these metals, similar to those encountered are commonly found in surface soils throughout the San Francisco Bay area. For this reason, they are often considered to represent "background" concentrations.

The concentrations of metals in the soil samples are not considered indicative of a soil contamination problem requiring remediation. However, because it is possible that soluble or extractable concentrations of lead could exceed STLC values, additional field and laboratory data should be developed to further define the lead contamination conditions. Future studies should include analyses to document extractable concentrations of lead in the soil.

3. Petroleum Hydrocarbons

Gasoline odors were detected in soil samples obtained from Borings 12, 19 and 24 through 27. Analytical tests performed on selected samples confirm the presence of petroleum hydrocarbons (as gasoline) and the volatile constituents of gasoline. Analytical test data are summarized in Table 5.

Gasoline concentrations in the soil range up to about 2,310 mg/kg. Gasoline was detected at depths which indicate that both soil and groundwater have been impacted. The concentrations are sufficiently high, particularly in Test Boring 24, that we conclude that some remediation will likely be necessary. The scope of the remedial effort cannot be accurately defined at this time because of the lack of data regarding the lateral and vertical extent of the problem. Additional study is required to further refine our understanding of the problem, as well as identify the source of contamination.

It may be premature to speculate on the source of the gasoline contamination. However, because significant contamination was not detected at shallow depths, we suspect that the source of contamination may not be on-site. As discussed previously, it is believed that a gasoline service station previously existed across Jefferson Street (Plate 4). Given its location to the property, we

why
not
from
the
OPD
tank

suspect that this station could be the primary source of the observed problem.

During the study, very mild gasoline odors were noted at shallow depths, i.e. between depths of about 7 and 15 feet, in Borings 26 and 27. This condition would suggest that the source of the odors was nearby, and could have been the fuel tanks used by the Oakland Police Department garage or possibly, the previous service station operator. During our investigation, we did not encounter conditions suggesting the presence of underground storage tanks. In addition, the analyses performed to date have not produced data suggesting that a significant <u>source</u> of gasoline contamination exists near the corner of 13th and Jefferson Streets.

B. Groundwater

Detectable concentrations of two heavy metals, barium and molybdenum, were encountered in the groundwater composites. Analytical results are summarized in Table 4. The concentrations of barium in the composites was about 0.1 mg/L. Molybdenum was also encountered in Composite 2W (Borings 19, 20 and 21) at a concentration of 0.02 mg/L, which is at the detection limit of the analysis performed. Neither acid/base/neutral organic chemicals (EPA 625) nor volatile organic chemicals (EPA 624) were present in the groundwater composites at concentrations above detection limits.

The heavy metal concentrations in groundwater are low, even considering the limitations associated with compositing the water samples. They are not considered to indicate a soil or groundwater contamination problem requiring mitigation nor further study.

C. Well Water

The groundwater sample obtained from the deep water well on the property was analyzed as a discrete sample, i.e., it was not composited with other water samples. Analytical test results are summarized in Table 4. Acid and base/neutral compounds or volatile organic chemicals were not present in the sample at concentrations above detection limits. However, three heavy metals were detected (barium, copper, zinc) at concentrations of 0.19, 0.02, and 0.02 mg/L, respectively. The concentrations of these heavy metals are low and are not considered indicative of a groundwater contamination problem requiring mitigation or further study. Although unconfirmed, we suspect that the slightly elevated copper and zinc concentrations may be associated with decomposition of the metal well casing.

D. Acetic Soils

Analyses indicate that the soils adjacent to the drain inlet in the existing basement have a pH of 5.1. This pH is relatively low, as compared to the pH of other, similar on-site soils (Table 6). This suggests that acid may have seeped into soils in the area. Other analyses did not reveal the presence of priority pollutant organic chemicals nor elevated concentrations of heavy metals in the soils near the inlet.

At the present time, we do not view this condition as indicative of a serious problem. However, we recommend that a test boring be drilled in the area to evaluate the extent of ~~acetic~~ acidic soils. If it is apparent that groundwater has been adversely impacted it may be appropriate to install a groundwater monitoring well.

E. Sump

As discussed previously, the sump adjacent to Boring 18 contains a relatively small quantity of oily sludge containing PCBs, heavy metals, and other organic chemicals. Based upon the Boring 18 analytical results (Composite 2) it appears that the sump has not released contaminants into the soil. The wastes appear to be contained within the sump.

The sump and its contents should be removed, manifested and disposed of as Class 1 hazardous wastes. We believe that it will be most practical and cost effective to remove the sump and its contents during remediation of the PNA problem.

F. Recommendations

Our preliminary assessment of the property has indicated several conditions which, in our opinion, warrant further study and in some cases remediation. These conditions include:

1. **PNA Contamination** - Additional test borings should be drilled to obtain samples of soils in the eastern end of the property. Analytical tests should be conducted on individual samples to define the lateral and vertical extent of PNA contamination, and assist in preparing plans for the most appropriate remediation scheme.

2. **Lead** - Soil samples from borings situated in the eastern end of the property should be analyzed to evaluate extractable lead concentrations and check that they do not exceed STLC hazardous waste criteria.

3. **Gasoline Contamination - Jefferson and 13th Streets**- Additional studies should be conducted to identify the source of the problem and evaluate the lateral and vertical extent of soil contamination. Groundwater

monitoring wells should be installed to evaluate the impact on groundwater in the area.

4. **Acetic Soils** - A test boring should be installed adjacent to the floor drain inlet near Test Boring 23. Soil samples should be analyzed to evaluate the extent of acetic soil conditions. A groundwater monitoring well may be necessary if it is apparent that groundwater has been impacted.

List of Attached Plates:

Plate 1	Site Plan
Plate 2	Site Use Map - 1901
Plate 3	Site Use Map - 1911
Plate 4	Site Use Map - 1951
Plates 5 thru 17	Logs of Borings 5, 12 and 17 thru 27
Plate 18	Unified Soil Classification System

Appendix:

Analytical Test Reports

Chain of Custody Records

Progress Report 1, dated July 29, 1988, Underground Fuel Tank Leak Assessment, 1330 Martin Luther King, Jr. Way

Distribution:

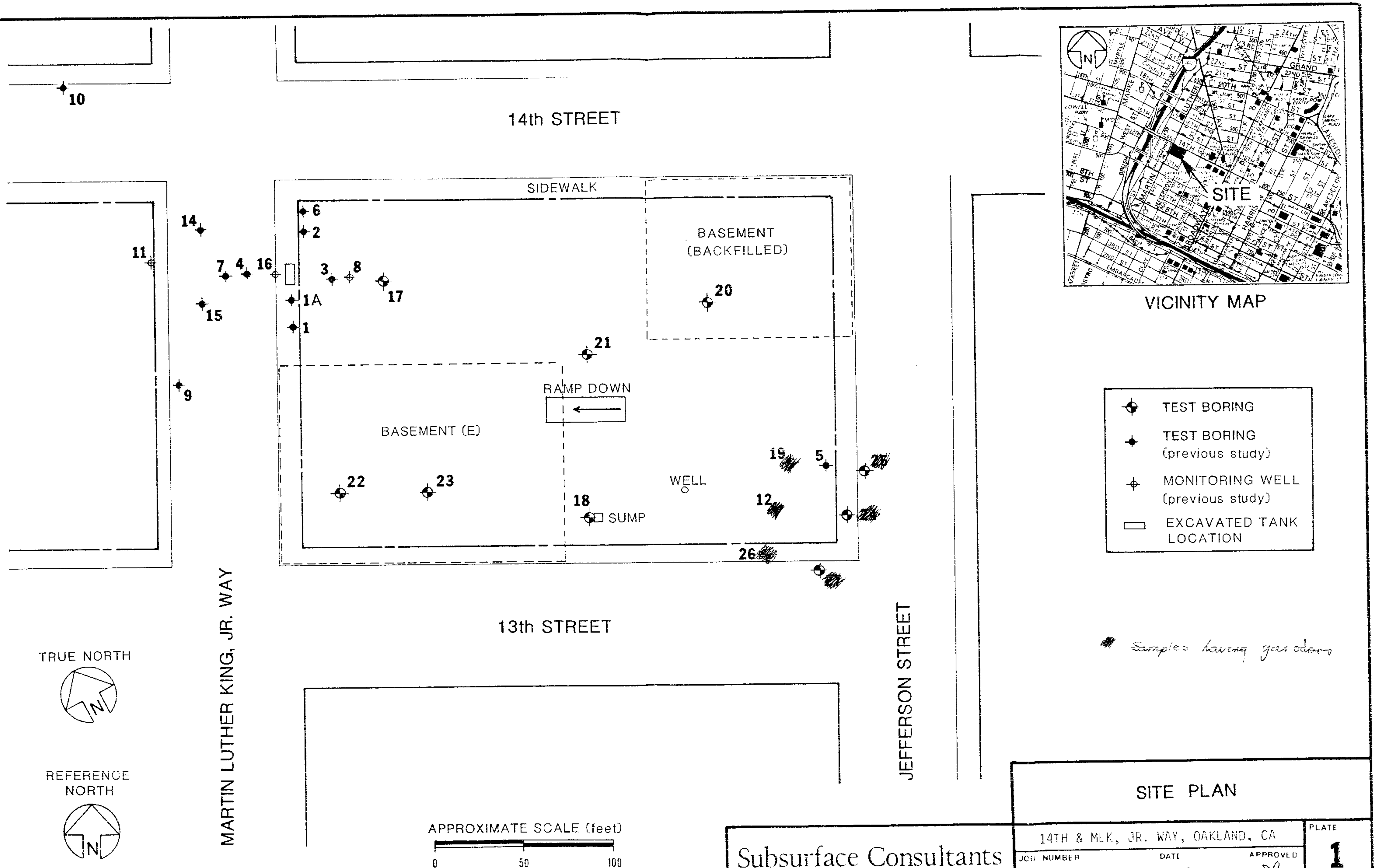
2 copies: Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

2 copies: Ms. Lois Parr
City of Oakland
Office of Economic Development and Employment
1417 Clay Street
Oakland, California 94612

1 copy: Mr. Tim Brown
Crosby, Heafey, Roach & May
1999 Harrison Street
Oakland, California 94612

1 copy: Mr. Donnell Choy, Attorney
City of Oakland
One City Hall Plaza
Oakland, California 94612

GTT:RWR:JPB:ggm

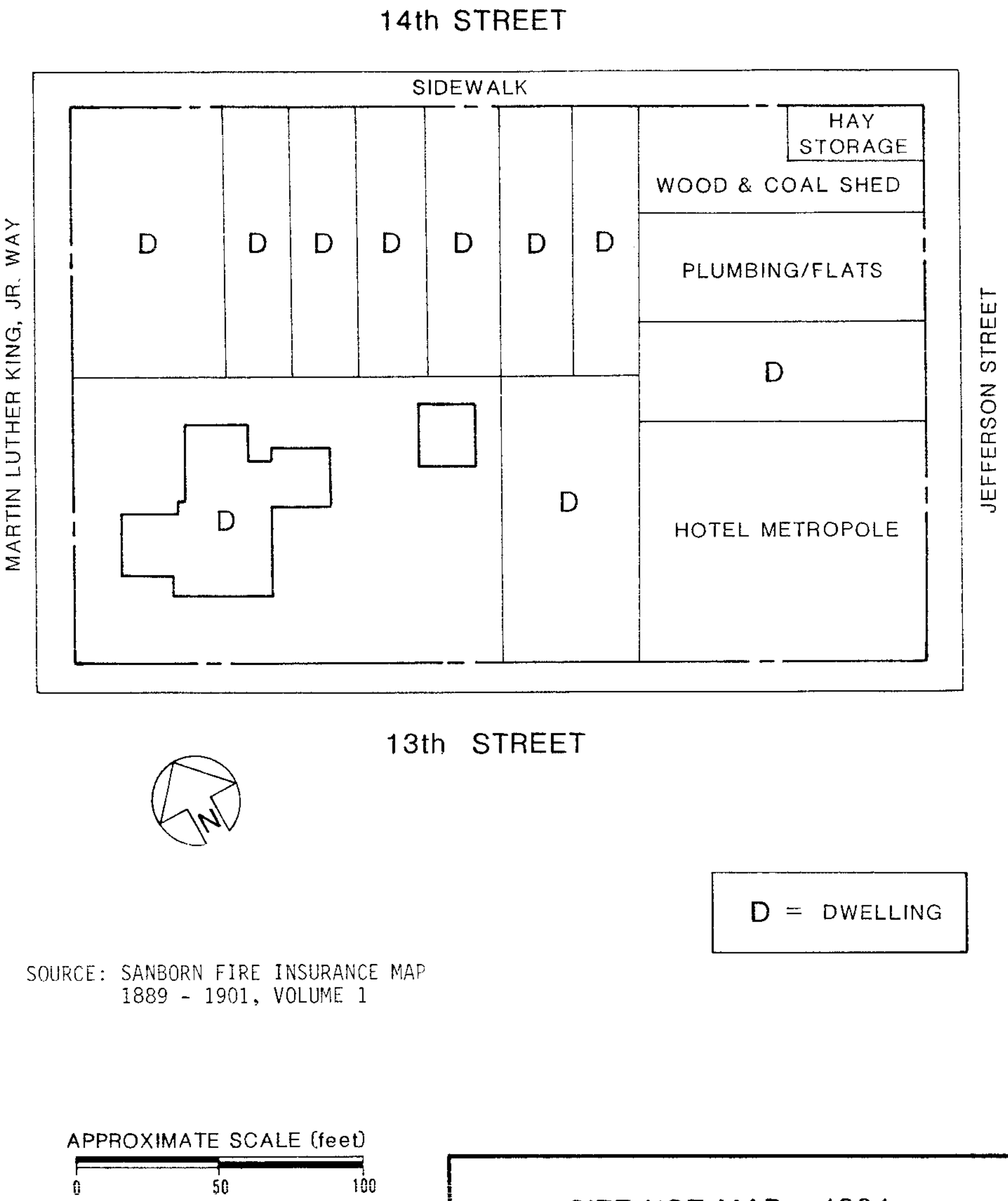


SITE PLAN

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	8/17/88		1



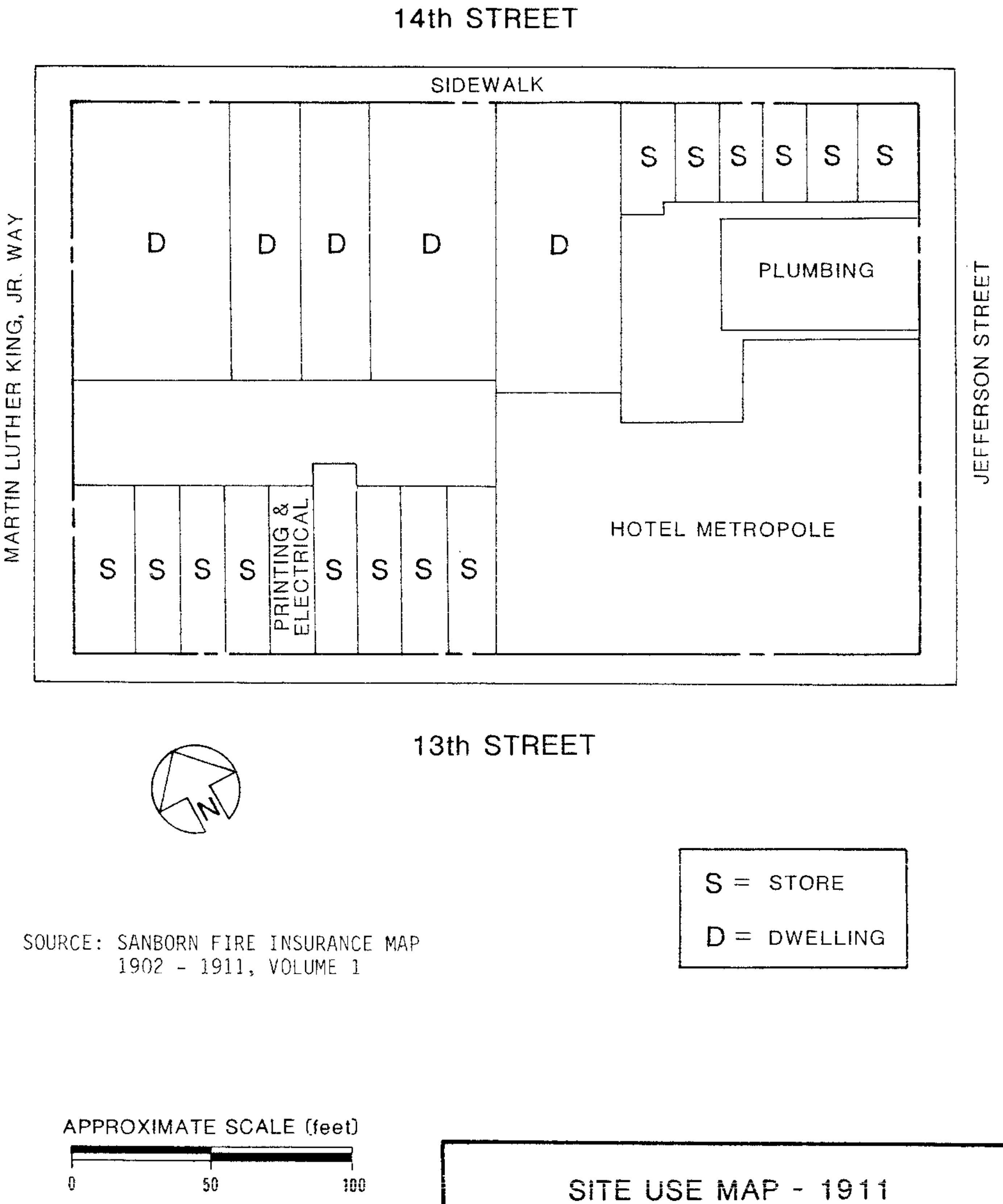
SOURCE: SANBORN FIRE INSURANCE MAP
1889 - 1901, VOLUME 1

SITE USE MAP - 1901

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	9/13/88		2



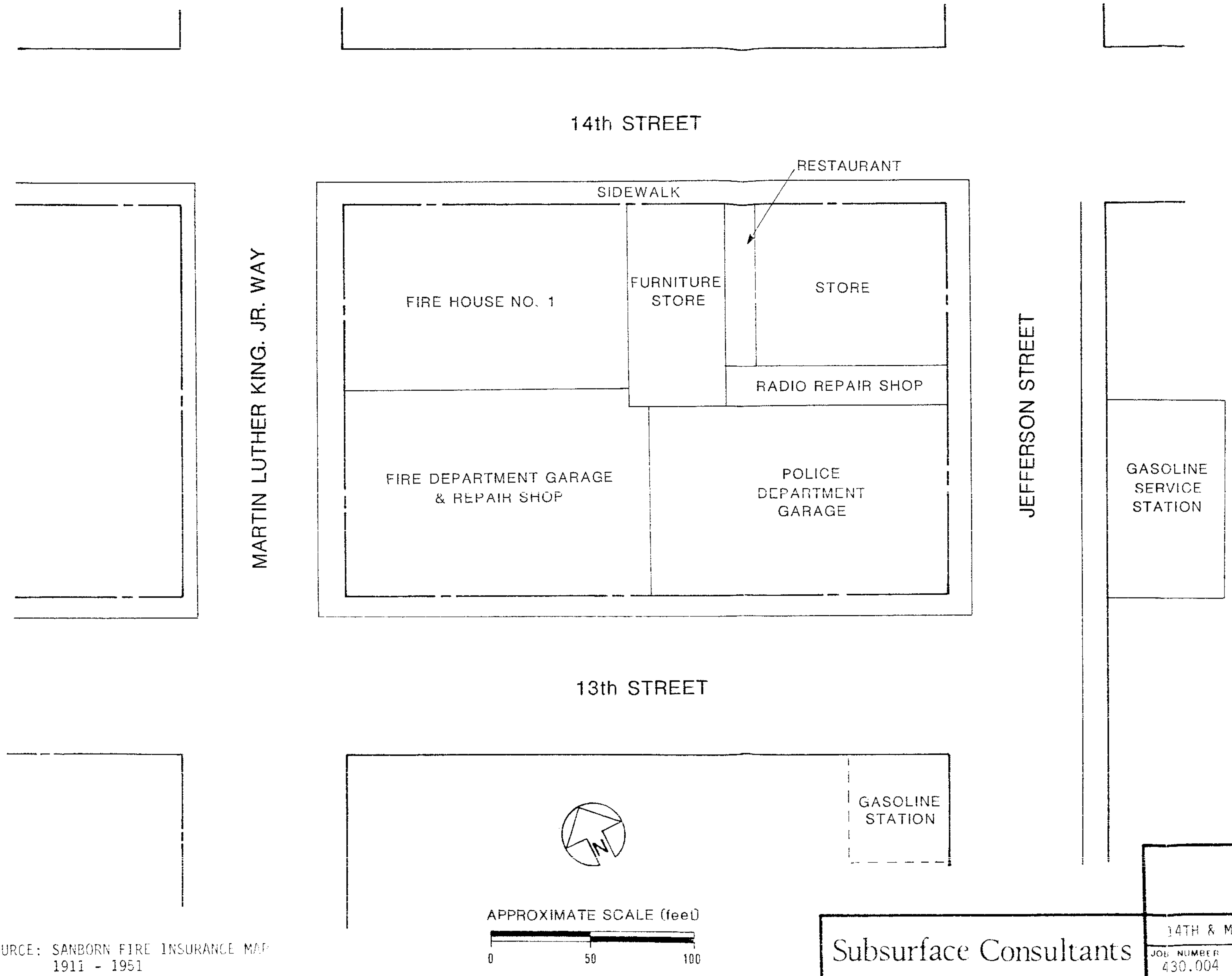
SOURCE: SANBORN FIRE INSURANCE MAP
1902 - 1911, VOLUME 1

SITE USE MAP - 1911

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	9/13/88		3



SOURCE: SANBORN FIRE INSURANCE MAP
1911 - 1951

Subsurface Consultants

SITE USE MAP - 1951

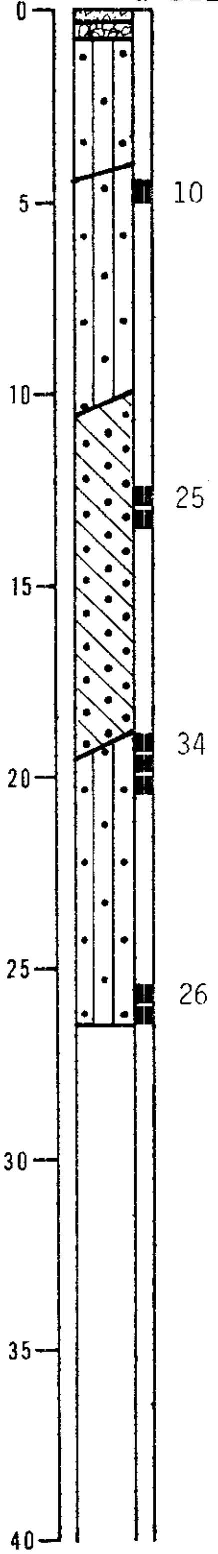
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	9/13/88		4

LOG OF TEST BORING 5

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



4" CONCRETE
3" BASE ROCK
BLACK SILTY SAND (SM)
medium dense, moist, with numerous pieces of brick red, glass (fill)

MOTTLED GRAY BROWN SILTY SAND (SM)
medium dense, moist

BROWN SILTY CLAYEY SAND (SC)
dense, moist

GRAY BROWN SILTY SAND (SM-SP)
dense, moist

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

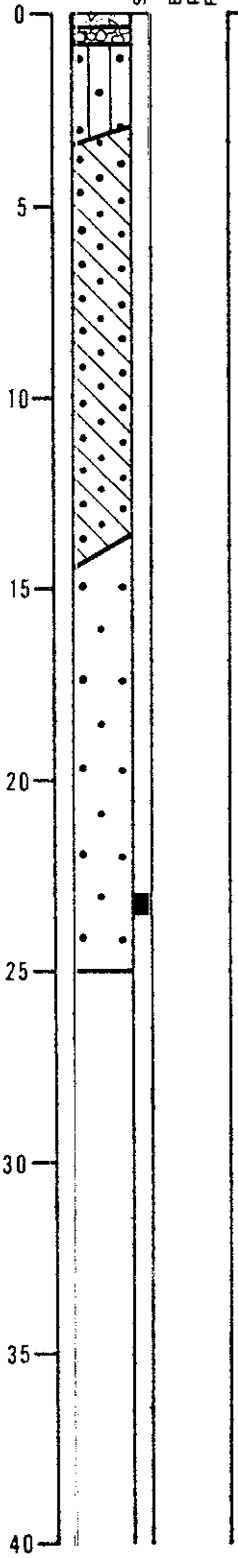
JOB NUMBER 430.004
DATE 7/14/88
APPROVED

PLATE 5

LOG OF TEST BORING 12

EQUIPMENT 8" HOLLOW STEM AUGER
DATE DRILLED 6-23-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT
	12.4	104			



4" CONCRETE
4" BASE ROCK

DARK BROWN SILTY SAND (SM)
medium dense, moist, with numerous bricks and other debris (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER NOT ENCOUNTERED DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

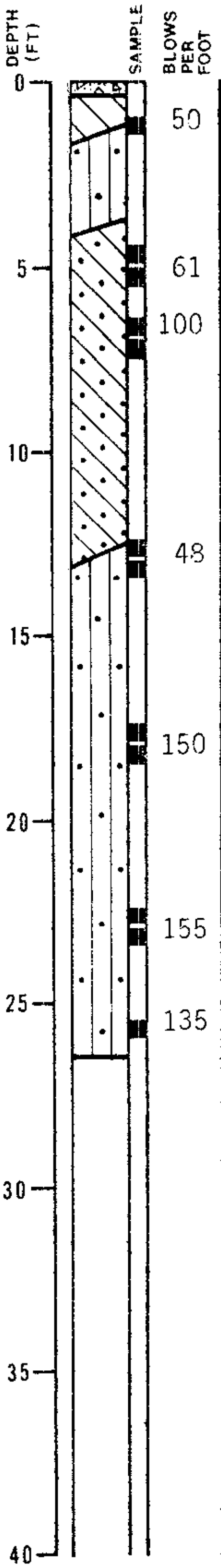
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	7/14/88		6

LOG OF TEST BORING 17

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/21/88
ELEVATION 96.1 feet*

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



4" CONCRETE
DARK BROWN SILTY CLAY (CL)
stiff, moist
BROWN SILTY SAND (SM/SP)
dense, moist
BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SM/SP)
dense, moist

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

* 14th Street Parking Lot Topographic Plan, KCA Engineers, Inc., June 1988

SAMPLER TYPE:
CALIFORNIA DRIVE
O.D.: 2.5 inches
I.D.: 2.0 inches

HAMMER WEIGHT: 140 pounds
HAMMER DROP: 30 inches

BLOWCOUNTS ARE NONREPRESENTATIVE DUE TO EQUIPMENT MALFUNCTION (BORINGS 17 & 18 ONLY)

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

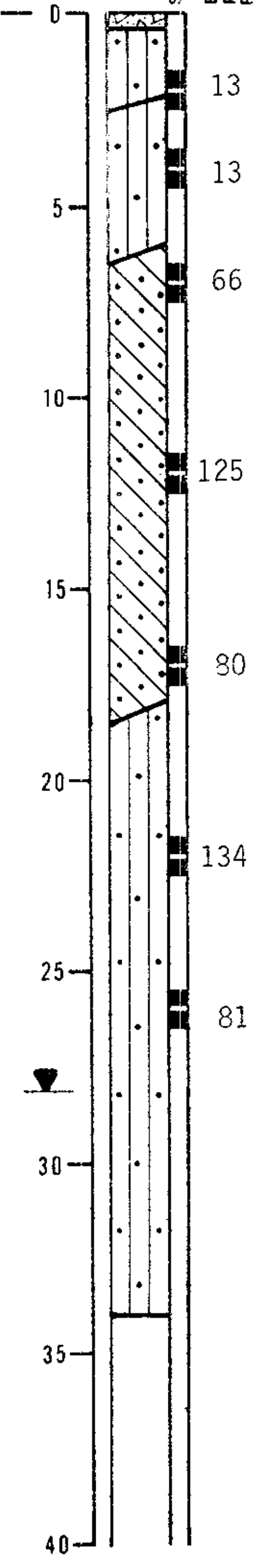
JOB NUMBER 430.004
DATE 8/4/88
APPROVED

PLATE 7

LOG OF TEST BORING 18

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/21/88
ELEVATION 97.7 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



3" CONCRETE

DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

BROWN SAND (SM)
medium dense, moist (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SM/SP)
very dense, moist, fine grained

GROUNDWATER LEVEL DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

BLOWCOUNTS ARE NONREPRESENTATIVE DUE TO EQUIPMENT MALFUNCTION (BORINGS 17 & 18 ONLY)

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

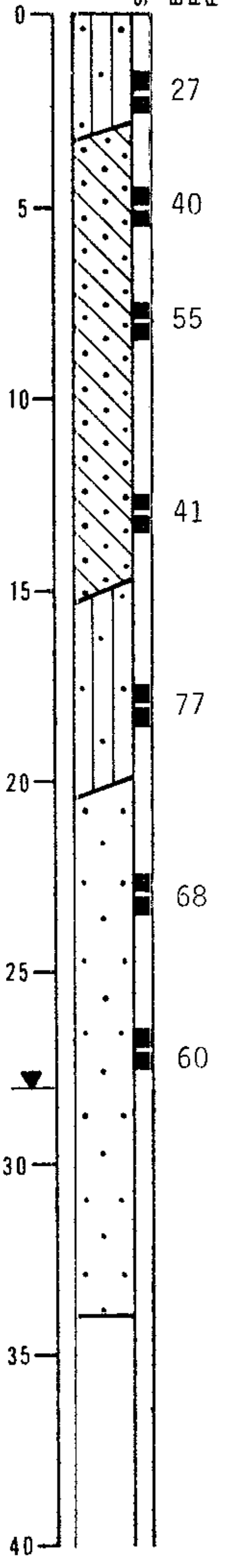
JOB NUMBER 430.004
DATE 8/4/88
APPROVED

PLATE 8

LOG OF TEST BORING 19

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/21/88
ELEVATION 97.8 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



DARK BROWN/BLACK SILTY SAND (SM)
medium dense, moist, with numerous pieces of brick and concrete rubble, and asphalt (fill)

BROWN CLAYEY SAND (SC)
very dense, moist

color change to mottled gray and brown below 10 feet

BROWN SILTY SAND (SM/SP)
dense, moist

GRAY SAND (SP)
dense, moist, fine grained

slight gasoline oder @ 26 feet

GROUNDWATER LEVEL DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

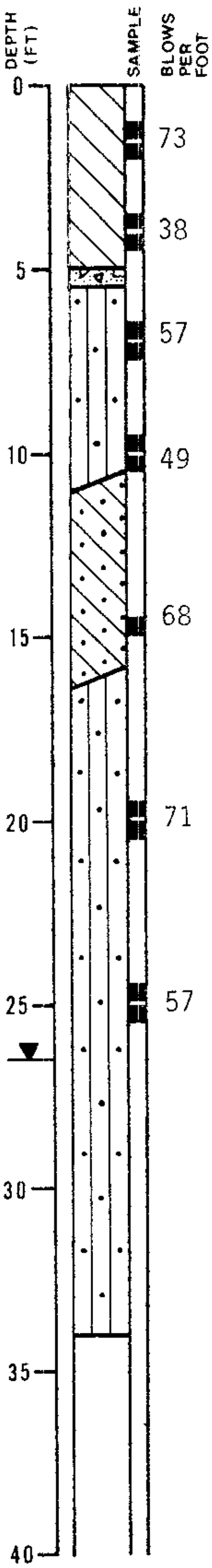
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	8/4/88		9

LOG OF TEST BORING 20

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/22/88
ELEVATION 97.6 feet

LABORATORY TESTS
MOISTURE CONTENT %
DRY DENSITY (PCF)



DARK BROWN SANDY GRAVELLY CLAY (CL)
stiff, moist, with numerous fragments, brick, rubble and asphalt (fill)

CONCRETE RUBBLE ? @ 5 FEET
DARK BROWN TO BLACK SILTY SAND (SM)
dense, moist, with numerous debris fragments (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM/SP)
very dense, moist, fine grained

color change to gray brown below 22 feet

▼ GROUNDWATER LEVEL DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

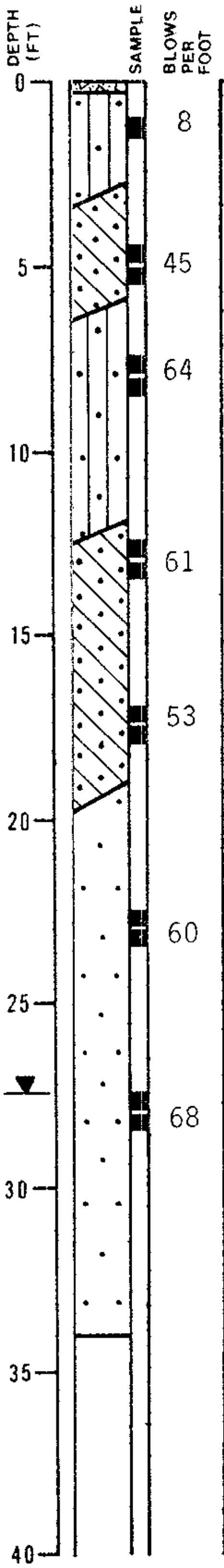
JOB NUMBER 430.004
DATE 8/4/88
APPROVED

PLATE **10**

LOG OF TEST BORING 21

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/22/88
ELEVATION 97.1 feet

LABORATORY TESTS
MOISTURE CONTENT %
DRY DENSITY (PCF)



3" CONCRETE

DARK BROWN SILTY SAND (SM)
medium dense, moist, with numerous pieces of rubble debris (fill)

BROWN SILTY CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM/SP)
dense, moist, fine grained

MOTTLED BROWN SILTY CLAYEY SAND (SC)
very dense, moist

GRAY AND BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

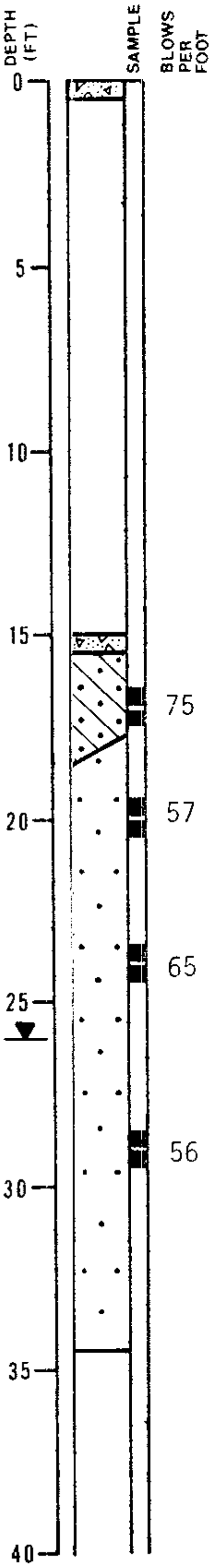
JOB NUMBER 430.004
DATE 8/4/88
APPROVED

PLATE **11**

LOG OF TEST BORING 22

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7/22/88
ELEVATION 98.1 feet

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)**



6" CONCRETE

BASEMENT

BASEMENT FLOOR, SLAB 6" THICK
BROWN SILTY CLAYEY SAND (SM/SP)
very dense, moist

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL DURING DRILLING

UPON COMPLETION OF DRILLING, BORING BACKFILLED WITH A BENTONITE GROUT

Subsurface Consultants

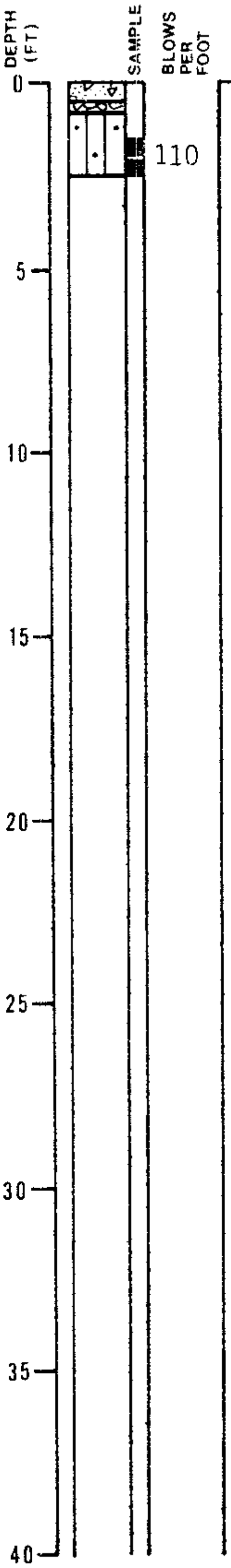
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	8/4/88	JB	12

LOG OF TEST BORING 23

EQUIPMENT Hand Auger
DATE DRILLED 8/4/88
ELEVATION 82.9 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



6" CONCRETE
3" GRAVEL
BROWN SILTY SAND (SM/SP)
very dense, moist

NO GROUNDWATER ENCOUNTERED
DURING DRILLING

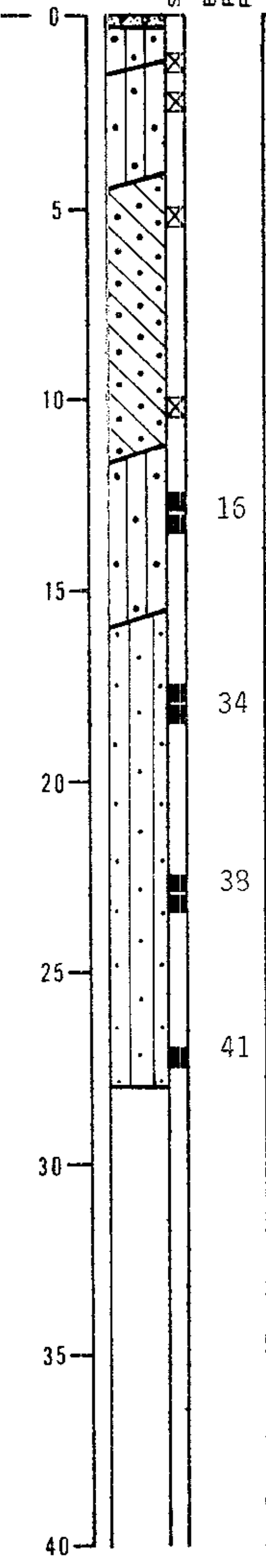
SAMPLER O.D.: 2.5 INCHES
SAMPLER I.D.: 2.0 INCHES
HAMMER WEIGHT: 32 pounds
HAMMER DROP: 18 inches
(BORING 23 ONLY)

Subsurface Consultants	14TH & MLK, JR. WAY, OAKLAND, CA			**PLATE**
	JOB NUMBER 430.004	**DATE** 8/4/88	**APPROVED**	**13**

LOG OF TEST BORING 24

EQUIPMENT 8" Hollow Stem
DATE DRILLED 8/3/88
ELEVATION 97.8 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



ASPHALT CONCRETE - 3"THICK

BLACK SILTY SAND (SM/SP)
loose, moist, with brick and rock fragments (fill)

BROWN SILTY SAND (SM/SP)
loose, moist (fill)

BROWN CLAYEY SAND (SC)
loose to medium dense, moist

MOTTLED BROWN SILTY SAND (SM)
medium dense, moist

GRAY/GREEN SILTY SAND(SP/SM)
dense, moist

BORING BACKFILLED WITH BENTONITE GROUT BEFORE A STABILIZED GROUNDWATER LEVEL WAS RECORDED

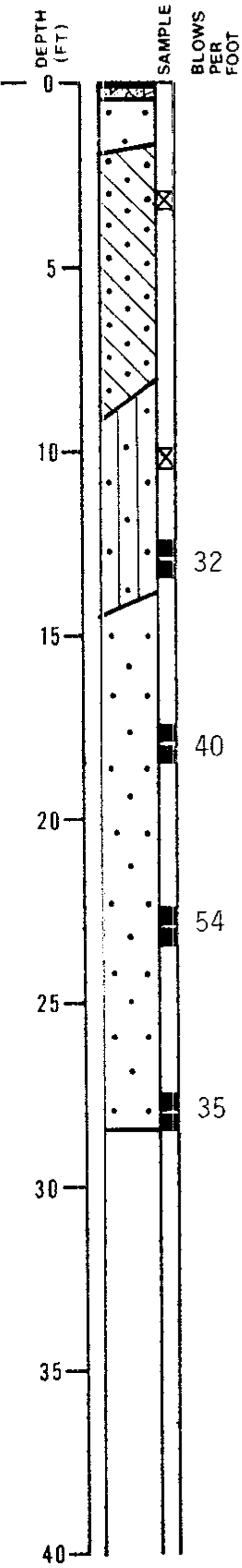
☒ DISTURBED SAMPLE

Subsurface Consultants	14TH & MLK, JR. WAY, OAKLAND, CA		PLATE **14**
	JOB NUMBER 430.004	DATE 8/5/88	APPROVED

LOG OF TEST BORING 25

EQUIPMENT 8" Hollow Stem
DATE DRILLED 8/3/88
ELEVATION 97.2 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



ASPHALT CONCRETE/CONCRETE SLAB
5" THICK
BROWN SILTY SAND (SP)
loose, moist (fill)
BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
dense, moist

GRAY SAND (SP)
dense, moist

BORING BACKFILLED WITH
BENTONITE GROUT BEFORE A
STABILIZED GROUNDWATER LEVEL
WAS RECORDED

Subsurface Consultants

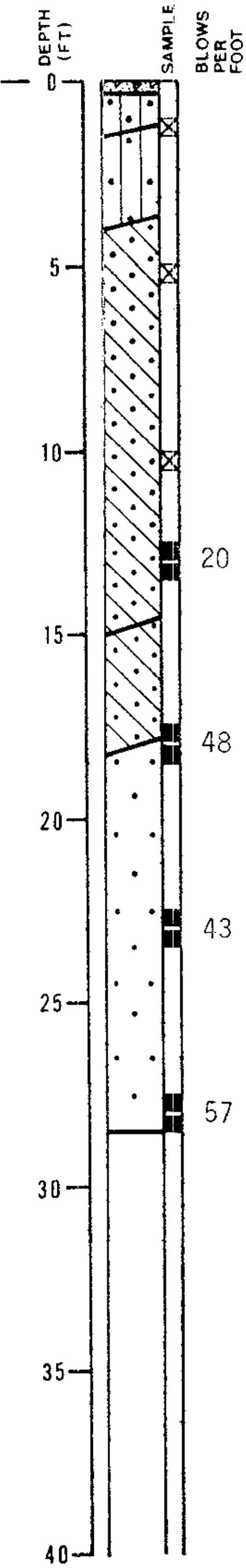
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.004	8/5/88		**15**

LOG OF TEST BORING 26

EQUIPMENT 8" Hollow Stem
DATE DRILLED 8/3/88
ELEVATION 97.6 feet

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



CONCRETE SLAB - 3"THICK

DARK BROWN SILTY SAND(SM/SP)
loose, moist, with brick and rock fragments (fill)

BROWN SILTY SAND (SM/SP)
loose, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

MOTTLED GRAY BROWN CLAYEY SAND (SC)
dense, moist

GRAY SAND (SP)
dense, moist

BORING BACKFILLED WITH BENTONITE GROUT BEFORE A STABILIZED GROUNDWATER LEVEL WAS RECORDED

Subsurface Consultants

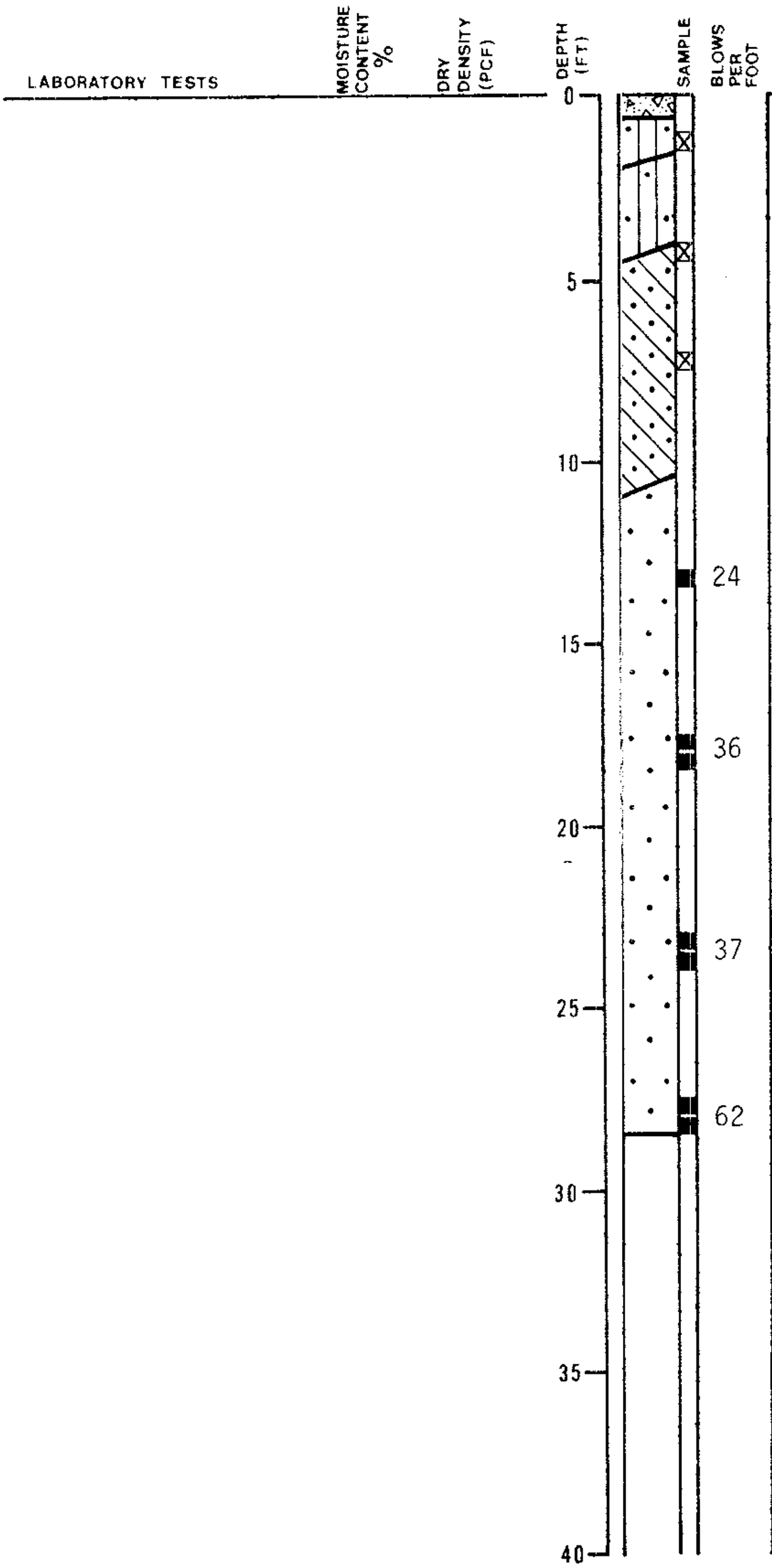
14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER 430.004
DATE 8/5/88
APPROVED

PLATE **16**

LOG OF TEST BORING 27

EQUIPMENT 8" Hollow Stem
DATE DRILLED 8/3/88
ELEVATION 97.3 feet



CONCRETE SLAB - 7" THICK

DARK BROWN SILTY SAND (SM)
loose, moist, with brick and rock fragments (fill)

BROWN SILTY SAND (SM)
loose, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY SAND (SP)
medium dense, moist

BORING BACKFILLED WITH BENTONITE GROUT BEFORE A STABILIZED GROUNDWATER LEVEL WAS RECORDED

Subsurface Consultants

14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER 430.004
DATE 8/5/88
APPROVED
PLATE **17**

GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

14TH & MLK, JR. WAY, OAKLAND, CA

JOB NUMBER 430.004

DATE 8/4/88

APPROVED

PLATE 18

Subsurface Consultants

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15223-15A
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.004,
BRAMALEA ENVIR. ASSESS.

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/05/88
DATE REPORTED: 08/11/88
PAGE 1 OF 21

Total Volatile Hydrocarbons (TVH) by EPA 8015
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)
15223-15	19 @ 27.0	20.9

QA/QC SUMMARY

%RPD	16
%RECOVERY	119

LABCRATORY DIRECTOR

LABORATORY NUMBER: 15223-1,2,3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSESS.
COMPOSITE ID: WELL 8, BORING 18, BORING 22

DATE RECEIVED: 07/26/88
DATE ANALYZED: 07/27/88
DATE REPORTED: 08/09/88
PAGE 2 OF 21

EPA METHOD 624: VOLATILE ORGANICS IN WATER

COMPOUND	Result ug/L	Detection Limit ug/L
benzene	ND	5
carbon tetrachloride	ND	5
chlorobenzene	ND	5
1,2-dichloroethane	ND	5
1,1,1-trichloroethane	ND	5
1,1-dichloroethane	ND	5
1,1,2-trichloroethane	ND	5
1,1,2,2-tetrachloroethane	ND	5
chloroethane	ND	5
2-chloroethylvinyl ether	ND	10
chloroform	ND	5
1,1-dichloroethene	ND	5
1,2 dichloroethene (total)	ND	5
1,2-dichloropropane	ND	5
1,3-dichloropropene	ND	5
ethylbenzene	ND	5
methylene chloride	ND	10
chloromethane	ND	5
bromomethane	ND	5
bromoform	ND	5
bromodichloromethane	ND	5
fluorotrichloromethane	ND	5
chlorodibromomethane	ND	5
tetrachloroethene	ND	5
toluene	ND	5
trichloroethene	ND	5
vinyl chloride	ND	5

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	10
2-butanone	ND	10
carbon disulfide	ND	5
2-hexanone	ND	5
4-methyl-2-pentanone	ND	5
styrene	ND	5
vinyl acetate	ND	5
total xylenes	ND	5

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	86
Toluene-d8	102
Bromofluorobenzene	110

LABORATORY NUMBER: 15223-4,5,6
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSESS.
COMPOSITE ID: BORING 20, 21, 19

DATE RECEIVED: 07/26/88
DATE ANALYZED: 07/27/88
DATE REPORTED: 08/09/88

EPA METHOD 624: VOLATILE ORGANICS IN WATER

COMPOUND	Result ug/L	Detection Limit ug/L
benzene	ND	5
carbon tetrachloride	ND	5
chlorobenzene	ND	5
1,2-dichloroethane	ND	5
1,1,1-trichloroethane	ND	5
1,1-dichloroethane	ND	5
1,1,2-trichloroethane	ND	5
1,1,2,2-tetrachloroethane	ND	5
chloroethane	ND	5
2-chloroethylvinyl ether	ND	10
chloroform	ND	5
1,1-dichloroethene	ND	5
1,2 dichloroethene (total)	ND	5
1,2-dichloropropane	ND	5
1,3-dichloropropene	ND	5
ethylbenzene	ND	5
methylene chloride	ND	10
chloromethane	ND	5
bromomethane	ND	5
bromoform	ND	5
bromodichloromethane	ND	5
fluorotrichloromethane	ND	5
chlorodibromomethane	ND	5
tetrachloroethene	ND	5
toluene	ND	5
trichloroethene	ND	5
vinyl chloride	ND	5

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	10
2-butanone	ND	10
carbon disulfide	ND	5
2-hexanone	ND	5
4-methyl-2-pentanone	ND	5
styrene	ND	5
vinyl acetate	ND	5
total xylenes	ND	5

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	87
Toluene-d8	102
Bromofluorobenzene	109

LABORATORY NUMBER: 15223-7,8,9,10
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
COMPOSITE ID: 17 @ 1.0, 17 @ 8.0.
21 @ 1.0, 21 @ 5.0

DATE RECEIVED: 07/26/88
DATE EXTRACTED:07/27/88
DATE ANALYZED: 07/27/88
DATE REPORTED: 08/09/88
PAGE 4 OF 21

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/kg	Detection Limit ug/kg
benzene	ND	500
carbon tetrachloride	ND	500
chlorobenzene	ND	500
1,2-dichloroethane	ND	500
1,1,1-trichloroethane	ND	500
1,1-dichloroethane	ND	500
1,1,2-trichloroethane	ND	500
1,1,2,2-tetrachloroethane	ND	500
chloroethane	ND	500
2-chloroethylvinyl ether	ND	1000
chloroform	ND	500
1,1-dichloroethene	ND	500
1,2 dichloroethene (total)	ND	500
1,2-dichloropropane	ND	500
1,3-dichloropropene	ND	500
ethylbenzene	ND	500
methylene chloride	ND	1000
chloromethane	ND	500
bromomethane	ND	500
bromoform	ND	500
bromodichloromethane	ND	500
fluorotrichloromethane	ND	500
chlorodibromomethane	ND	500
tetrachloroethene	ND	500
toluene	ND	500
trichloroethene	ND	500
vinyl chloride	ND	500

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	1000
2-butanone	ND	1000
carbon disulfide	ND	500
2-hexanone	ND	500
4-methyl-2-pentanone	ND	500
styrene	ND	500
vinyl acetate	ND	500
total xylenes	ND	500

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	83
Toluene-d8	101
Bromofluorobenzene	105

LABORATORY NUMBER: 15223-11,12,13,14
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
COMPOSITE ID: 18 @ 4.0, 18 @ 12.0,
18 @ 7.0, 18 @ 17.0

DATE RECEIVED: 07/26/88
DATE EXTRACTED:07/27/88
DATE ANALYZED: 07/27/88
DATE REPORTED: 08/09/88
PAGE 5 OF 21

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/kg	Detection Limit ug/kg
benzene	ND	500
carbon tetrachloride	ND	500
chlorobenzene	ND	500
1,2-dichloroethane	ND	500
1,1,1-trichloroethane	ND	500
1,1-dichloroethane	ND	500
1,1,2-trichloroethane	ND	500
1,1,2,2-tetrachloroethane	ND	500
chloroethane	ND	500
2-chloroethylvinyl ether	ND	1000
chloroform	ND	500
1,1-dichloroethene	ND	500
1,2 dichloroethene (total)	ND	500
1,2-dichloropropane	ND	500
1,3-dichloropropene	ND	500
ethylbenzene	ND	500
methylene chloride	ND	1000
chloromethane	ND	500
bromomethane	ND	500
bromoform	ND	500
bromodichloromethane	ND	500
fluorotrichloromethane	ND	500
chlorodibromomethane	ND	500
tetrachloroethene	ND	500
toluene	ND	500
trichloroethene	ND	500
vinyl chloride	ND	500

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	1000
2-butanone	ND	1000
carbon disulfide	ND	500
2-hexanone	ND	500
4-methyl-2-pentanone	ND	500
styrene	ND	500
vinyl acetate	ND	500
total xylenes	ND	500

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	83
Toluene-d8	99
Bromofluorobenzene	105

LABORATORY NUMBER: 15223-16,17,18,19
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
COMPOSITE ID: 19 @ 2.0, 19 @ 13.0,
20 @ 4.0, 20 @ 10.0

DATE RECEIVED: 07/26/88
DATE EXTRACTED: 07/27/88
DATE ANALYZED: 07/27/88
DATE REPORTED: 08/09/88
PAGE 6 OF 21

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/kg	Detection Limit ug/kg
benzene	ND	500
carbon tetrachloride	ND	500
chlorobenzene	ND	500
1,2-dichloroethane	ND	500
1,1,1-trichloroethane	ND	500
1,1-dichloroethane	ND	500
1,1,2-trichloroethane	ND	500
1,1,2,2-tetrachloroethane	ND	500
chloroethane	ND	500
2-chloroethylvinyl ether	ND	1000
chloroform	ND	500
1,1-dichloroethene	ND	500
1,2 dichloroethene (total)	ND	500
1,2-dichloropropane	ND	500
1,3-dichloropropene	ND	500
ethylbenzene	ND	500
methylene chloride	ND	1000
chloromethane	ND	500
bromomethane	ND	500
bromoform	ND	500
bromodichloromethane	ND	500
fluorotrichloromethane	ND	500
chlorodibromomethane	ND	500
tetrachloroethene	ND	500
toluene	ND	500
trichloroethene	ND	500
vinyl chloride	ND	500

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	1000
2-butanone	ND	1000
carbon disulfide	ND	500
2-hexanone	ND	500
4-methyl-2-pentanone	ND	500
styrene	ND	500
vinyl acetate	ND	500
total xylenes	ND	500

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	85
Toluene-d8	98
Bromofluorobenzene	96

LABORATORY NUMBER: 15223-1,2,3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSES.
COMPOSITE ID: WELL 8, BORING 18, BORING 22

DATE RECEIVED: 07/26/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/96/88
DATE REPORTED: 08/09/88
PAGE 7 OF 21

EPA 625: Base/Neutral and Acid Extractables in Water
Extraction Method: EPA 3510 Liquid/Liquid

ACID COMPOUNDS	RESULT ug/L	LOD ug/L
Phenol	ND	5
2-Chlorophenol	ND	5
2-Nitrophenol	ND	25
2,4-Dimethylphenol	ND	5
2,4-Dichlorophenol	ND	5
4-Chloro-3-methylphenol	ND	10
2,4,6-Trichlorophenol	ND	5
2,4-Dinitrophenol	ND	25
4-Nitrophenol	ND	25
2-Methyl-4,6-dinitrophenol	ND	25
Pentachlorophenol	ND	25
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	5
1,3-Dichlorobenzene	ND	5
1,4-Dichlorobenzene	ND	5
1,2-Dichlorobenzene	ND	5
Bis(2-chloroisopropyl)ether	ND	5
N-nitrosodi-n-propylamine	ND	5
Hexachloroethane	ND	5
Nitrobenzene	ND	5
Isophorone	ND	5
Bis(2-chloroethoxy)methane	ND	5
1,2,4-Trichlorobenzene	ND	5
Naphthalene	ND	5
Hexachlorobutadiene	ND	5
Hexachlorocyclopentadiene	ND	5
2-Chloronaphthalene	ND	5
Dimethyl phthalate	ND	5
Acenaphthylene	ND	5
2,6-Dinitrotoluene	ND	5
Acenaphthene	ND	5
2,4-Dinitrotoluene	ND	5
Fluorene	ND	5
Diethyl phthalate	ND	5
4-Chlorophenylphenyl ether	ND	5
N-Nitrosodiphenylamine	ND	5
1,2-Diphenylhydrazine	ND	5

LABORATORY NUMBER: 15223-1,2,3
COMPOSITE ID: WELL 8, BORING 18, BORING 22

EPA 625

BASE/NEUTRAL COMPOUNDS	RESULT ug/L	LOD ug/L
4-Bromophenylphenyl ether	ND	5
Hexachlorobenzene	ND	5
Phenanthrene	ND	5
Anthracene	ND	5
Dibutylphthalate	ND	5
Fluoranthene	ND	5
Benzidine	ND	25
Pyrene	ND	5
Butylbenzylphthalate	ND	5
Benzo (a) anthracene	ND	5
3,3'-Dichlorobenzidine	ND	25
Chrysene	ND	5
Bis (2-ethylhexyl)phthalate	ND	5
Di-n-octyl phthalate	ND	5
Benzo (b) fluoranthene	ND	5
Benzo (k) fluoranthene	ND	5
Benzo (a) pyrene	ND	5
Indeno (1,2,3-cd) pyrene	ND	25
Dibenzo (a,h) anthracene	ND	25
Benzo (ghi) perylene	ND	25
HSL COMPOUNDS		
Benzoic Acid	ND	50
2-Methylphenol	ND	5
4-Methylphenol	ND	5
2,4,5-Trichlorophenol	ND	5
Aniline	ND	5
Benzyl Alcohol	ND	25
4-Chloroaniline	ND	10
2-Methylnaphthalene	ND	5
2-Nitroanline	ND	25
3-Nitroaniline	ND	25
Dibenzofuran	ND	5
4-Nitroaniline	ND	25

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	54	2-Fluorobiphenyl	73
2,4,6-tribromophenol	124	Terphenyl	71
Nitrobenzene-d5	77		

LABORATORY NUMBER: 15223-4,5,6
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSES.
SAMPLE ID: BORING 20,21,19

DATE RECEIVED: 07/26/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/96/88
DATE REPORTED: 08/09/88
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EPA 625: Base/Neutral and Acid Extractables in Water
Extraction Method: EPA 3510 Liquid/Liquid

ACID COMPOUNDS	RESULT ug/L	LOD ug/L
Phenol	ND	5
2-Chlorophenol	ND	5
2-Nitrophenol	ND	25
2,4-Dimethylphenol	ND	5
2,4-Dichlorophenol	ND	5
4-Chloro-3-methylphenol	ND	10
2,4,6-Trichlorophenol	ND	5
2,4-Dinitrophenol	ND	25
4-Nitrophenol	ND	25
2-Methyl-4,6-dinitrophenol	ND	25
Pentachlorophenol	ND	25
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	5
1,3-Dichlorobenzene	ND	5
1,4-Dichlorobenzene	ND	5
1,2-Dichlorobenzene	ND	5
Bis(2-chloroisopropyl)ether	ND	5
N-nitrosodi-n-propylamine	ND	5
Hexachloroethane	ND	5
Nitrobenzene	ND	5
Isophorone	ND	5
Bis(2-chloroethoxy)methane	ND	5
1,2,4-Trichlorobenzene	ND	5
Naphthalene	ND	5
Hexachlorobutadiene	ND	5
Hexachlorocyclopentadiene	ND	5
2-Chloronaphthalene	ND	5
Dimethyl phthalate	ND	5
Acenaphthylene	ND	5
2,6-Dinitrotoluene	ND	5
Acenaphthene	ND	5
2,4-Dinitrotoluene	ND	5
Fluorene	ND	5
Diethyl phthalate	ND	5
4-Chlorophenylphenyl ether	ND	5
N-Nitrosodiphenylamine	ND	5
1,2-Diphenylhydrazine	ND	5

LABORATORY NUMBER: 15223-4,5,6
SAMPLE ID: BORING 20,21,19

BASE/NEUTRAL COMPOUNDS	RESULT ug/L	LOD ug/L
4-Bromophenylphenyl ether	ND	5
Hexachlorobenzene	ND	5
Phenanthrene	ND	5
Anthracene	ND	5
Dibutylphthalate	ND	5
Fluoranthene	ND	5
Benzidine	ND	25
Pyrene	ND	5
Butylbenzylphthalate	ND	5
Benzo (a) anthracene	ND	5
3,3'-Dichlorobenzidine	ND	25
Chrysene	ND	5
Bis (2-ethylhexyl)phthalate	ND	5
Di-n-octyl phthalate	ND	5
Benzo (b) fluoranthene	ND	5
Benzo (k) fluoranthene	ND	5
Benzo (a) pyrene	ND	5
Indeno (1,2,3-cd) pyrene	ND	25
Dibenzo (a,h) anthracene	ND	25
Benzo (ghi) perylene	ND	25
HSL COMPOUNDS		
Benzoic Acid	ND	50
2-Methylphenol	ND	5
4-Methylphenol	ND	5
2,4,5-Trichlorophenol	ND	5
Aniline	ND	5
Benzyl Alcohol	ND	25
4-Chloroaniline	ND	10
2-Methylnaphthalene	ND	5
2-Nitroanline	ND	25
3-Nitroaniline	ND	25
Dibenzofuran	ND	5
4-Nitroaniline	ND	25

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	48	2-Fluorobiphenyl	68
2,4,6-tribromophenol	103	Terphenyl	78
Nitrobenzene-d5	90		

LABORATORY NUMBER: 15223-7,8,9,10
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSESS.
COMPOSITE ID: 17@1.0, 17@8.0, 21@1.0, 21@5.0

DATE RECEIVED: 07/26/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/09/88
DATE REPORTED: 08/11/88
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EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

ACID COMPOUNDS	RESULT mg/kg	LOD mg/kg
Phenol	ND	0.33
2-Chlorophenol	ND	0.33
2-Nitrophenol	ND	1.65
2,4-Dimethylphenol	ND	0.33
2,4-Dichlorophenol	ND	0.33
4-Chloro-3-methylphenol	ND	0.66
2,4,6-Trichlorophenol	ND	0.33
2,4-Dinitrophenol	ND	1.65
4-Nitrophenol	ND	1.65
2-Methyl-4,6-dinitrophenol	ND	1.65
Pentachlorophenol	ND	1.65
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	0.33
1,3-Dichlorobenzene	ND	0.33
1,4-Dichlorobenzene	ND	0.33
1,2-Dichlorobenzene	ND	0.33
Bis(2-chloroisopropyl)ether	ND	0.33
N-nitrosodi-n-propylamine	ND	0.33
Hexachloroethane	ND	0.33
Nitrobenzene	ND	0.33
Isophorone	ND	0.33
Bis(2-chloroethoxy)methane	ND	0.33
1,2,4-Trichlorobenzene	ND	0.33
Naphthalene	ND	0.33
Hexachlorobutadiene	ND	0.33
Hexachlorocyclopentadiene	ND	0.33
2-Chloronaphthalene	ND	0.33
Dimethyl phthalate	ND	0.33
Acenaphthylene	ND	0.33
2,6-Dinitrotoluene	ND	0.33
Acenaphthene	ND	0.33
2,4-Dinitrotoluene	ND	0.33
Fluorene	ND	0.33
Diethyl phthalate	ND	0.33
4-Chlorophenylphenyl ether	ND	0.33
N-Nitrosodiphenylamine	ND	0.33
1,2-Diphenylhydrazine	ND	0.33

LABORATORY NUMBER: 15223-7,8,9,10
COMPOSITE ID: 17@1.0, 17@8.0, 21@1.0, 21@5.0

EPA 8270

BASE/NEUTRAL COMPOUNDS	RESULT mg/kg	LOD mg/kg
4-Bromophenylphenyl ether	ND	0.33
Hexachlorobenzene	ND	0.33
Phenanthrene	ND	0.33
Anthracene	ND	0.33
Dibutylphthalate	ND	0.33
Fluoranthene	ND	0.33
Benzidine	ND	1.65
Pyrene	ND	0.33
Butylbenzylphthalate	ND	0.33
Benzo (a) anthracene	ND	0.33
3,3'-Dichlorobenzidine	ND	1.65
Chrysene	ND	0.33
Bis (2-ethylhexyl)phthalate	ND	0.33
Di-n-octyl phthalate	ND	0.33
Benzo (b) fluoranthene	ND	0.33
Benzo (k) fluoranthene	ND	0.33
Benzo (a) pyrene	ND	0.33
Indeno (1,2,3-cd) pyrene	ND	1.65
Dibenzo (a,h) anthracene	ND	1.65
Benzo (ghi) perylene	ND	1.65
HSL COMPOUNDS		
Benzoic Acid	ND	3.3
2-Methylphenol	ND	0.33
4-Methylphenol	ND	0.33
2,4,5-Trichlorophenol	ND	0.33
Aniline	ND	0.33
Benzyl Alcohol	ND	1.65
4-Chloroaniline	ND	0.66
2-Methylnaphthalene	ND	0.33
2-Nitroanline	ND	1.65
3-Nitroaniline	ND	1.65
Dibenzofuran	ND	0.33
4-Nitroaniline	ND	1.65

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	24	2-Fluorobiphenyl	64
2,4,6-tribromophenol	30	Terphenyl	82
Nitrobenzene-d5	64		

LABORATORY NUMBER: 15223-11,12,13,14
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIR. ASSES.
COMPOSITE ID: 18@4.0, 18@7.0,18@12.0, 18@17.0

DATE RECEIVED: 07/26/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/09/88
DATE REPORTED: 08/11/88
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EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

ACID COMPOUNDS	RESULT mg/kg	LOD mg/kg
Phenol	ND	0.33
2-Chlorophenol	ND	0.33
2-Nitrophenol	ND	1.65
2,4-Dimethylphenol	ND	0.33
2,4-Dichlorophenol	ND	0.33
4-Chloro-3-methylphenol	ND	0.66
2,4,6-Trichlorophenol	ND	0.33
2,4-Dinitrophenol	ND	1.65
4-Nitrophenol	ND	1.65
2-Methyl-4,6-dinitrophenol	ND	1.65
Pentachlorophenol	ND	1.65
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	0.33
1,3-Dichlorobenzene	ND	0.33
1,4-Dichlorobenzene	ND	0.33
1,2-Dichlorobenzene	ND	0.33
Bis(2-chloroisopropyl)ether	ND	0.33
N-nitrosodi-n-propylamine	ND	0.33
Hexachloroethane	ND	0.33
Nitrobenzene	ND	0.33
Isophorone	ND	0.33
Bis(2-chloroethoxy)methane	ND	0.33
1,2,4-Trichlorobenzene	ND	0.33
Naphthalene	ND	0.33
Hexachlorobutadiene	ND	0.33
Hexachlorocyclopentadiene	ND	0.33
2-Chloronaphthalene	ND	0.33
Dimethyl phthalate	ND	0.33
Acenaphthylene	ND	0.33
2,6-Dinitrotoluene	ND	0.33
Acenaphthene	ND	0.33
2,4-Dinitrotoluene	ND	0.33
Fluorene	ND	0.33
Diethyl phthalate	ND	0.33
4-Chlorophenylphenyl ether	ND	0.33
N-Nitrosodiphenylamine	ND	0.33
1,2-Diphenylhydrazine	ND	0.33

LABORATORY NUMBER: 15223-11,12,13,14
COMPOSITE ID: 18@4.0, 18@7.0,18@12.0, 18@17.0

EPA 8270
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BASE/NEUTRAL COMPOUNDS	RESULT mg/kg	LOD mg/kg
4-Bromophenylphenyl ether	ND	0.33
Hexachlorobenzene	ND	0.33
Phenanthrene	ND	0.33
Anthracene	ND	0.33
Dibutylphthalate	ND	0.33
Fluoranthene	ND	0.33
Benzidine	ND	1.65
Pyrene	ND	0.33
Butylbenzylphthalate	ND	0.33
Benzo (a) anthracene	ND	0.33
3,3'-Dichlorobenzidine	ND	1.65
Chrysene	ND	0.33
Bis (2-ethylhexyl)phthalate	ND	0.33
Di-n-octyl phthalate	ND	0.33
Benzo (b) fluoranthene	ND	0.33
Benzo (k) fluoranthene	ND	0.33
Benzo (a) pyrene	ND	0.33
Indeno (1,2,3-cd) pyrene	ND	1.65
Dibenzo (a,h) anthracene	ND	1.65
Benzo (ghi) perylene	ND	1.65
HSL COMPOUNDS		
Benzoic Acid	ND	3.3
2-Methylphenol	ND	0.33
4-Methylphenol	ND	0.33
2,4,5-Trichlorophenol	ND	0.33
Aniline	ND	0.33
Benzyl Alcohol	ND	1.65
4-Chloroaniline	ND	0.66
2-Methylnaphthalene	ND	0.33
2-Nitroanline	ND	1.65
3-Nitroaniline	ND	1.65
Dibenzofuran	ND	0.33
4-Nitroaniline	ND	1.65

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	37	2-Fluorobiphenyl	74
2,4,6-tribromophenol	36	Terphenyl	82
Nitrobenzene-d5	91		

LABORATORY NUMBER: 15223-16,17,18,19
DATE RECEIVED: 07/26/88 Dil
tion
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRN. ASSESS.
COMPOSITE ID: 19@2.0, 19@13.0, 20@4.0, 20@10.

DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/09/88
DATE REPORTED: 08/11/88

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

ACID COMPOUNDS	RESULT mg/kg	LOD mg/kg
Phenol	ND	20
2-Chlorophenol	ND	20
2-Nitrophenol	ND	100
2,4-Dimethylphenol	ND	20
2,4-Dichlorophenol	ND	20
4-Chloro-3-methylphenol	ND	40
2,4,6-Trichlorophenol	ND	20
2,4-Dinitrophenol	ND	100
4-Nitrophenol	ND	100
2-Methyl-4,6-dinitrophenol	ND	100
Pentachlorophenol	ND	100
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Bis(2-chloroisopropyl)ether	ND	20
N-nitrosodi-n-propylamine	ND	20
Hexachloroethane	ND	20
Nitrobenzene	ND	20
Isophorone	ND	20
Bis(2-chloroethoxy)methane	ND	20
1,2,4-Trichlorobenzene	ND	20
Naphthalene	1,100	20
Hexachlorobutadiene	ND	20
Hexachlorocyclopentadiene	ND	20
2-Chloronaphthalene	ND	20
Dimethyl phthalate	ND	20
Acenaphthylene	330	20
2,6-Dinitrotoluene	ND	20
Acenaphthene	ND	20
2,4-Dinitrotoluene	ND	20
Fluorene	65	20
Diethyl phthalate	ND	20
4-Chlorophenylphenyl ether	ND	20
N-Nitrosodiphenylamine	ND	20
1,2-Diphenylhydrazine	ND	20

LABORATORY NUMBER: 15223-16,17,18,19
COMPOSITE ID: 19@2.0, 19@13.0, 20@4.0, 20@10.0

EPA 8270

BASE/NEUTRAL COMPOUNDS	RESULT mg/kg	LOD mg/kg
4-Bromophenylphenyl ether	ND	20
Hexachlorobenzene	ND	20
Phenanthrene	830	20
Anthracene	110	20
Dibutylphthalate	ND	20
Fluoranthene	590	20
Benzidine	ND	100
Pyrene	730	20
Butylbenzylphthalate	ND	20
Benzo (a) anthracene	120	20
3,3'-Dichlorobenzidine	ND	100
Chrysene	170	20
Bis (2-ethylhexyl)phthalate	ND	20
Di-n-octyl phthalate	ND	20
Benzo (b) fluoranthene	98	20
Benzo (k) fluoranthene	21	20
Benzo (a) pyrene	ND	20
Indeno (1,2,3-cd) pyrene	150	100
Dibenzo (a,h) anthracene	ND	100
Benzo (ghi) perylene	ND	100
HSL COMPOUNDS		
Benzoic Acid	ND	200
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4,5-Trichlorophenol	ND	20
Aniline	ND	20
Benzyl Alcohol	ND	100
4-Chloroaniline	ND	40
2-Methylnaphthalene	43	20
2-Nitroanline	ND	100
3-Nitroaniline	ND	100
Dibenzofuran	ND	20
4-Nitroaniline	ND	100

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	39	2-Fluorobiphenyl	64
2,4,6-tribromophenol	29	Terphenyl	79
Nitrobenzene-d5	61		

LABORATORY NUMBER: 15223-1,2,3
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
COMPOSITE ID: WELL 8, BORING 18,
BORING 22

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
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Title 22 Metals in Aqueous Solutions

METAL	RESULT mg/L	DETECTION LIMIT mg/L	METHOD
Antimony	ND	0.2	EPA 6010
Arsenic	ND	0.2	EPA 6010
Barium	0.10	0.01	EPA 6010
Beryllium	ND	0.01	EPA 6010
Cadmium	ND	0.01	EPA 6010
Chromium (total)	ND	0.02	EPA 6010
Cobalt	ND	0.02	EPA 6010
Copper	ND	0.02	EPA 6010
Lead	ND	0.2	EPA 6010
Mercury	ND	0.001	EPA 7470
Molybdenum	ND	0.02	EPA 6010
Nickel	ND	0.02	EPA 6010
Selenium	ND	0.02	EPA 7740
Silver	ND	0.05	EPA 6010
Thallium	ND	0.2	EPA 6010
Vanadium	ND	0.05	EPA 6010
Zinc	ND	0.02	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	112	Mercury	<1	92
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

LABORATORY NUMBER: 15223-4,5,6
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
COMPOSITE ID: BORING 20, BORING 21
BORING 19

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
PAGE 18 OF 21

Title 22 Metals in Aqueous Solutions

METAL	RESULT mg/L	DETECTION LIMIT mg/L	METHOD
Antimony	ND	0.03	EPA 6010
Arsenic	ND	0.2	EPA 6010
Barium	0.09	0.01	EPA 6010
Beryllium	ND	0.01	EPA 6010
Cadmium	ND	0.01	EPA 6010
Chromium (total)	ND	0.02	EPA 6010
Cobalt	ND	0.02	EPA 6010
Copper	ND	0.02	EPA 6010
Lead	ND	0.2	EPA 6010
Mercury	ND	0.001	EPA 7470
Molybdenum	0.02	0.02	EPA 6010
Nickel	ND	0.02	EPA 6010
Selenium	ND	0.02	EPA 7740
Silver	ND	0.05	EPA 6010
Thallium	ND	0.2	EPA 6010
Vanadium	ND	0.05	EPA 6010
Zinc	ND	0.02	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	112	Mercury	<1	92
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

LABORATORY NUMBER: 15223-7,8,9,10
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
COMPOSITE ID: 17@1.0, 17@8.0
21@1.0, 21@5.0

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
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Title 22 Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	DETECTION LIMIT mg/Kg	METHOD
Antimony	ND	5.0	EPA 7040
Arsenic	ND	3.0	EPA 6010
Barium	67	0.3	EPA 6010
Beryllium	ND	0.3	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	30	0.5	EPA 6010
Cobalt	4.1	0.5	EPA 6010
Copper	14	0.5	EPA 6010
Lead	11	3.0	EPA 6010
Mercury	0.13	0.1	EPA 7470
Molybdenum	ND	0.5	EPA 6010
Nickel	22	0.5	EPA 6010
Selenium	ND	1.0	EPA 7740
Silver	ND	1.0	EPA 6010
Thallium	ND	3.0	EPA 7840
Vanadium	18	1.0	EPA 6010
Zinc	27	0.5	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	80	Mercury	<1	90
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

LABORATORY NUMBER: 15223-11,12,13,14
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
COMPOSITE ID: 18@4.0,18@7.0,
18@12.0, 18@17.0

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
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Title 22 Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	DETECTION LIMIT mg/Kg	METHOD
Antimony	ND	5.0	EPA 7040
Arsenic	ND	3.0	EPA 6010
Barium	38	0.3	EPA 6010
Beryllium	ND	0.3	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	28	0.5	EPA 6010
Cobalt	5.8	0.5	EPA 6010
Copper	4.5	0.5	EPA 6010
Lead	3.9	3.0	EPA 6010
Mercury	ND	0.1	EPA 7470
Molybdenum	0.5	0.5	EPA 6010
Nickel	19	0.5	EPA 6010
Selenium	ND	1.0	EPA 7740
Silver	ND	1.0	EPA 6010
Thallium	ND	3.0	EPA 7840
Vanadium	11	1.0	EPA 6010
Zinc	13	0.5	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	80	Mercury	<1	90
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

LABORATORY NUMBER: 15223-16,17,18,19
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
COMPOSITE ID: 19@2.0, 19@13.0,
20@4.0, 20@10.0

DATE RECEIVED: 07/26/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
PAGE 21 OF 21

Title 22 Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	DETECTION LIMIT mg/Kg	METHOD
Antimony	ND	5.0	EPA 7040
Arsenic	ND	3.0	EPA 6010
Barium	57	0.3	EPA 6010
Beryllium	ND	0.3	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	20	0.5	EPA 6010
Cobalt	6.5	0.5	EPA 6010
Copper	35	0.5	EPA 6010
Lead	73	3.0	EPA 6010
Mercury	0.27	0.1	EPA 7470
Molybdenum	ND	0.5	EPA 6010
Nickel	26	0.5	EPA 6010
Selenium	ND	1.0	EPA 7740
Silver	ND	1.0	EPA 6010
Thallium	ND	3.0	EPA 7840
Vanadium	23	1.0	EPA 6010
Zinc	178	0.5	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	80	Mercury	<1	90
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15384
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS.

DATE RECEIVED: 07/28/88
DATE ANALYZED: 08/15/88
DATE REPORTED: 08/15/88

C&T ID	SAMPLE ID	pH, SU EPA 9040/9045
15384-1	BORING 23 @ 2	5.1

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15243-1,2
CLIENT: SUBSURFACE CONSULTANTS
JOB ID #: 430.004,
BRAMALEA ENVIRON. ASSESS.

DATE RECEIVED: 07/27/88
DATE ANALYZED: 08/04/88
DATE REPORTED: 08/11/88
PAGE 1 OF 8

C&T ID	COMPOSITE ID	pH, SU EPA 9045
15243-1,2	22 @ 24.0, 23 @ 2.0	5.7

LABORATORY DIRECTOR

LABORATORY NUMBER: 15243-1,2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
COMPOSITE ID: 22 @ 24.0, 23 @ 2.0

DATE RECEIVED: 07/24/88
DATE EXTRACTED: 08/04/88
DATE ANALYZED: 08/04/88
DATE REPORTED: 08/09/88
PAGE 2 OF 8

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/kg	Detection Limit ug/kg
benzene	ND	500
carbon tetrachloride	ND	500
chlorobenzene	ND	500
1,2-dichloroethane	ND	500
1,1,1-trichloroethane	ND	500
1,1-dichloroethane	ND	500
1,1,2-trichloroethane	ND	500
1,1,2,2-tetrachloroethane	ND	500
chloroethane	ND	500
2-chloroethylvinyl ether	ND	1000
chloroform	ND	500
1,1-dichloroethene	ND	500
1,2 dichloroethene (total)	ND	500
1,2-dichloropropane	ND	500
1,3-dichloropropene	ND	500
ethylbenzene	ND	500
methylene chloride	ND	1000
chloromethane	ND	500
bromomethane	ND	500
bromoform	ND	500
bromodichloromethane	ND	500
fluorotrichloromethane	ND	500
chlorodibromomethane	ND	500
tetrachloroethene	ND	500
toluene	ND	500
trichloroethene	ND	500
vinyl chloride	ND	500

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	1000
2-butanone	ND	1000
carbon disulfide	ND	500
2-hexanone	ND	500
4-methyl-2-pentanone	ND	500
styrene	ND	500
vinyl acetate	ND	500
total xylenes	ND	500

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	76
Toluene-d8	99
Bromofluorobenzene	99

LABORATORY NUMBER: 15243-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
SAMPLE ID: WATER WELL

DATE RECEIVED: 07/27/88
DATE ANALYZED: 08/04/88
DATE REPORTED: 08/09/88
PAGE 3 OF 8

EPA METHOD 624: VOLATILE ORGANICS IN WATER

COMPOUND	Result ug/L	Detection Limit ug/L
benzene	ND	5
carbon tetrachloride	ND	5
chlorobenzene	ND	5
1,2-dichloroethane	ND	5
1,1,1-trichloroethane	ND	5
1,1-dichloroethane	ND	5
1,1,2-trichloroethane	ND	5
1,1,2,2-tetrachloroethane	ND	5
chloroethane	ND	5
2-chloroethylvinyl ether	ND	10
chloroform	ND	5
1,1-dichloroethene	ND	5
1,2 dichloroethene (total)	ND	5
1,2-dichloropropane	ND	5
1,3-dichloropropene	ND	5
ethylbenzene	ND	5
methylene chloride	ND	10
chloromethane	ND	5
bromomethane	ND	5
bromoform	ND	5
bromodichloromethane	ND	5
fluorotrichloromethane	ND	5
chlorodibromomethane	ND	5
tetrachloroethene	ND	5
toluene	ND	5
trichloroethene	ND	5
vinyl chloride	ND	5

Non-Priority Hazardous Pollutant Substances List Compounds

acetone	ND	10
2-butanone	ND	10
carbon disulfide	ND	5
2-hexanone	ND	5
4-methyl-2-pentanone	ND	5
styrene	ND	5
vinyl acetate	ND	5
total xylenes	ND	5

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2 Dichloroethane-d4	79
Toluene-d8	100
Bromofluorobenzene	97

LABORATORY NUMBER: 15243-1,2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENIRON. ASSESS.
COMPOSITE ID: 22 @ 24.0, 23 @ 2.0

DATE RECEIVED: 07/27/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/09/88
DATE REPORTED: 08/11/88
PAGE 4 OF 8

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

ACID COMPOUNDS	RESULT mg/kg	LOD mg/kg
Phenol	ND	0.33
2-Chlorophenol	ND	0.33
2-Nitrophenol	ND	1.65
2,4-Dimethylphenol	ND	0.33
2,4-Dichlorophenol	ND	0.33
4-Chloro-3-methylphenol	ND	0.66
2,4,6-Trichlorophenol	ND	0.33
2,4-Dinitrophenol	ND	1.65
4-Nitrophenol	ND	1.65
2-Methyl-4,6-dinitrophenol	ND	1.65
Pentachlorophenol	ND	1.65
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	0.33
1,3-Dichlorobenzene	ND	0.33
1,4-Dichlorobenzene	ND	0.33
1,2-Dichlorobenzene	ND	0.33
Bis(2-chloroisopropyl)ether	ND	0.33
N-nitrosodi-n-propylamine	ND	0.33
Hexachloroethane	ND	0.33
Nitrobenzene	ND	0.33
Isophorone	ND	0.33
Bis(2-chloroethoxy)methane	ND	0.33
1,2,4-Trichlorobenzene	ND	0.33
Naphthalene	ND	0.33
Hexachlorobutadiene	ND	0.33
Hexachlorocyclopentadiene	ND	0.33
2-Chloronaphthalene	ND	0.33
Dimethyl phthalate	ND	0.33
Acenaphthylene	ND	0.33
2,6-Dinitrotoluene	ND	0.33
Acenaphthene	ND	0.33
2,4-Dinitrotoluene	ND	0.33
Fluorene	ND	0.33
Diethyl phthalate	ND	0.33
4-Chlorophenylphenyl ether	ND	0.33
N-Nitrosodiphenylamine	ND	0.33
1,2-Diphenylhydrazine	ND	0.33

LABORATORY NUMBER: 15243-1,2
COMPOSITE ID: 22 @ 24.0, 23 @ 2.0

EPA 8270
PAGE 5 OF 8

BASE/NEUTRAL COMPOUNDS	RESULT mg/kg	LOD mg/kg
4-Bromophenylphenyl ether	ND	0.33
Hexachlorobenzene	ND	0.33
Phenanthrene	ND	0.33
Anthracene	ND	0.33
Dibutylphthalate	ND	0.33
Fluoranthene	ND	0.33
Benzidine	ND	1.65
Pyrene	ND	0.33
Butylbenzylphthalate	ND	0.33
Benzo (a) anthracene	ND	0.33
3,3'-Dichlorobenzidine	ND	1.65
Chrysene	ND	0.33
Bis (2-ethylhexyl)phthalate	ND	0.33
Di-n-octyl phthalate	ND	0.33
Benzo (b) fluoranthene	ND	0.33
Benzo (k) fluoranthene	ND	0.33
Benzo (a) pyrene	ND	0.33
Indeno (1,2,3-cd) pyrene	ND	1.65
Dibenzo (a,h) anthracene	ND	1.65
Benzo (ghi) perylene	ND	1.65
HSL COMPOUNDS		
Benzoic Acid	ND	3.3
2-Methylphenol	ND	0.33
4-Methylphenol	ND	0.33
2,4,5-Trichlorophenol	ND	0.33
Aniline	ND	0.33
Benzyl Alcohol	ND	1.65
4-Chloroaniline	ND	0.66
2-Methylnaphthalene	ND	0.33
2-Nitroanline	ND	1.65
3-Nitroaniline	ND	1.65
Dibenzofuran	ND	0.33
4-Nitroaniline	ND	1.65

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	25	2-Fluorobiphenyl	49
2,4,6-tribromophenol	70	Terphenyl	84
Nitrobenzene-d5	46		

LABORATORY NUMBER: 15243-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.004, BRAMALEA ENVIRON. ASSESS.
SAMPLE ID: WATER WELL

DATE RECEIVED: 07/27/88
DATE EXTRACTED: 08/09/88
DATE ANALYZED: 08/09/88
DATE REPORTED: 08/11/88
PAGE 6 OF 8

EPA 625: Base/Neutral and Acid Extractables in Water
Extraction Method: EPA 3510 Liquid/Liquid

ACID COMPOUNDS	RESULT ug/L	LOD ug/L
Phenol	ND	5
2-Chlorophenol	ND	5
2-Nitrophenol	ND	25
2,4-Dimethylphenol	ND	5
2,4-Dichlorophenol	ND	5
4-Chloro-3-methylphenol	ND	10
2,4,6-Trichlorophenol	ND	5
2,4-Dinitrophenol	ND	25
4-Nitrophenol	ND	25
2-Methyl-4,6-dinitrophenol	ND	25
Pentachlorophenol	ND	25
BASE/NEUTRAL COMPOUNDS		
Bis(2-chloroethyl)ether	ND	5
1,3-Dichlorobenzene	ND	5
1,4-Dichlorobenzene	ND	5
1,2-Dichlorobenzene	ND	5
Bis(2-chloroisopropyl)ether	ND	5
N-nitrosodi-n-propylamine	ND	5
Hexachloroethane	ND	5
Nitrobenzene	ND	5
Isophorone	ND	5
Bis(2-chloroethoxy)methane	ND	5
1,2,4-Trichlorobenzene	ND	5
Naphthalene	ND	5
Hexachlorobutadiene	ND	5
Hexachlorocyclopentadiene	ND	5
2-Chloronaphthalene	ND	5
Dimethyl phthalate	ND	5
Acenaphthylene	ND	5
2,6-Dinitrotoluene	ND	5
Acenaphthene	ND	5
2,4-Dinitrotoluene	ND	5
Fluorene	ND	5
Diethyl phthalate	ND	5
4-Chlorophenylphenyl ether	ND	5
N-Nitrosodiphenylamine	ND	5
1,2-Diphenylhydrazine	ND	5

LABORATORY NUMBER: 15243-3
SAMPLE ID: WATER WELL

EPA 625

BASE/NEUTRAL COMPOUNDS	RESULT ug/L	LOD ug/L
4-Bromophenylphenyl ether	ND	5
Hexachlorobenzene	ND	5
Phenanthrene	ND	5
Anthracene	ND	5
Dibutylphthalate	ND	5
Fluoranthene	ND	5
Benzidine	ND	25
Pyrene	ND	5
Butylbenzylphthalate	ND	5
Benzo (a) anthracene	ND	5
3,3'-Dichlorobenzidine	ND	25
Chrysene	ND	5
Bis (2-ethylhexyl)phthalate	ND	5
Di-n-octyl phthalate	ND	5
Benzo (b) fluoranthene	ND	5
Benzo (k) fluoranthene	ND	5
Benzo (a) pyrene	ND	5
Indeno (1,2,3-cd) pyrene	ND	25
Dibenzo (a,h) anthracene	ND	25
Benzo (ghi) perylene	ND	25
HSL COMPOUNDS		
Benzoic Acid	ND	50
2-Methylphenol	ND	5
4-Methylphenol	ND	5
2,4,5-Trichlorophenol	ND	5
Aniline	ND	5
Benzyl Alcohol	ND	25
4-Chloroaniline	ND	10
2-Methylnaphthalene	ND	5
2-Nitroanline	ND	25
3-Nitroaniline	ND	25
Dibenzofuran	ND	5
4-Nitroaniline	ND	25

ND = None Detected, Limit of Detection (LOD) appears in right column

QA/QC SUMMARY: SURROGATE RECOVERIES

Compound	%Recovery	Compound	%Recovery
2-Fluorophenol	51	2-Fluorobiphenyl	66
2,4,6-tribromophenol	115	Terphenyl	74
Nitrobenzene-d5	79		

LABORATORY NUMBER: 15223-3
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS
SAMPLE ID : WELL WATER

DATE RECEIVED: 07/27/88
DATE ANALYZED: 08/12/88
DATE REPORTED: 08/12/88
PAGE 8 OF 8

Title 22 Metals in Aqueous Solutions

METAL	RESULT mg/L	DETECTION LIMIT mg/L	METHOD
Antimony	ND	0.2	EPA 6010
Arsenic	ND	0.2	EPA 6010
Barium	0.19	0.01	EPA 6010
Beryllium	ND	0.01	EPA 6010
Cadmium	ND	0.01	EPA 6010
Chromium (total)	ND	0.02	EPA 6010
Cobalt	ND	0.02	EPA 6010
Copper	0.02	0.02	EPA 6010
Lead	ND	0.2	EPA 6010
Mercury	ND	0.001	EPA 7470
Molybdenum	ND	0.02	EPA 6010
Nickel	ND	0.02	EPA 6010
Selenium	ND	0.02	EPA 7740
Silver	ND	0.05	EPA 6010
Thallium	ND	0.2	EPA 6010
Vanadium	ND	0.05	EPA 6010
Zinc	0.02	0.02	EPA 6010

ND = None Detected

QA/QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	<1	112	Mercury	<1	92
Arsenic	<1	110	Molybdenum	<1	100
Barium	<1	99	Nickel	<1	108
Beryllium	<1	116	Selenium	<1	75
Cadmium	<1	107	Silver	<1	94
Chromium	<1	106	Thallium	<1	91
Cobalt	<1	115	Vanadium	<1	108
Copper	<1	102	Zinc	<1	106
Lead	<1	106			

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 15588-1
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS.
SAMPLE ID: 17 @ 1.0'

DATE RECEIVED: 09/06/88
DATE ANALYZED: 09/08/88
DATE REPORTED: 09/09/88
PAGE 1 OF 4

EPA ASBESTOS: POLARIZED LIGHT MICROSCOPY

MICROSCOPIC DESCRIPTION	RESULTS, %	LOD, %
TOTAL ASBESTOS PRESENT:		
Chrysotile	TRACE	(1)
Amosite	ND	(1)
Crocidolite	ND	(1)

ND = None Detected; Limit of Detection is Indicated in Last Column.

LABORATORY DIRECTOR

LABORATORY NUMBER: 15588-2
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS.
SAMPLE ID: 21 @ 1.0'

DATE RECEIVED: 09/06/88
DATE ANALYZED: 09/08/88
DATE REPORTED: 09/09/88
PAGE 2 OF 4

EPA ASBESTOS: POLARIZED LIGHT MICROSCOPY

MICROSCOPIC DESCRIPTION	RESULTS, %	LOD, %
TOTAL ASBESTOS PRESENT:		
Chrysotile	ND	(1)
Amosite	ND	(1)
Crocidolite	ND	(1)

ND = None Detected; Limit of Detection is Indicated in Last Column.

LABORATORY NUMBER: 15588-3
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS.
SAMPLE ID: 20 @ 4.0'

DATE RECEIVED: 09/06/88
DATE ANALYZED: 09/08/88
DATE REPORTED: 09/09/88
PAGE 3 OF 4

EPA ASBESTOS: POLARIZED LIGHT MICROSCOPY

MICROSCOPIC DESCRIPTION	RESULTS, %	LOD, %
TOTAL ASBESTOS PRESENT:		
Chrysotile	ND	(1)
Amosite	ND	(1)
Crocidolite	ND	(1)

ND = None Detected; Limit of Detection is Indicated in Last Column.

LABORATORY NUMBER: 15588-4
CLIENT: SUBSURFACE CONSULTANTS
JOB ID: 430.004, BRAMALEA ENVIR. ASSESS.
SAMPLE ID: 19 @ 2.0'

DATE RECEIVED: 09/06/88
DATE ANALYZED: 09/08/88
DATE REPORTED: 09/09/88
PAGE 4 OF 4

EPA ASBESTOS: POLARIZED LIGHT MICROSCOPY

MICROSCOPIC DESCRIPTION	RESULTS, %	LOD, %
TOTAL ASBESTOS PRESENT:		
Chrysotile	ND	(1)
Amosite	ND	(1)
Crocidolite	ND	(1)

ND = None Detected; Limit of Detection is Indicated in Last Column.

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: Bramalea Environ Assess

SCI Job Number: 430.004

Project Contact at SCI: J. Bowers / T. TEBB

Sampled By: T. TEBB

Analytical Laboratory: Curtis & Tompkins

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
22 @ 24.0	S	T	7/22/88			
					PREPARE	COMPOSITE
23 @ 2.0	S	T	7/26/88		EPA	8240
					EPA	8270
					pH	
WATER WELL	W	V	7/26/88		EPA 624	
	W	G	7/26/88		EPA 625	
	W	P	7/26/88		CAM METALS (17)	
					PLEASE FILTER METALS SAMPLE	

* * * * * *

Released by: Date: 7/27/88

Released by Courier: Date:

Received by Laboratory: Date:

Relinquished by Laboratory: Date:

Received by: Gabriella [illegible] Date: 7/27/88

[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: Bramalea ENVIR. ASSESS

SCI Job Number: 430.004

Project Contact at SCI: J. BOWERS / T. TEBB

Sampled By: T. TEBB

Analytical Laboratory: CURTIS & TOMPKINS, LTD

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
18 @ 4.0	S	T	7/21/88			
18 @ 7.0	S	T	7/21/88		PREPARE	COMPOSITE
18 @ 12.0	S	T	"		EPA	8240
18 @ 17.0	S	T	"		EPA	8270
19 @ 27.0	S	T	7/21/88		TVH	

* * * * * *

Released by: Date: 7/26/88

Released by Courier: Date:

Received by Laboratory: Nancy J. Wilson Date: 7/26/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: BRAMALEA ENVIRON. ASSESS.

SCI Job Number: 430.004

Project Contact at SCI: J. BOWERS / T. TEBB

Sampled By: T. TEBB

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
19 @ 2.0	S	T	7/21/88			
19 @ 13.0	S	T	7/21/88		PREPARE	COMPOSITE
					EPA	8240
20 @ 4.0	S	T	7/22/88		EPA	8270
					CAM	METALS (17)
20 @ 10.0	S	T	7/22/88			

* * * * * *

Released by: Date: 7/26/88

Released by Courier: Date:

Received by Laboratory: Nancy Wilson Date: 7/26/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- Notify SCI if there are any anomalous peaks on GC or other scans
- Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

**CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST**

Project Name: Bramalea Environ. Assess.

SCI Job Number: 430.004

Project Contact at SCI: J. Bowers / T. Tebb

Sampled By: T. TEBB

Analytical Laboratory: CURTIS & Tompkins, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
17 @ 1.0	S	T	7/21/88			
17 @ 8.0	S	T	7/21/88		PREPARE	COMPOSITE
					EPA	8240
21 @ 1.0	S	T	7/22/88		EPA	8270
					CAM	METALS (17)
21 @ 5.0	S	T	7/22/88			

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Released by: Date: 7/26/88

Released by Courier: Date:

Received by Laboratory: Date: 7/26/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

-Notify SCI if there are any anomalous peaks on GC or other scans
-Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: BRAMALEA ENVIR. ASSESS.

SCI Job Number: 930.009

Project Contact at SCI: J BOWERS / T. TEBB

Sampled By: T. TEBB

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
WELL 8	W	VOA	7/22/88			
	W	1 liter(G)			PREPARE	COMPOSITE
	W	P			EPA	624
BORING 18	W	V	7/21/88		EPA	625
	W	G			CAM	METALS (17)
	W	P				
BORING 22	W	V	7/22/88			
	W	G				
	W	P				

PLEASE FILTER SAMPLES FOR METALS ANALYSIS

* * * * * *

Released by: Date: 7/26/88

Released by Courier: Date:

Received by Laboratory: Date: 7/26/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:
- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

Subsurface Consultants

CHAIN OF CUSTODY RECORD
& ANALYTICAL TEST REQUEST

Project Name: BRAMALEA ENVIRON. ASSESS.

SCI Job Number: 430.004

Project Contact at SCI: J. BOWERS / T. TEBB

Sampled By: T. TEBB

Analytical Laboratory: CURTIS & TOMPKINS, LTD.

Analytical Turnaround: NORMAL

Sample ID	Sample Type[1]	Container Type[2]	Sampling Date	Hold	Analysis	Analytical Method
BORING 20	W	V	7/22/88			
	W	G			PREPARE	COMPOSITE
	W	P			EPA	624
BORING 21	W	V	7/22/88		EPA	625
	W	G			CAM	METALS (17)
	W	P				
BORING 19	W	V	7/21/88			
	W	G				
	W	P				

PLEASE FILTER SAMPLES FOR METALS ANALYSIS

* * * * * *

Released by: Date: 7/26/88

Released by Courier: Date:

Received by Laboratory: Nancy Wilson Date: 7/26/88

Relinquished by Laboratory: Date:

Received by: Date:

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[1] Sample Type: W = water, S = soil, O = other (specify)

[2] Container Type: V = VOA, P = plastic, G = glass, T = brass tube, O = other (specify)

Notes to Laboratory:

- -Notify SCI if there are any anomalous peaks on GC or other scans
- -Questions/clarifications...contact SCI at (415) 268-0461

PROGRESS REPORT 1
UNDERGROUND FUEL TANK LEAK ASSESSMENT
1330 MARTIN LUTHER KING, JR. WAY
SCI 430.002

Prepared for:

Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

By:

R. William Rudolph

R. William Rudolph
Geotechnical Engineer 741 (expires 12/31/88)

ROSS WILLIAM RUDOLPH
No. GE 000741
12/31/88

James P. Bowers
Geotechnical Engineer 157 (expires 3/31/91)

JAMES P. BOWERS
No. GE 000157
Exp.

Subsurface Consultants, Inc.
171 12th Street, Suite 201
Oakland, California 94607
(415) 268-0461

July 29, 1988

I INTRODUCTION

This report records the results of services provided to date by Subsurface Consultants, Inc. (SCI) regarding an assessment of an underground fuel leak at 1330 Martin Luther King, Jr. Way, in Oakland, California. The location of the site is shown on the Site Plan, Plate 1.

The purpose of the assessment was to check for indications of previous tank leakage and conduct studies to define the extent of soil and groundwater contamination resulting from the leak. Specifically, the services included drilling test borings, obtaining soil samples from within the borings, installing groundwater monitoring wells, and performing analytical tests on the soil and groundwater samples.

II FIELD INVESTIGATION

Subsurface conditions were explored by drilling 14 test borings ranging from 25 to 37 feet deep. Boring locations are shown on Plate 1. Test Borings 8, 11 and 16 were converted to groundwater monitoring wells. Test Borings 9 and 10 were unsampled probes and were utilized to install piezometer standpipes. Borings 5 and 12 were drilled in nearby areas for another investigation; the logs of these borings have been omitted from this report. The piezometers were used establish groundwater elevations in areas away from the tank and evaluate the direction of groundwater flow. The test borings were drilled with a truck-mounted rig equipped with 8-inch-diameter, hollow-stem augers.

Our geologist observed drilling operations and prepared logs of the borings. Soil samples were obtained from the borings using a California Drive sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches. The sampler was driven with a 140-pound hammer having a drop of approximately 30 inches. The blow counts required to drive the sampler the final 12 inches of each 18-inch penetration were recorded and are shown on the Boring Logs, Plates 2 through 16. Soil samples were retained in brass sample liners. Samples for environmental analysis were capped and sealed with plastic tape. Teflon sheeting was placed between the caps and the soil sample. Upon sealing and labeling, the samples were promptly refrigerated on-site in ice chests.

Soils are classified in accordance with the Soil Classification System, described on Plate 17.

All augers, drill rods, samplers, well casing, etc., that were placed into the boreholes were steam-cleaned prior to their initial use and before each subsequent use to reduce the likelihood of cross contamination between borings.

The groundwater monitoring wells are constructed of 2-inch-diameter Schedule 40 PVC pipe having flush threaded joints. The lower portion of each well consists of machine-slotted well screen having 0.020 inch slots. The annular space around the screened section was backfilled with Lone Star #3 sand. A bentonite plug, approximately 12 inches thick, was placed above the sand. The annulus above the plug was backfilled with bentonite grout. The wells were finished flush with the groundsurface. The wellheads are secured by a locking cover. Specific details of the wells are shown on the appropriate boring logs.

The wells were developed by removing water with a Teflon bailer until the water became relatively free of turbidity. After development, each well was sampled with a Teflon sampling device. The bailer and sampler were steam-cleaned prior to their initial use and each subsequent use to limit the likelihood of cross contamination between wells. The water samples were promptly refrigerated on-site in ice chests. All soil and water samples remained refrigerated until delivered to the analytical laboratory. Chain-of-custody documents accompanied all samples delivered to the laboratory.

The piezometers consist of 1.25 inch steel pipe fitted with a prefabricated steel well point tip. The piezometer pipes extend approximately 32 feet below the groundsurface. A bentonite pellet seal was placed in the piezometer boreholes at about mid-depth. The annulus above the bentonite pellet seal was backfilled with bentonite grout.

III SITE CONDITIONS

A. Site History

An underground fuel storage tank was located beneath the sidewalk at 1330 Martin Luther King, Jr. Way. The tank was situated approximately 50 feet south of the intersection of Martin Luther King, Jr. Way and 14th Street. The tank was reportedly used to store gasoline. The unlined steel tank had a reported capacity of 550 gallons. The bottom of the tank was situated approximately 10 feet below the sidewalk grade.

Prior to tank removal, a test boring was drilled (Boring 1A) and confirmed that the tank had leaked previously. On June 17, 1988, the tank was removed by the Cleveland Wrecking Company. The tank was removed from the site by the H & H Ship Company and disposed of. Tank removal was observed by representatives of the Oakland Fire Department and the Alameda County Health Care Services Agency (ACHCSA). A soil sample was obtained from beneath the bottom of the tank following removal. The sample was tested for the presence of total petroleum hydrocarbons and benzene, toluene, xylene and ethylbenzene. Following tank removal, the excavation was backfilled with on-site soils. The ACHCSA approved backfilling of the excavation without the removal of any contaminated soil, on the basis that studies would be promptly implemented to define the extent of soil and groundwater contamination.

B. Subsurface Conditions

Our test borings indicate that soil conditions in the area are relatively uniform. The upper 9 to 20 feet of soil consists of clayey sands. These materials are dense and contain appreciable quantities of silt and clay. Below the clayey sands, to the depths drilled, are sands containing significantly less silt and clay. With depth, the silt and clay content in the sand decreases. At a depth of about 25 feet, the sands are relatively clean and fine-grained.

Groundwater was encountered at a depth of approximately 26.5 feet below the groundsurface. These depths correspond to elevations[1] of 72.4 to 74.0 feet. Based on this data, it is apparent that groundwater is flowing toward the northwest at a gradient of approximately 1 percent. Groundwater level data recorded in the wells and piezometers is summarized in Table 1.

---

[1] Assumed datum: The elevation of the PG&E manhole in Martin Luther King, Jr. Way, west of the tank, was assumed to have an elevation of 100 feet.

TABLE 1. GROUNDWATER ELEVATION DATA

Date	Time	Groundwater Elevation[1] (feet) Well 8	Piezo 9	Piezo 10	Well 11	Well 16
6/30/88	1300	74.28	72.75	71.03	-	-
	1400	74.10	73.02	72.49	-	-
	1430	74.16	73.00	72.37	-	-
7/01/88	0900	74.17	73.60	72.41	-	-
7/05/88	1500	74.03	73.50	72.39	73.10	73.36
7/28/88	1400	73.93	73.43	-	73.01	72.93

---

[1] assumed datum

IV ANALYTICAL TESTING

Groundwater samples from the monitoring wells and selected soil samples from the borings were transmitted to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services to conduct hazardous waste and water testing. Soil samples from Test Boring 1A were analyzed for total petroleum hydrocarbons (TPH) in accordance with the EPA 8015 test method (sonication). The results indicated the presence of gasoline and not other heavier hydrocarbons. For this reason, all subsequent analyses were performed to check for total volatile hydrocarbons (TVH) in accordance with EPA Method 8015 (purge and trap). The samples were also analyzed for purgeable aromatic compounds in accordance with EPA Method 602. Laboratory test reports are presented in the Appendix. The analytical test results for soil samples are summarized in Table 2. Groundwater analysis results are presented in Table 3. In addition, the analytical results for the TPH analyses are presented on Plate 1.

The engineering properties of the materials encountered were evaluated by laboratory tests. The testing program included moisture content/dry density determinations, shear strength, grain size distribution, and percent passing a #200 sieve. The grain size distribution tests are presented on Plate 18. The remainder of the test results are presented in the boring logs.

TABLE 2. CONTAMINANT CONCENTRATIONS IN SOIL

SAMPLE[3]	TVH[1] mg/kg[2]	BENZENE mg/kg	TOLUENE mg/kg	TOTAL XYLENES mg/kg	ETHYL BENZENE mg/kg
1 @ 16.0	ND[4]	ND	ND	ND	ND
1 @ 21.0	ND	ND	ND	ND	ND
1 @ 25.0	ND	ND	ND	ND	ND
2 @ 16.0	ND	ND	ND	ND	ND
2 @ 21.0	1,810	26.3	42.5	154	24.8
2 @ 25.5	7,530	29.5	447	752	87.9
3 @ 16.0	ND	ND	ND	ND	ND
3 @ 21.0	2,370	15.9	39.2	199	31.0
3 @ 25.5	ND	ND	ND	ND	ND
4 @ 16.0	54	ND	ND	3.0	0.5
4 @ 21.0	6,770	21.9	158	598	101
4 @ 26.0	ND	ND	0.2	ND	ND
6 @ 17.5	ND	ND	ND	ND	ND
6 @ 23.0	ND	ND	ND	ND	ND
6 @ 27.0	ND	ND	ND	ND	ND
7 @ 19.0	ND	ND	ND	ND	ND
7 @ 24.0	987	ND	16	64	12
7 @ 28.5	2,020	32.8	74.6	152	26.5
8 @ 16.0	ND	ND	ND	ND	ND
8 @ 21.0	ND	ND	ND	ND	ND
8 @ 26.0	ND	ND	ND	ND	ND
11 @ 25.0	ND	ND	ND	ND	ND
14 @ 19.0	ND	ND	ND	ND	ND
14 @ 22.0	ND	ND	ND	ND	ND
14 @ 25.0	6,710	38.9	324	735	122
15 @ 25.0	ND	ND	ND	ND	ND
16 @ 25.0	7,660	39.3	257	719	117

---

[1] TVH = Total Volatile Hydrocarbons as gasoline

[2] mg/kg = milligrams per kilogram or part per million (ppm)

[3] Boring number and sample depth (feet)

[4] ND = Not detected at concentrations above detection limit; see test reports for detection limits

TABLE 3. CONTAMINANT CONCENTRATIONS IN WATER

Sample	TPH[1] (mg/L)[2]	Benzene (ug/L)[3]	Toluene (ug/L)	Total Xylenes (ug/L)	Ethyl Benzene (ug/L)
Well #8	<10	ND[4]	ND	ND	ND
Well #11	10	1800	ND	1200	ND
Well #16	90	3100	2700	5500	ND

---

[1] TPH = Total Petroleum Hydrocarbons, as gasoline

[2] mg/L = milligrams per liter or parts per million (ppm)

[3] ug/L = micrograms per liter or parts per billion (ppb)

[4] ND = not detected at concentrations above detection limit; see test reports for detection limits

V DISCUSSION AND CONCLUSIONS

Our investigation indicates that detectable concentrations of gasoline and constituents of gasoline i.e., benzene, toluene, xylene and ethylbenzene (BTXE) are present in the soil and groundwater at the site. The source of these chemicals appears to have been the fuel tank removed from the site. Accordingly, an "Underground Storage Tank Unauthorized Release (Leak) Contamination Site Report" should be filed with the ACHCSA. This report was completed by SCI and transmitted to the County on July 7, 1988. To put the contaminant concentration levels into perspective, a brief discussion of current regulatory guidelines applicable to fuel leakage problems is presented below.

A. Regulatory Criteria

Currently, City, County, Regional and State agencies are active in regulating soil and groundwater contamination resulting from leaking fuel storage tanks. The local agency in the Oakland area is the Alameda County Health Care Services Agency. Regionally, the California Regional Water Quality Control Board (RWQCB), the Department of Health Services (DHS) and the Bay Area Air Quality Management District may be involved depending on what type of problems exist.

Formal regulatory criteria for site assessments and remediation of sites where fuel leakage has occurred have not been established. Instead, the RWQCB has developed guidelines for addressing fuel leaks[2]. Specific requirements as to whether or not remediation is necessary, and if so, to what degree, will depend on many factors, such as (1) the extent of soil and groundwater contamination, (2) contaminant concentrations, (3) groundwater hydrology, (4) local climatology, (5) the potential/current beneficial uses of the groundwater that has been contaminated, and (6) whether the problem causes a nuisance or hazardous condition. The response to any problem is generally negotiated with the RWQCB, local regulatory agencies or other appropriate agencies based on site specific factors. A brief summary of current and draft regulatory guidelines is summarized in Table 4.

In practice, an upper level decision value of 1000 ppm for total petroleum hydrocarbons (TPH) has been commonly used to define the extent of removal for fuel contaminated soil. A lower level decision value of 10 ppm is generally only applicable where sensitive groundwater conditions exist. Only draft guidelines have been proposed regarding decision values for BTXE in soil; the draft guidelines have not been formally adopted by the regulatory agencies. The RWQCB generally requires a monitoring well and quarterly groundwater sampling and analysis at sites where greater than 100 ppm of TPH has been detected and left in place. The RWQCB is clear to point out that if future groundwater contamination results from contaminated soil which is

---

[2] Guidelines for Addressing Fuel Leaks, California Regional Water Quality Control Board, San Francisco Region, September 1985.

TABLE 4. SUMMARY OF DRAFT REGULATORY GUIDELINES

Soil Contamination

Constituent	Concentration	General Regulatory Guidelines
TPH	<10 ppm[1]	Generally does not constitute a threat to groundwater or cause a nuisance or hazardous condition
TPH	10 to 1000 ppm[1]	May require remediation depending on site specific factors, i.e., threat to groundwater, nuisance or hazardous condition
TPH	>100 ppm[1]	Monitoring well required
TPH	>1000 ppm[1]	Requires remediation under almost all circumstances
BTXE	<0.3 ppm[2]	Generally does not constitute a threat to groundwater
BTXE	>0.3 ppm[2]	May require remediation depending on threat to groundwater
Groundwater Contamination		
TPH	<1/4" thickness[1]	May require remediation if the condition causes a health threat or nuisance
	>1/4" thickness[1] on groundwater	Requires remediation under almost all circumstances
Benzene	>.7 ppb[4]	May require remediation depending on groundwater usage
Toluene	>100 ppb[4]	
Xylene	>620 ppb[4]	
Ethylbenzene	>680 ppb[5]	

TPH = Total Petroleum Hydrocarbons
BTXE = Benzene, Toluene, Xylene and Ethylbenzene
ppm = parts per million (milligrams per kilogram or per liter)
ppb = parts per billion (micrograms per liter)

---

[1] Guidelines for Addressing Fuel Leaks, RWQCB, September 1985

[2] Draft Leaking Underground Fuel Tank (LUFT) Field Manual, July 1987, by State of California LUFT Task Force (not adopted by S.F. Bay Region RWQCB)

[3] Title 22 CAC 66699

[4] DHS drinking water action levels

[5] Federal Drinking Water Criteria

left in place, regardless of which decision values were applied, additional remediation may be required.

B. Soil Contamination

The analytical test data indicates that a fuel leak has occurred in the past. Gasoline concentrations in the soil varied up to 7660 mg/kg (ppm) near the tank location. The approximate extent of soil contamination is shown on Plate 1. In many areas, the concentration of gasoline detected in the soil exceeds 1000 ppm. Accordingly, we conclude that some clean up of fuel contaminated soil will likely be required. Based on information generated to date, it appears that soil remediation will be necessary in areas near and northwest of the tank. The analytical tests indicate that in areas more than 10 feet or so from the tank, contamination exists within a zone of soil situated between depths of about 20 and 28 feet. The layer of contaminated soil appears to be only a few feet thick in areas furthest from the tank (e.g. Boring 14). The Boring 14 analytical results suggest that this thin zone of contaminated soil extends beyond the area explored to date. We believe that the thin zone of contamination was created by seasonal variations in groundwater level.

C. Groundwater Contamination

Gasoline and BTX were detected in groundwater as a result of past tank leakage. A thin layer of floating gasoline was detected on the groundwater surface in Well 16. However, floating product was not observed elsewhere. The extent of the contaminated groundwater plume has not been defined by the data generated to date. Dissolved gasoline, as well as benzene and toluene, were detected in Well 11, indicating that impacted groundwater has migrated significant distances from the tank location. Nondetectable concentrations of gasoline were encountered in soil samples from Boring 11; however, gasoline, benzene and toluene were detected in the groundwater at this location.

BTX concentrations in the groundwater significantly exceed DHS action levels for drinking water. However, we judge that the area will likely not be considered a particularly sensitive groundwater area by the RWQCB. Although unconfirmed, we suspect that groundwater in the area is likely not used as a drinking water source. For this reason, we judge that drinking water standards will not be used to establish clean up levels; some higher standard will likely be applicable. The scope of any groundwater remediation will have to be negotiated with the RWQCB.

D. Soil/Groundwater Remediation

It is premature to draw definitive conclusions regarding the need for and the extent of soil and groundwater remediation. Input from the ACHCSA and the RWQCB is necessary before final decisions are made.

If groundwater cleanup is necessary, we judge that the most appropriate method to do so will involve installing groundwater extraction wells, removing water from the wells by pumping, and treating the contaminated groundwater at a facility utilizing activated carbon filtering or air stripping methods.

Soil remediation will be complicated by the fact that (1) the area of contamination has largely affected areas beneath city streets, (2) contamination exists at significant depths below the groundsurface, and (3) major utility installations exist within the streets in the area. These issues will make the removal of contaminated soils relatively difficult and costly. For these reasons, we judge that it will be most appropriate to employ mitigation methods which treat the soil in place (in situ). Several methods are available to do so. The most common alternatives are In Situ Biodegradation (ISB) and In Situ Volatilization (ISV). In brief, the ISB method utilizes special bacteria to consume hydrocarbons in the soil. An enriched solution of bacteria and nutrients is allowed to pass through soil using injection wells and/or infiltration sumps/trenches. The ISV method utilizes a system of wells into which air is injected. A system of extraction wells is used to extract air containing gasoline vapor and other volatile chemicals in the soil. The extracted air is typically discharged to the atmosphere (if appropriate) or treated using activated carbon filtering methods prior to discharge to the atmosphere. The effectiveness of these systems depends significantly on soil conditions. At this time, we have not identified the most appropriate method of soil remediation. However, given the sandy soils at the site, we judge that ISV may prove to be the most cost effective and efficient alternative.

Prior to developing plans for mitigation systems, it will likely be necessary to conduct additional engineering studies to (1) define the lateral and vertical extent of groundwater contamination, (2) characterize the permeability of saturated soils, (3) evaluate the effectiveness of an ISV system, and (4) define the extent of soil contamination in areas not yet explored. Several of these issues should be discussed with the regulatory agencies prior to proceeding with the studies.

List of Attached Plates:

Plate 1	Site Plan
Plate 2 thru 16	Logs of Borings 1 thru 16 (excluding 5 and 12)
Plate 17	Unified Soil Classification System
Plate 18	Particle Size Analysis
Appendix	Laboratory Test Reports

Distribution:

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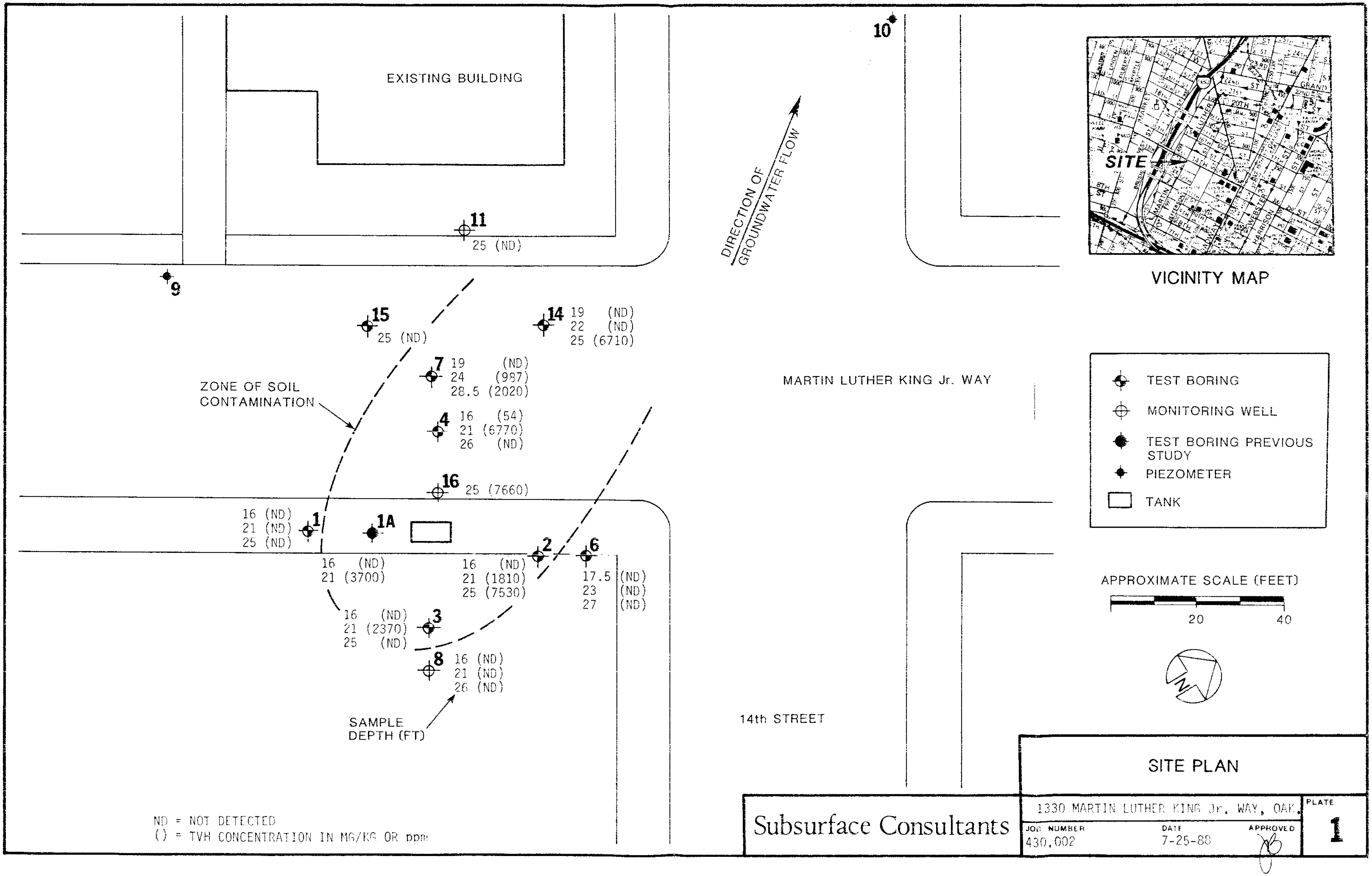

ND = NOT DETECTED
() = TVH CONCENTRATION IN MG/KG OR ppm

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SITE PLAN

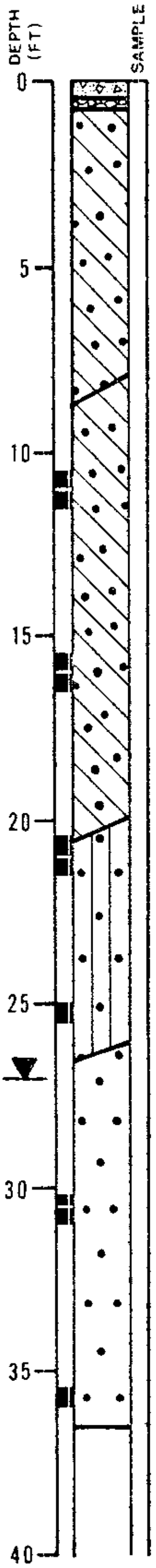
1330 MARTIN LUTHER KING Jr. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-25-88		1

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				6" CONCRETE 3" BASE ROCK BROWN CLAYEY SAND (SC) medium dense, moist
				MOTTLED BROWN CLAYEY SAND (SC) medium dense, moist
UC = 705	14.2	122	20	
			29	
%-200 = 14.0	17.2	98	35	GRAY BROWN SILTY SAND (SM-SP) dense, moist
			39	
				groundwater level 6/23/88
				GRAY BROWN SAND (SP) medium dense, saturated
				boring backfilled with a cement/ bentonite grout upon completion of drilling



UC = UNCONFINED COMPRESSIVE SHEAR STRENGTH

%-200 = % PASSING #200 SIEVE (0.074mm)

SAMPLE TYPE:
CALIFORNIA DRIVE SAMPLE
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES

HAMMER WEIGHT: 140 POUNDS
HAMMER DROP : 30 INCHES

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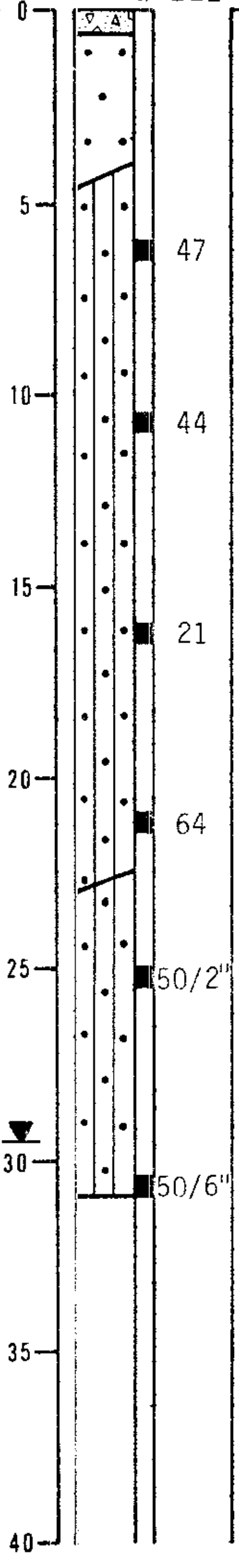
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE 2

LOG OF TEST BORING 1A

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-6-88
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



6" CONCRETE SLAB

BROWN SAND (SP)
loose, moist (fill)

BROWN SILTY SAND (SM)
dense, moist

becomes very dense, gasoline
oder noted

GREY BROWN SILTY SAND (SM/SP)
very dense, moist

groundwater level during drilling

boring backfilled with cement/
bentonite grout

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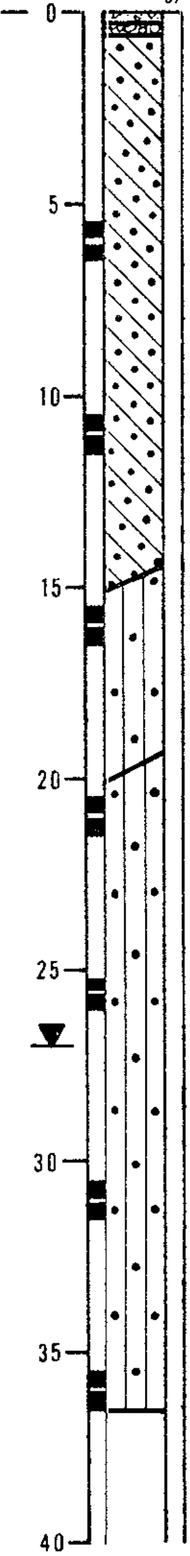
JOB NUMBER	DATE	APPROVED	PLATE
430.001	6/30/88		3

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	BLOWS PER FOOT	
			0		3" THICK CONCRETE 3" BASE ROCK
					BROWN CLAYEY SAND (SC) medium dense to dense, moist
			5	26	
					becomes mottled brown and gray below 9'
UC = 1021	13.7	121	10	35	
			15	31	BROWN SILTY SAND (SM) dense, moist
					interbedded with some clayey sand
%-200 = 15.4	16.0	106	20	27	BROWN SILTY SAND (SM) medium dense to dense, moist
%-200 = 26.6			25	20	
					groundwater level 30 minutes after drilling
			30	36	
			35		boring backfilled with cement/ bentonite grout upon completion of drilling
			40		

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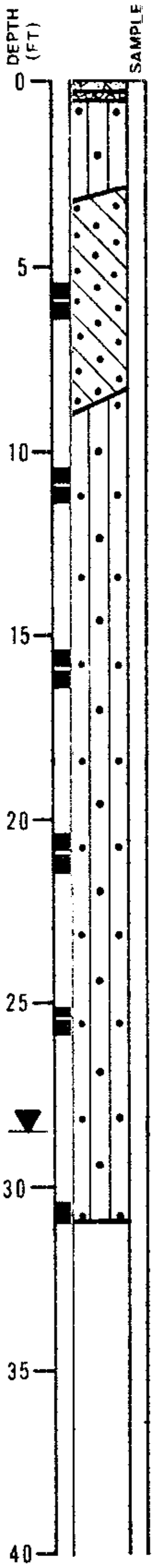
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE 4

LOG OF TEST BORING 3

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			27
%-200 = 37.3	12.9	118	33
%-200 = 18.3			29
%-200 = 13.5	17.0	105	29
			30
			16



3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM)
loose, moist, with numerous pieces of glass, brick, etc. (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM)
dense, moist

groundwater level 6/23/88

boring backfilled with a cement/bentonite grout upon completion of drilling

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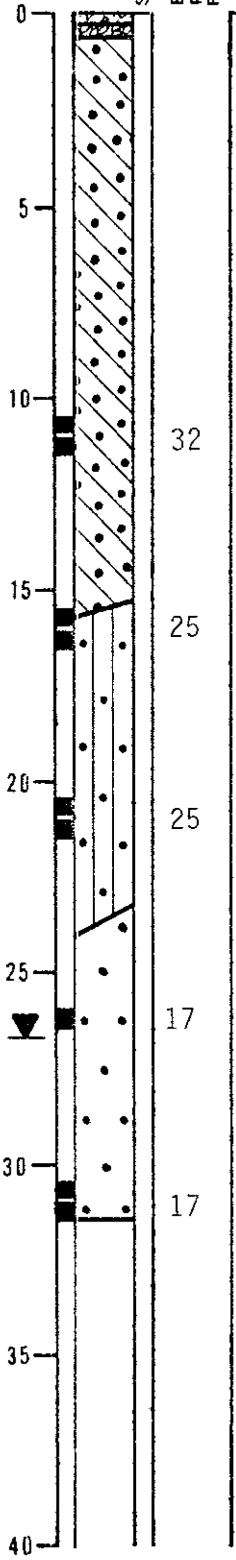
JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		5

LOG OF TEST BORING 4

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
UC = 1329	13.1	123	32
			25
%-200 = 22.5	16.9	99	25
			17
			17

4" ASPHALTIC CONCRETE
3" BASE ROCK

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray brown below 8'

GRAY BROWN SILTY SAND (SM)
dense, moist

GRAY BROWN SAND (SP)
medium dense, saturated

groundwater level 6/24/88

boring backfilled with a cement/bentonite grout upon completion of drilling

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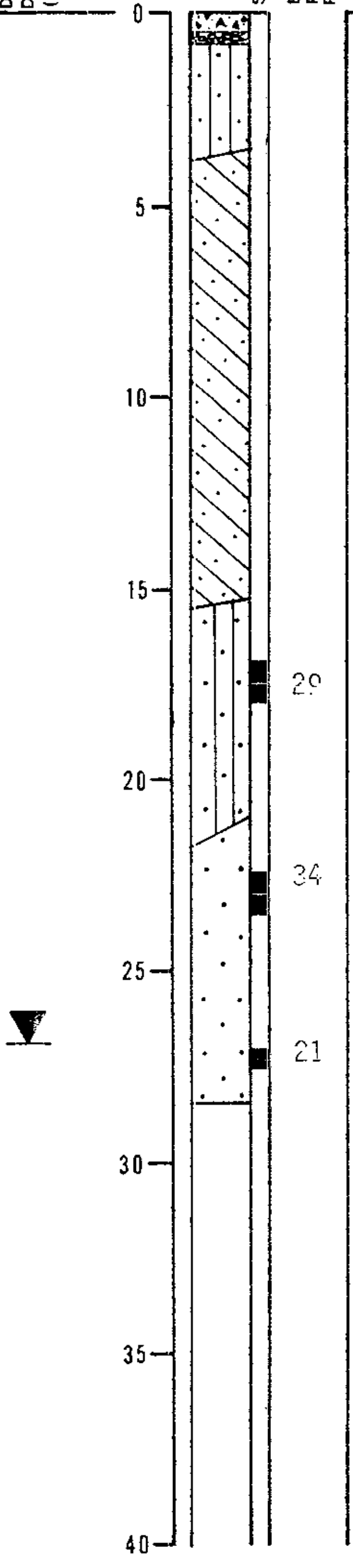
JOB NUMBER 430.002
DATE 6/29/88
APPROVED

PLATE 6

LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-83
ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF) | DEPTH (FT) | SAMPLE | BLOWS PER FOOT



6" CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)
BROWN SILTY CLAYEY SAND (SC)
medium dense, moist

color change to mottled brown and gray below 10 feet

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

BROWN SAND (SP)
medium dense to dense, moist

GROUNDWATER LEVEL 6-24-83

boring backfilled with a cement/bentonite grout upon completion of drilling

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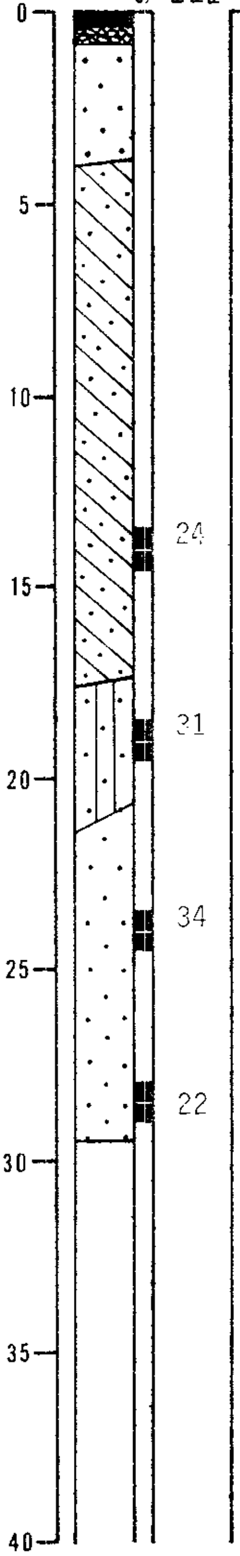
1330 MARTIN LUTHER KING, JR. WAY, OAK

JOB NUMBER 430.002
DATE 7-11-83
APPROVED

PLATE
7

LOG OF TEST BORING 7

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			24
%-200 = 25.5	14.4	183	31
%-200 = 5.6	12.4	104	34
		▼	
			22

4" ASPHALTIC CONCRETE
6" BASE ROCK
BROWN SAND (SP)
medium dense, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

color change to mottled gray and brown below 8 feet

GRAY BROWN SILTY SAND (SM)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY OAK.

JOB NUMBER 430.002
DATE 7-11-88
APPROVED

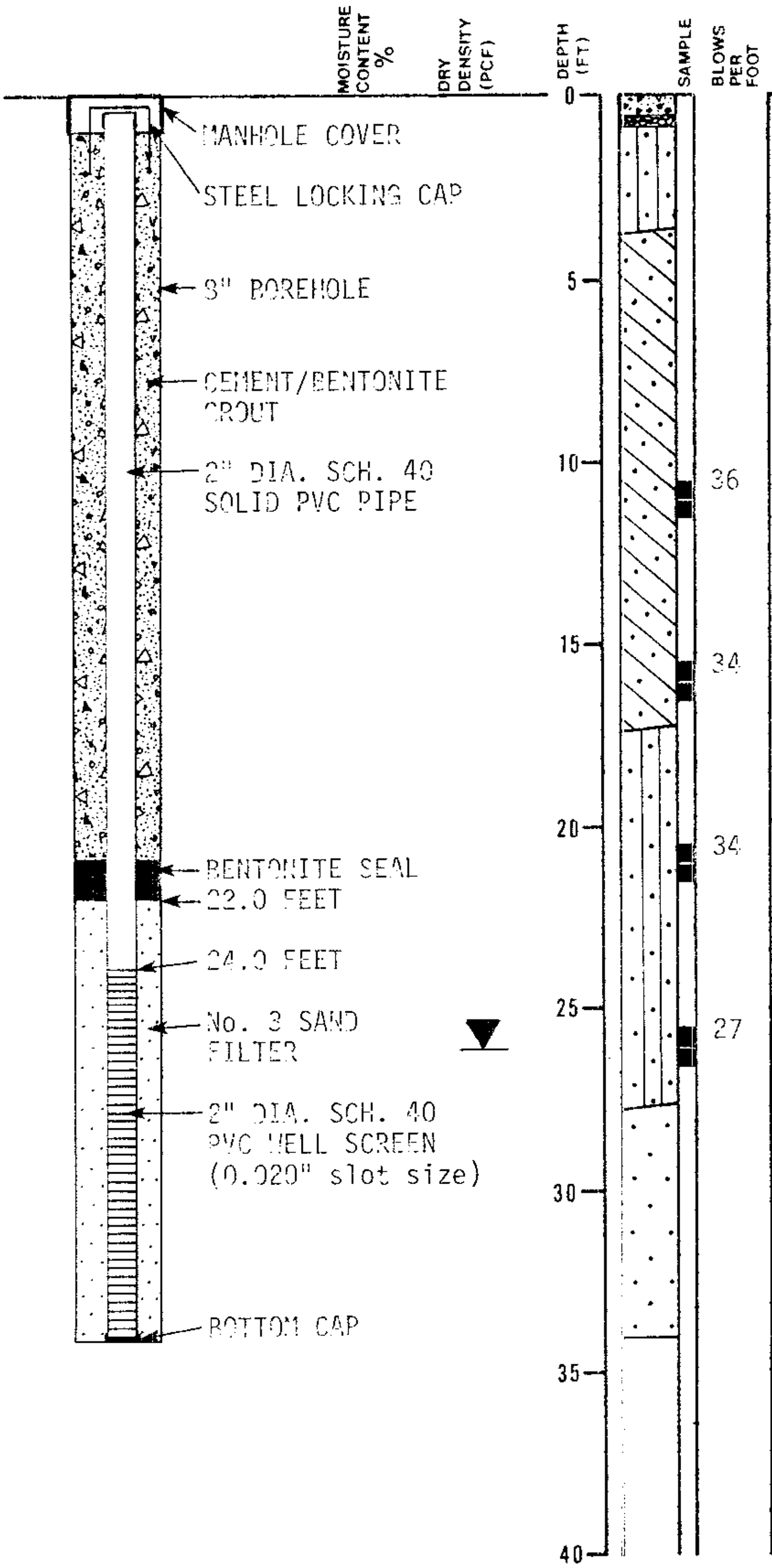
PLATE 8

LOG OF TEST BORING 8

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-24-88

ELEVATION --



6" CONCRETE

3" BASE ROCK

DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

GROUNDWATER LEVEL 6-30-88

BROWN SAND (SP)
medium dense to dense, saturated, fine grained

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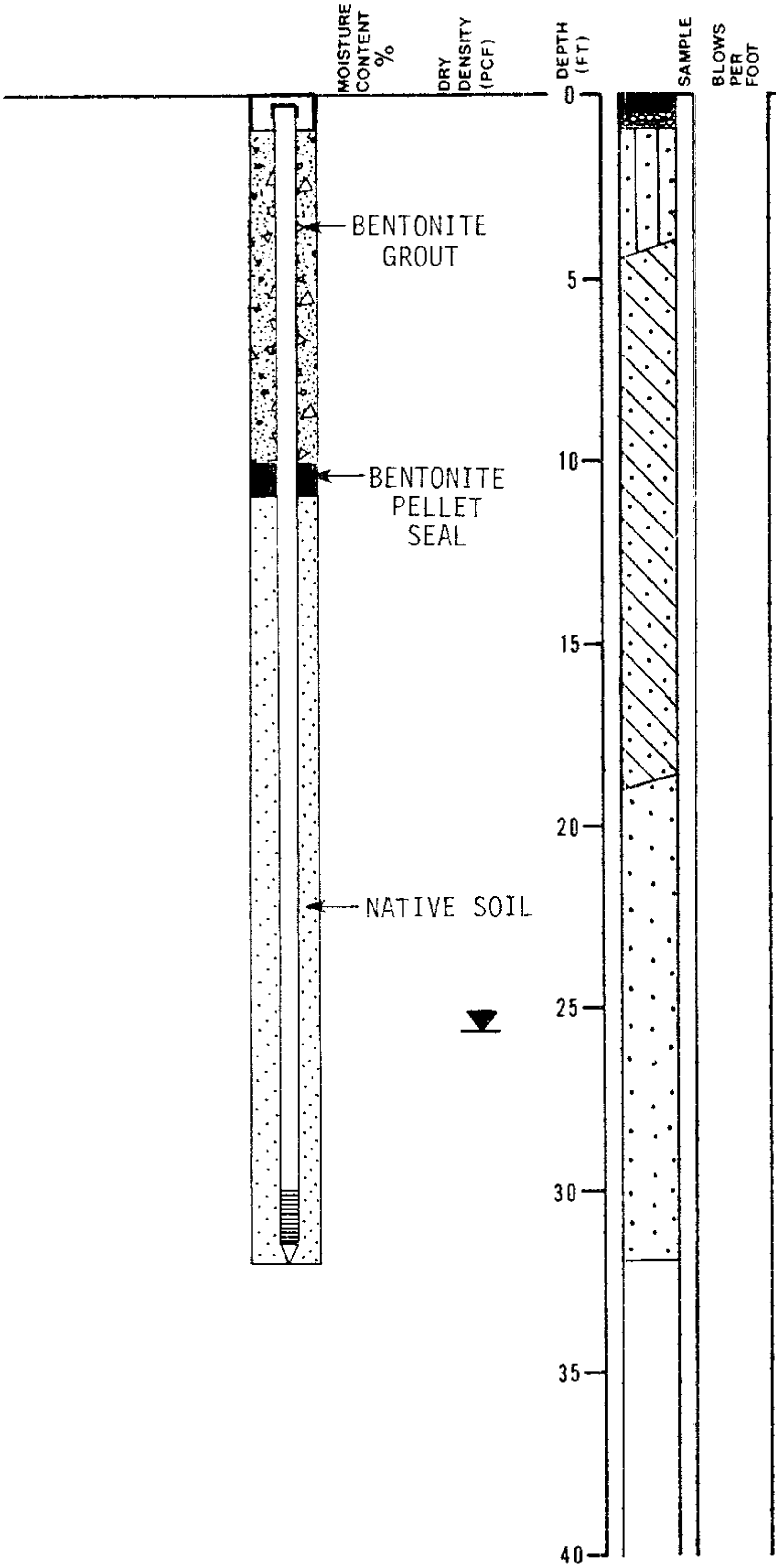
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		9

LOG OF TEST BORING 9

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
3" BASE ROCK
BROWN SILTY SAND (SM)
medium dense to dense, moist,
fine grained
BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SP)
very dense, moist, fine
grained

GROUNDWATER LEVEL 6-30-88

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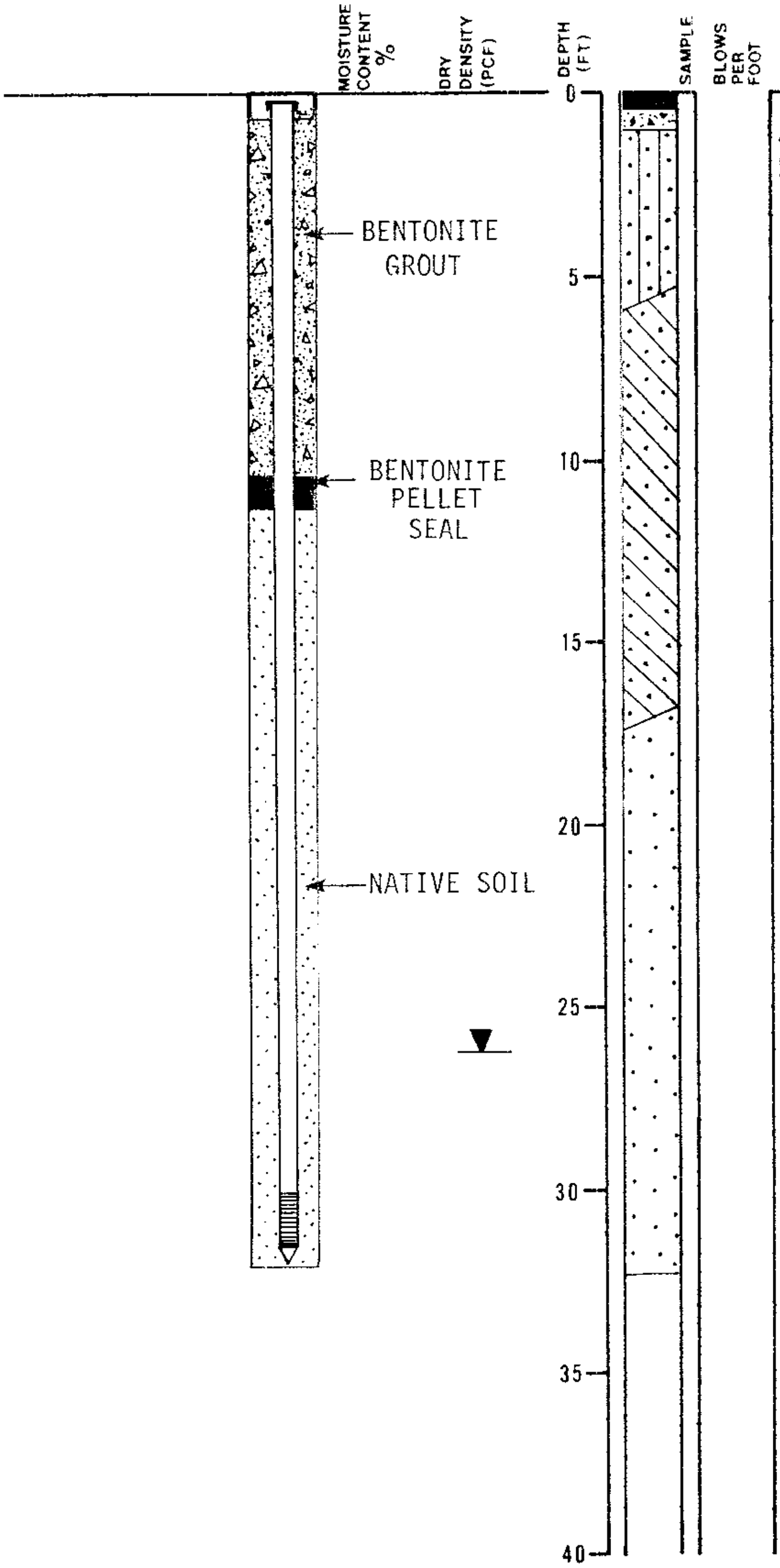
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88	MB	10

LOG OF TEST BORING 10

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --



3" ASPHALT CONCRETE
4" CONCRETE
BROWN SILTY SAND (SM)
medium dense, moist, fine grained

BROWN CLAYEY SAND (SC)
dense, moist, fine grained

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 6-30-88
measured during drilling

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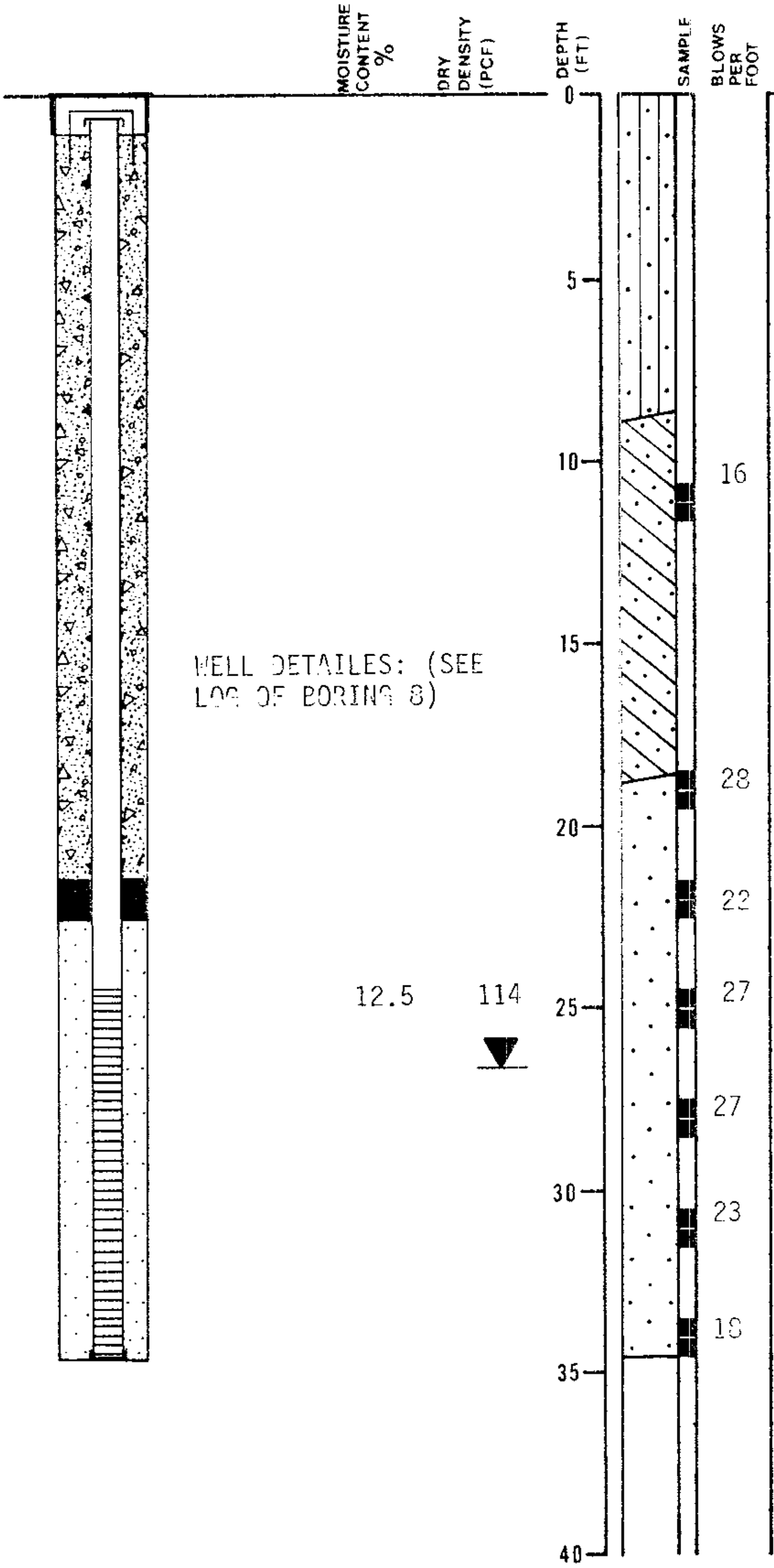
1330 MARTIN LUTHER KING Jr. WAY, OAK

JOB NUMBER	DATE	APPROVED
430.002	7-28-88	

PLATE
11

LOG OF TEST BORING 11

EQUIPMENT 8" Hollow stem
DATE DRILLED 6-30-88
ELEVATION --



BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED GRAY AND BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY BROWN SAND (SP)
medium dense, moist, fine grained

GROUNDWATER LEVEL 7-5-88

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JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88	B	12

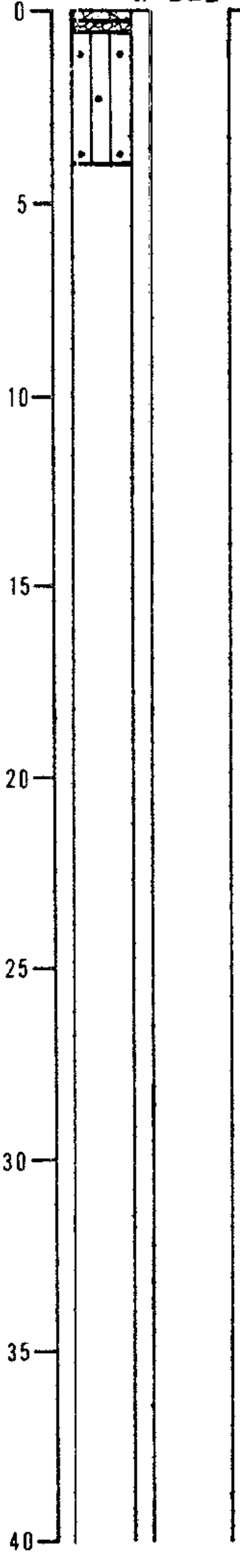
LOG OF TEST BORING 13

EQUIPMENT

DATE DRILLED

ELEVATION

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	SAMPLE	BLOWS PER FOOT



3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM) medium dense, moist, with numerous bricks, pebbles and debris (fill)

hit obstruction, boring terminated at 4.0 feet

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

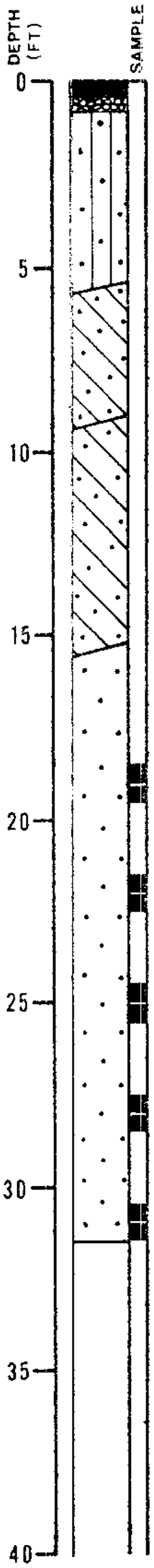
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7/14/88		13

LOG OF TEST BORING 14

EQUIPMENT 8" Hollow Stem

DATE DRILLED 7-1-88

ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				4" ASPHALTIC CONCRETE 4" BASE ROCK DARK BROWN SILTY SAND (SM) medium dense, moist (fill)
				MOTTLED OLIVE GREEN AND BROWN CLAYEY SAND (SC) medium dense, moist
				BROWN CLAYEY SAND (SC) medium dense, moist
				BROWN SAND (SP) dense, moist, fine grained
			29	
				color change to gray brown below 20 feet
%-200 = 7.2	10.8	106	44	
%-200 = 5.9			36	
		▼	29	GROUNDWATER LEVEL 7-1-88
			24	
				boring backfilled with a cement/ bentonite grout upon completion of drilling

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

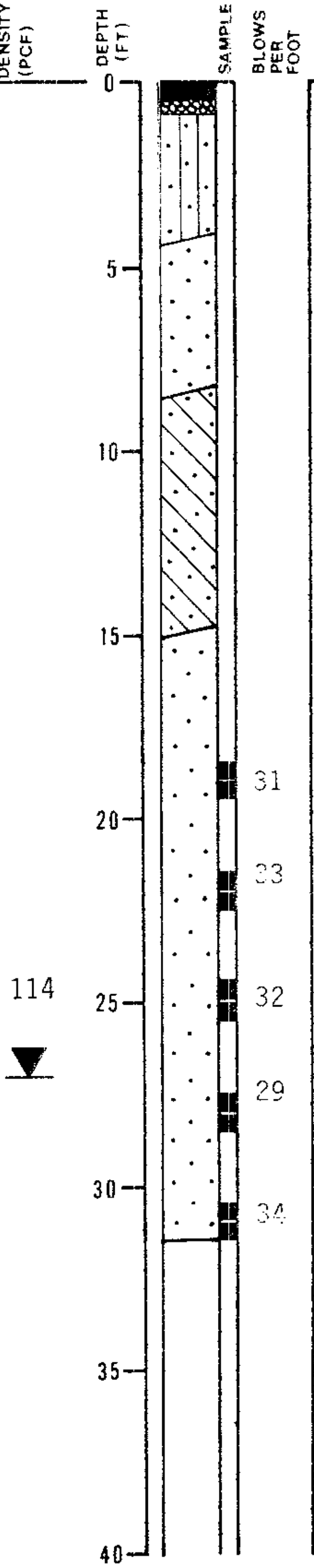
JOB NUMBER 430.002 **DATE** 7-11-88 **APPROVED**

PLATE 14

LOG OF TEST BORING 15

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-83
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)
%-200 = 7.2			
	12.5	114	



4" ASPHALTIC CONCRETE
4" BASE ROCK
BROWN SILTY SAND (SM)
medium dense, moist (fill)

GRAY BROWN SAND (SP)
medium dense, moist, fine grained

DARK GRAY BROWN CLAYEY SAND (SC)
medium dense, moist
color change to brown below 10 feet

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER LEVEL 7-1-83
color change to brown below 26 feet

boring backfilled with a cement/bentonite grout upon completion of drilling

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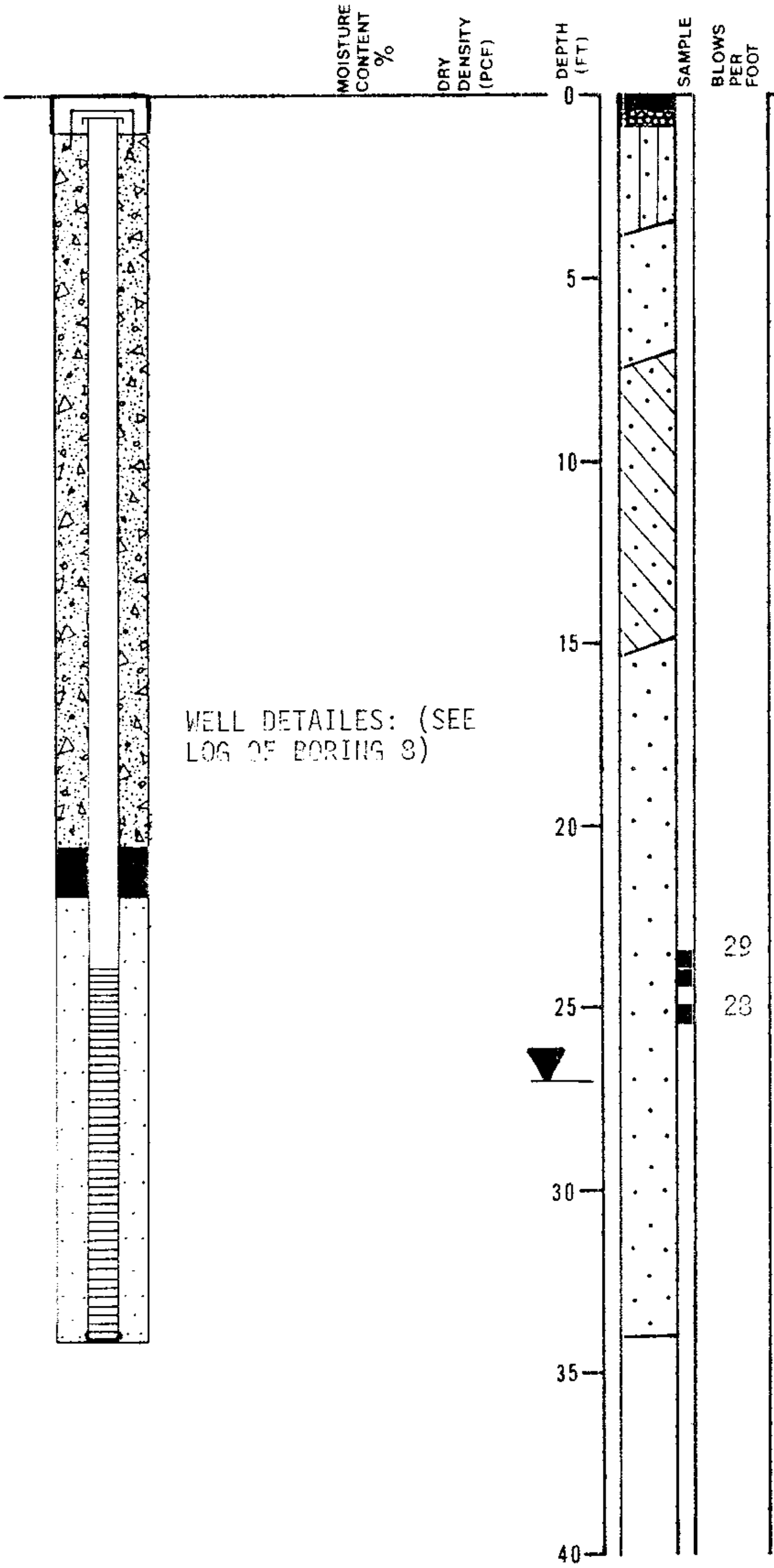
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-83		15

LOG OF TEST BORING 16

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --



4" ASPHALT CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

BROWN SAND (SP)
medium dense, moist
fine grained

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray and brown
below 12 feet

GRAY BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL MEASURED 7-1-88

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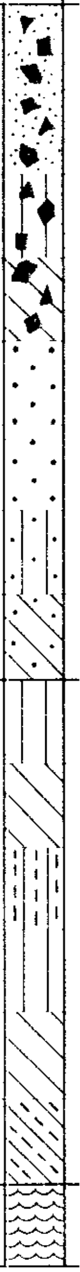
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88	JB	16

GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

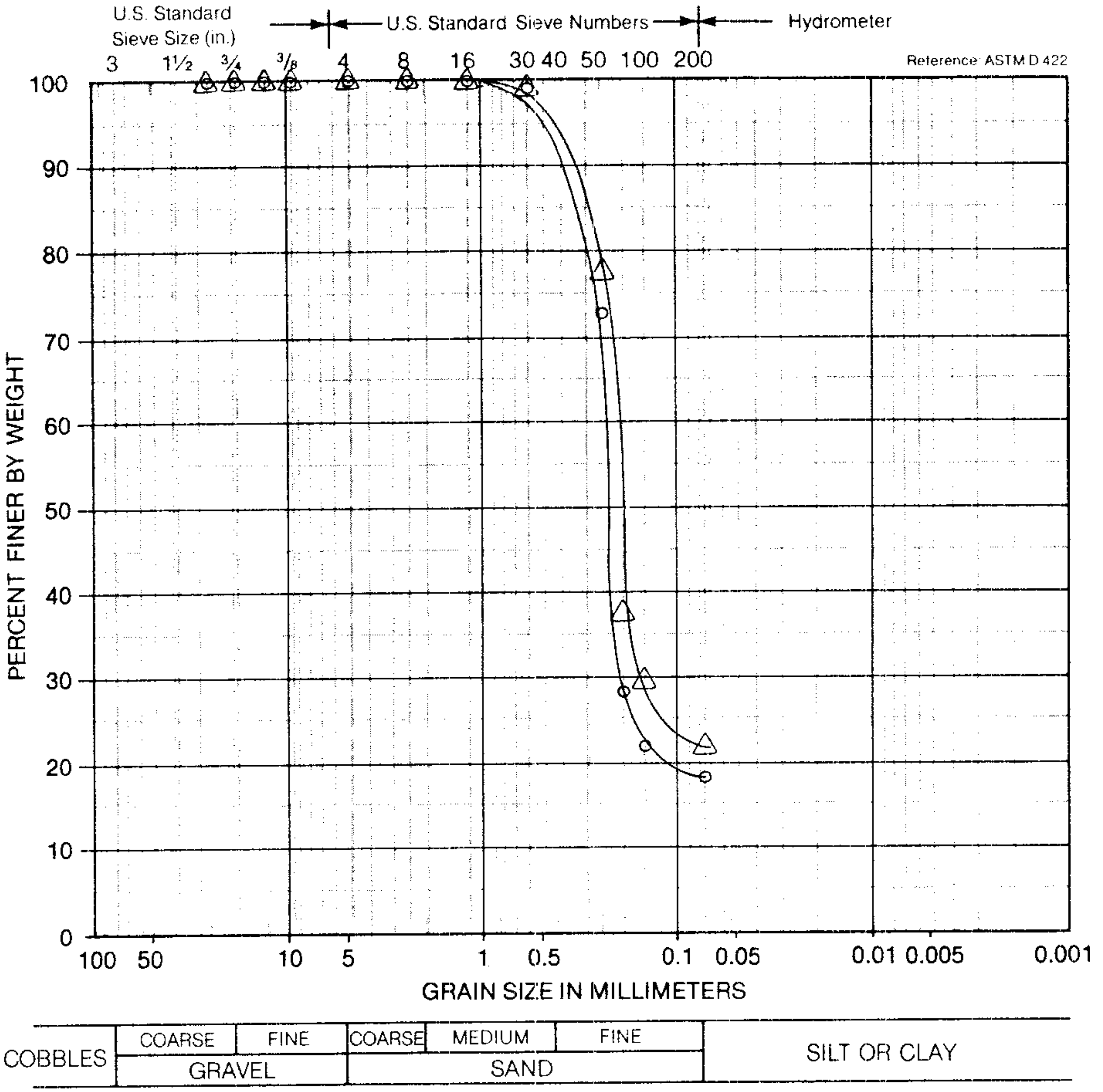


UNIFIED SOIL CLASSIFICATION SYSTEM

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		17



Symbol	Sample Source	Classification
○	BORING 3 @ 15.5	BROWN SILTY SAND (SM)
△	BORING 4 @ 20.5	GRAY SILTY SAND (SM)

PARTICLE SIZE ANALYSIS

Subsurface Consultants

1330 MARTIN LUTHER KING jr. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88		18

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

LABORATORY NUMBER: 14984A
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-1	1 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-2	1 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-3	1 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-4	2 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-5	2 @ 21.0	1,810	26.3	42.5	154	24.8
14984-6	2 @ 25.5	7,530	29.5	447	752	87.9
14984-7	3 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-8	3 @ 21.0	2,370	15.9	39.2	199	31.0
14984-9	3 @ 25.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 14984
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 2 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-10	4 @ 16.0	54.0	ND(0.1)	ND(0.1)	3.0	0.5
14984-11	4 @ 21.0	6,770	21.9	158	598	101
14984-12	4 @ 26.0	ND(10)	ND(0.1)	0.2	ND(0.1)	ND(0.1)
14984-13	6 @ 17.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-14	6 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-15	6 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-16	7 @ 19.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-17	7 @ 28.5	2,020	32.8	74.6	152	26.5
14984-18	8 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-19	8 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-20	8 @ 26.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

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

LABORATORY NUMBER: 15050
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY, FUEL TANK

DATE RECEIVED: 07/05/88
DATE EXTRACTED: 07/12/88
DATE ANALYZED: 07/15/88
DATE REPORTED: 07/18/88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15050-1	11@ 25.0′	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-2	12@ 23.0′	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-3	14@ 19.0′	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-4	14@ 22.0′	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-5	14@ 25.0′	6,710	38.9	324	735	122
15050-6	15@ 25.0′	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-7	16@ 25.0′	7,660	39.3	257	719	117

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	4	--	3	1	1
%RECOVERY	--	93	96	95	91

OB Godfrey
LABORATORY DIRECTOR

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

LABORATORY NUMBER: 14983
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 06-28-88
DATE REPORTED: 06-29-88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14983-1	7 @ 24.0	987	ND(1)	16	64	12

QA/QC SUMMARY

%RPD	<1
%RECOVERY	81

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-08-88
DATE REPORTED: 07-20-88
PAGE 1 OF 4

Total Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
15066-1	WELL #8	TRACE	ND(0.05)	ND(0.05)
15066-2	WELL #11	10	ND(0.05)	ND(0.05)
15066-3	WELL #16	90	ND(0.05)	ND(0.05)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	7
Spike: % Recovery	112

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066-1
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #8

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

LABORATORY NUMBER: 15066-2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #11

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	1,800	100
Toluene	ND	100
Ethyl Benzene	ND	100
Total Xylenes	1,200	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

LABORATORY NUMBER: 15066-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #16

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	3,100	100
Toluene	2,700	100
Ethyl Benzene	ND	100
Total Xylenes	5,500	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

JOB NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-22-88
DATE REPORTED: 07-01-88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14932-1	1,000	ND(10)	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	21
Spike: % Recovery	87

Laboratory Director

LABORATORY NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-30-88
DATE REPORTED: 07-01-88
PAGE 2 OF 2

EPA 8020: Volatile Aromatic Hydrocarbons in Soils & Wastes
Extraction Method: EPA 5030 - Purge & Trap

COMPOUND	Result ug/Kg	LOD ug/Kg
Benzene	790	100
Toluene	1,200	500
Ethyl Benzene	7,300	100
Total Xylenes	38,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	6
Average Spike Recovery %	89

BORING 1A

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

JOB NUMBER: 14810
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK

DATE RECEIVED: 06/07/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	SAMPLE ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14810-1	1 @ 16′	ND(10)	ND(10)	ND(10)
14810-2	1 @ 21′	3,700	ND(10)	ND(10)

		GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
14810-3	BORING 1	68	ND(10)	ND(10)

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

Duplicate: Relative % Difference	4
Spike: % Recovery	112

Laboratory Director

Curtis & Tompkins, Ltd

BORING 1A

LABORATORY NUMBER: 14810-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK
SAMPLE ID: BORING 1

DATE RECEIVED: 06/08/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	4,200	100
Toluene	4,800	500
Ethyl Benzene	1,700	100
Total Xylenes	12,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

%RPD	4
%RECOVERY	118

July 29, 88

7-29-88

■ Subsurface Consultants, Inc.

PROGRESS REPORT 1
UNDERGROUND FUEL TANK LEAK ASSESSMENT
1330 MARTIN LUTHER KING, JR. WAY
SCI 430.002

Prepared for:

Mr. John Esposito
Bramalea Pacific
1221 Broadway, Suite 1800
Oakland, California 94612

By:

R. William Rudolph

R. William Rudolph
Geotechnical Engineer 741 (expires 12/31/88)

REGISTERED PROFESSIONAL ENGINEER
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12/31/88
GEOTECHNICAL
STATE OF CALIFORNIA

James P. Bowers

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Oakland, California 94607
(415) 268-0461

July 29, 1988

I INTRODUCTION

This report records the results of services provided to date by Subsurface Consultants, Inc. (SCI) regarding an assessment of an underground fuel leak at 1330 Martin Luther King, Jr. Way, in Oakland, California. The location of the site is shown on the Site Plan, Plate 1.

The purpose of the assessment was to check for indications of previous tank leakage and conduct studies to define the extent of soil and groundwater contamination resulting from the leak. Specifically, the services included drilling test borings, obtaining soil samples from within the borings, installing groundwater monitoring wells, and performing analytical tests on the soil and groundwater samples.

II FIELD INVESTIGATION *

Subsurface conditions were explored by drilling 14 test borings ranging from 25 to 37 feet deep. Boring locations are shown on Plate 1. Test Borings 8, 11 and 16 were converted to groundwater monitoring wells. Test Borings 9 and 10 were unsampled probes and were utilized to install piezometer standpipes. Borings 5 and 12 were drilled in nearby areas for another investigation; the logs of these borings have been omitted from this report. The piezometers were used establish groundwater elevations in areas away from the tank and evaluate

* Jim Bowers said no gas fumes were noted in most boreholes unless depths of 18 to 20 feet (near tank) were attained. Boreholes away from tank had odors at depths of 24, 25 feet. No odors were noticed when surface slab was broken.

the direction of groundwater flow. The test borings were drilled with a truck-mounted rig equipped with 8-inch-diameter, hollow-stem augers.

Our geologist observed drilling operations and prepared logs of the borings. Soil samples were obtained from the borings using a California Drive sampler having an outside diameter of 2.5 inches and an inside diameter of 2.0 inches. The sampler was driven with a 140-pound hammer having a drop of approximately 30 inches. The blow counts required to drive the sampler the final 12 inches of each 18-inch penetration were recorded and are shown on the Boring Logs, Plates 2 through 16. Soil samples were retained in brass sample liners. Samples for environmental analysis were capped and sealed with plastic tape. Teflon ✓ ok sheeting was placed between the caps and the soil sample. Upon sealing and labeling, the samples were promptly refrigerated on-site in ice chests.

Soils are classified in accordance with the Soil Classification System, described on Plate 17.

All augers, drill rods, samplers, well casing, etc., that were placed into the boreholes were steam-cleaned prior to their initial use and before each subsequent use to reduce the likelihood of cross contamination between borings.

The groundwater monitoring wells are constructed of 2-inch-diameter Schedule 40 PVC pipe having flush threaded joints. The lower portion of each well consists of machine-slotted well screen having 0.020 inch slots. The annular space around the screened section was backfilled with Lone Star #3 sand. A bentonite plug, approximately 12 inches thick, was placed above the sand. The annulus above the plug was backfilled with bentonite grout. The wells were finished flush with the groundsurface. The wellheads are secured by a locking cover. Specific details of the wells are shown on the appropriate boring logs.

The wells were developed by removing water with a Teflon bailer until the water became relatively free of turbidity. After development, each well was sampled with a Teflon sampling device. The bailer and sampler were steam-cleaned prior to their initial use and each subsequent use to limit the likelihood of cross contamination between wells. The water samples were promptly refrigerated on-site in ice chests. All soil and water samples remained refrigerated until delivered to the analytical laboratory. Chain-of-custody documents accompanied all samples delivered to the laboratory.

The piezometers consist of 1.25 inch steel pipe fitted with a prefabricated steel well point tip. The piezometer pipes extend approximately 32 feet below the groundsurface. A bentonite pellet seal was placed in the piezometer boreholes at about mid-depth. The annulus above the bentonite pellet seal was backfilled with bentonite grout.

for water surface only

No. Bentonite grout used set

Cement at surfac (needed esp. in traffic areas)

Called Volclay. Has activator which causes grout to get hard. On street is capped with asphal On sidewal is capped with concre

[redacted]

Strictly piezomete were pushed int soil. Galvanized steel pipe. Fitted on en is a 2' prefabricate steel (solid well point tip. (6" long Upper part is a fine wire mesh. Mesh section is 18" long. Tip of "well" is 32 feet.

III SITE CONDITIONS

A. Site History

An underground fuel storage tank was located beneath the sidewalk at 1330 Martin Luther King, Jr. Way. The tank was situated approximately 50 feet south of the intersection of Martin Luther King, Jr. Way and 14th Street. The tank was reportedly used to store gasoline. The unlined steel tank had a reported capacity of 550 gallons.* The bottom of the tank was situated approximately 10 feet below the sidewalk grade.

Prior to tank removal, a test boring was drilled (Boring 1A) and confirmed that the tank had leaked previously. On June 17, 1988, the tank was removed by the Cleveland Wrecking Company. The tank was removed from the site by the H & H Ship Company and disposed of. Tank removal was observed by representatives of the Oakland Fire Department and the Alameda County Health Care Services Agency (ACHCSA). A soil sample was obtained from beneath the bottom of the tank following removal. The sample was tested for the presence of total petroleum hydrocarbons and benzene, toluene, xylene and ethylbenzene. Following tank removal, the excavation was backfilled with on-site soils. The ACHCSA approved backfilling of the excavation without the removal of any contaminated soil, on the basis that studies would be promptly implemented to define the extent of soil and groundwater contamination.

analytica results for Boring 1 are in Appendi

No't was. The sample was taken from the soil adjacent to the tank's lower side

*Was part of the fire station.
Tank taken out of commission
roughly 10+ years ago.
Building was built ~1930.
Tank may date to 1930 as well.

per conversation w/ Jim Bowers on 3/4/88.

B. Subsurface Conditions

Our test borings indicate that soil conditions in the area are relatively uniform. The upper 9 to 20 feet of soil consists of clayey sands. These materials are dense and contain appreciable quantities of silt and clay. Below the clayey sands, to the depths drilled, are sands containing significantly less silt and clay. With depth, the silt and clay content in the sand decreases. At a depth of about 25 feet, the sands are relatively clean and fine-grained.

*

Groundwater was encountered at a depth of approximately 26.5 feet below the groundsurface. These depths correspond to elevations[1] of 72.4 to 74.0 feet. Based on this data, it is apparent that groundwater is flowing toward the northwest at a gradient of approximately 1 percent. Groundwater level data recorded in the wells and piezometers is summarized in Table 1.

Free product detected; see p. 13.

---

[1] Assumed datum: The elevation of the PG&E manhole in Martin Luther King, Jr. Way, west of the tank, was assumed to have an elevation of 100 feet.

what is this assumpti based on

Just out-of-the-a round number tha Was convenie to use.

Note: Wells were surveyed in relative to PG&E manhole cover. Water levels corrected according to survey data

TABLE 1. GROUNDWATER ELEVATION DATA

Date	Time	Groundwater Elevation[1] (feet) Well 8	Piezo 9	Piezo 10	Well 11	Well 16
6/30/88	1300	74.28	72.75	71.03	-	-
	1400	74.10	73.02	72.49	-	-
	1430	74.16	73.00	72.37	-	-
7/01/88	0900	74.17	73.60	72.41	-	-
7/05/88	1500	74.03	73.50	72.39	73.10	73.36
7/28/88	1400	73.93	73.43	-	73.01	72.93

---

[1] assumed datum

IV ANALYTICAL TESTING

Groundwater samples from the monitoring wells and selected soil samples from the borings were transmitted to Curtis & Tompkins, Ltd., a laboratory certified by the California Department of Health Services to conduct hazardous waste and water testing. Soil samples from Test Boring 1A were analyzed for total petroleum hydrocarbons (TPH) in accordance with the EPA 8015 test method (sonication). The results indicated the presence of gasoline and not other heavier hydrocarbons. For this reason, all subsequent analyses were performed to check for total volatile hydrocarbons (TVH) in accordance with EPA Method 8015 (purge and trap). The samples were also analyzed for purgeable aromatic compounds in accordance with EPA Method 602. + 8020? Laboratory test reports are presented in the Appendix. The analytical test results for soil samples are summarized in Table 2. Groundwater analysis results are presented in Table 3. In addition, the analytical results for the TPH analyses are presented on Plate 1.

Sonication
extraction
w/ TPH sca
Gas - Des
visib.lt

was the
first
analysis
capable of
detecting
the low +
high boil

The engineering properties of the materials encountered were evaluated by laboratory tests. The testing program included moisture content/dry density determinations, shear strength, grain size distribution, and percent passing a #200 sieve. The grain size distribution tests are presented on Plate 18. The remainder of the test results are presented in the boring logs.

TABLE 2. CONTAMINANT CONCENTRATIONS IN SOIL

SAMPLE[3]	TVH[1] mg/kg[2]	BENZENE mg/kg	TOLUENE mg/kg	TOTAL XYLENES mg/kg	ETHYL BENZENE mg/kg
(Analytical Results for Boring 1A are in Appendix)					
1 @ 16.0	ND[4]	ND	ND	ND	ND
1 @ 21.0	ND	ND	ND	ND	ND
1 @ 25.0	ND	ND	ND	ND	ND
2 @ 16.0	ND	ND	ND	ND	ND
2 @ 21.0	1,810	26.3	42.5	154	24.8
2 @ 25.5	7,530	29.5	447	752	87.9
3 @ 16.0	ND	ND	ND	ND	ND
3 @ 21.0	2,370	15.9	39.2	199	31.0
3 @ 25.5	ND	ND	ND	ND	ND
4 @ 16.0	54	ND	ND	3.0	0.5
4 @ 21.0	6,770	21.9	158	598	101
4 @ 26.0	ND	ND	0.2	ND	ND
6 @ 17.5	ND	ND	ND	ND	ND
6 @ 23.0	ND	ND	ND	ND	ND
6 @ 27.0	ND	ND	ND	ND	ND
7 @ 19.0	ND	ND	ND	ND	ND
7 @ 24.0	987	ND	16	64	12
7 @ 28.5	2,020	32.8	74.6	152	26.5
8 @ 16.0	ND	ND	ND	ND	ND
8 @ 21.0	ND	ND	ND	ND	ND
8 @ 26.0	ND	ND	ND	ND	ND
11 @ 25.0	ND	ND	ND	ND	ND
(Boring 13 abandoned due to obstruction at 4')					
14 @ 19.0	ND	ND	ND	ND	ND
14 @ 22.0	ND	ND	ND	ND	ND
14 @ 25.0	6,710	38.9	324	735	122
15 @ 25.0	ND	ND	ND	ND	ND
16 @ 25.0	7,660	39.3	257	719	117

---

[1] TVH = Total Volatile Hydrocarbons as gasoline

[2] mg/kg = milligrams per kilogram or part per million (ppm)

[3] Boring number and sample depth (feet)

[4] ND = Not detected at concentrations above detection limit; see test reports for detection limits

Borings 9,10 - used to install piezometer pipes; were unsampled

TABLE 3. CONTAMINANT CONCENTRATIONS IN WATER

Sample	TPH[1] (mg/L)[2]	Benzene (ug/L)[3]	Toluene (ug/L)	Total Xylenes (ug/L)	Ethyl Benzene (ug/L)
Well #8	(trace) <10	ND[4]	ND	ND	ND
Well #11	10	1800	ND	1200	ND
Well #16	90	3100	2700	5500	ND

---

[1] TPH = Total Petroleum Hydrocarbons, as gasoline

[2] mg/L = milligrams per liter or parts per million (ppm)

[3] ug/L = micrograms per liter or parts per billion (ppb)

[4] ND = not detected at concentrations above detection limit; see test reports for detection limits

V DISCUSSION AND CONCLUSIONS

Our investigation indicates that detectable concentrations of gasoline and constituents of gasoline i.e., benzene, toluene, xylene and ethylbenzene (BTXE) are present in the soil and groundwater at the site. The source of these chemicals appears to have been the fuel tank removed from the site. Accordingly, an "Underground Storage Tank Unauthorized Release (Leak) Contamination Site Report" should be filed with the ACHCSA. This report was completed by SCI and transmitted to the County on July 7, 1988. To put the contaminant concentration levels into perspective, a brief discussion of current regulatory guidelines applicable to fuel leakage problems is presented below.

A. Regulatory Criteria

Currently, City, County, Regional and State agencies are active in regulating soil and groundwater contamination resulting from leaking fuel storage tanks. The local agency in the Oakland area is the Alameda County Health Care Services Agency. Regionally, the California Regional Water Quality Control Board (RWQCB), the Department of Health Services (DHS) and the Bay Area Air Quality Management District may be involved depending on what type of problems exist.

Formal regulatory criteria for site assessments and remediation of sites where fuel leakage has occurred have not been established. Instead, the RWQCB has developed guidelines for addressing fuel leaks[2]. Specific requirements as to whether or not remediation is necessary, and if so, to what degree, will depend on many factors, such as (1) the extent of soil and groundwater contamination, (2) contaminant concentrations, (3) groundwater hydrology, (4) local climatology, (5) the potential/current beneficial uses of the groundwater that has been contaminated, and (6) whether the problem causes a nuisance or hazardous condition. The response to any problem is generally negotiated with the RWQCB, local regulatory agencies or other appropriate agencies based on site specific factors. A brief summary of current and draft regulatory guidelines is summarized in Table 4.

In practice, an upper level decision value of 1000 ppm for total petroleum hydrocarbons (TPH) has been commonly used to define the extent of removal for fuel contaminated soil. A lower level decision value of 10 ppm is generally only applicable where sensitive groundwater conditions exist. Only draft guidelines have been proposed regarding decision values for BTXE in soil; the draft guidelines have not been formally adopted by the regulatory agencies. The RWQCB generally requires a monitoring well and quarterly groundwater sampling and analysis at sites where greater than 100 ppm of TPH has been detected and left in place. The RWQCB is clear to point out that if future groundwater contamination results from contaminated soil which is

---

[2] Guidelines for Addressing Fuel Leaks, California Regional Water Quality Control Board, San Francisco Region, September 1985.

TABLE 4. SUMMARY OF DRAFT REGULATORY GUIDELINES

Soil Contamination Constituent	Concentration	General Regulatory Guidelines
TPH	<10 ppm[1]	Generally does not constitute a threat to groundwater or cause a nuisance or hazardous condition
TPH	10 to 1000 ppm[1]	May require remediation depending on site specific factors, i.e., threat to groundwater, nuisance or hazardous condition
TPH	>100 ppm[1]	Monitoring well required
TPH	>1000 ppm[1]	Requires remediation under almost all circumstances
BTXE	<0.3 ppm[2]	Generally does not constitute a threat to groundwater
BTXE	>0.3 ppm[2]	May require remediation depending on threat to groundwater
Groundwater Contamination		
TPH	<1/4" thickness[1]	May require remediation if the condition causes a health threat or nuisance
	>1/4" thickness[1] on groundwater	Requires remediation under almost all circumstances
Benzene	>.7 ppb[4]	May require remediation depending on groundwater usage
Toluene	>100 ppb[4]	
Xylene	>620 ppb[4]	
Ethylbenzene	>680 ppb[5]	

TPH = Total Petroleum Hydrocarbons
BTXE = Benzene, Toluene, Xylene and Ethylbenzene
ppm = parts per million (milligrams per kilogram or per liter)
ppb = parts per billion (micrograms per liter)

---

[1] Guidelines for Addressing Fuel Leaks, RWQCB, September 1985

[2] Draft Leaking Underground Fuel Tank (LUFT) Field Manual, July 1987, by State of California LUFT Task Force (not adopted by S.F. Bay Region RWQCB)

[3] Title 22 CAC 66699

[4] DHS drinking water action levels

[5] Federal Drinking Water Criteria

left in place, regardless of which decision values were applied, additional remediation may be required.

B. **Soil Contamination**

The analytical test data indicates that a fuel leak has occurred in the past. Gasoline concentrations in the soil varied up to 7660 mg/kg (ppm) near the tank location. The approximate extent of soil contamination is shown on Plate 1. In many areas, the concentration of gasoline detected in the soil exceeds 1000 ppm. Accordingly, we conclude that some clean up of fuel contaminated soil will likely be required. Based on information generated to date, it appears that soil remediation will be necessary in areas near and northwest of the tank. The analytical tests indicate that in areas more than 10 feet or so from the tank, contamination exists within a zone of soil situated between depths of about 20 and 28 feet. The layer of contaminated soil appears to be only a few feet thick in areas furthest from the tank (e.g. Boring 14). The Boring 14 analytical results suggest that this thin zone of contaminated soil extends beyond the area explored to date. We believe that the thin zone of contamination was created by seasonal variations in groundwater level.

yes

indicat
free
produc
(??)

C. **Groundwater Contamination**

Gasoline and BTX were detected in groundwater as a result of past tank leakage. A thin layer of floating gasoline was detected on the groundwater surface in Well 16. However, floating product was not observed elsewhere. The extent of the

How
thin?
Roughly
1/8 inch
thick, as
measured b
a bailer.
(Not accurat
according t
RWQCB in
Santa Rosa)

contaminated groundwater plume has not been defined by the data generated to date. Dissolved gasoline, as well as benzene and toluene, were detected in Well 11, indicating that impacted groundwater has migrated significant distances from the tank location. Nondetectable concentrations of gasoline were encountered in soil samples from Boring 11; however, gasoline, benzene and toluene were detected in the groundwater at this location.

BTX concentrations in the groundwater significantly exceed DHS action levels for drinking water. However, we judge that the area will likely not be considered a particularly sensitive groundwater area by the RWQCB. Although unconfirmed, we suspect that groundwater in the area is likely not used as a drinking water source. For this reason, we judge that drinking water standards will not be used to establish clean up levels; some less stringent ~~higher~~ standard will likely be applicable. The scope of any groundwater remediation will have to be negotiated with the RWQCB.

D. **Soil/Groundwater Remediation**

It is premature to draw definitive conclusions regarding the need for and the extent of soil and groundwater remediation. Input from the ACHCSA and the RWQCB is necessary before final decisions are made.

its needed

If groundwater cleanup is necessary, we judge that the most appropriate method to do so will involve installing groundwater extraction wells, removing water from the wells by pumping, and treating the contaminated groundwater at a facility utilizing activated carbon filtering or air stripping methods.

also gas/water separation

Soil remediation will be complicated by the fact that (1) the area of contamination has largely affected areas beneath city streets, (2) contamination exists at significant depths below the groundsurface, and (3) major utility installations exist within the streets in the area. These issues will make the removal of contaminated soils relatively difficult and costly. For these reasons, we judge that it will be most appropriate to employ mitigation methods which treat the soil in place (in situ). Several methods are available to do so. The most common alternatives are In Situ Biodegradation (ISB) and In Situ Volatilization (ISV). In brief, the ISB method utilizes special bacteria to consume hydrocarbons in the soil. An enriched solution of bacteria and nutrients is allowed to pass through soil using injection wells and/or infiltration sumps/trenches. The ISV method utilizes a system of wells into which air is injected. A system of extraction wells is used to extract air containing gasoline vapor and other volatile chemicals in the soil. The extracted air is typically discharged to the atmosphere (if appropriate) or treated using activated carbon filtering methods prior to discharge to the atmosphere. The effectiveness of these systems depends significantly on soil conditions. At this time, we have not identified the most appropriate method of soil remediation. However, given the sandy soils at the site, we judge that ISV may prove to be the most

Can use combo.?

→ no

→ yes

cost effective and efficient alternative.

Prior to developing plans for mitigation systems, it will likely be necessary to conduct additional engineering studies to (1) define the lateral and vertical extent of groundwater contamination, (2) characterize the permeability of saturated soils, (3) evaluate the effectiveness of an ISV system, and (4) define the extent of soil contamination in areas not yet explored. Several of these issues should be discussed with the regulatory agencies prior to proceeding with the studies.

List of Attached Plates:

Plate 1	Site Plan
Plate 2 thru 16	Logs of Borings 1 thru 16 (excluding 5 and 12)
Plate 17	Unified Soil Classification System
Plate 18	Particle Size Analysis
Appendix	Laboratory Test Reports

Distribution:

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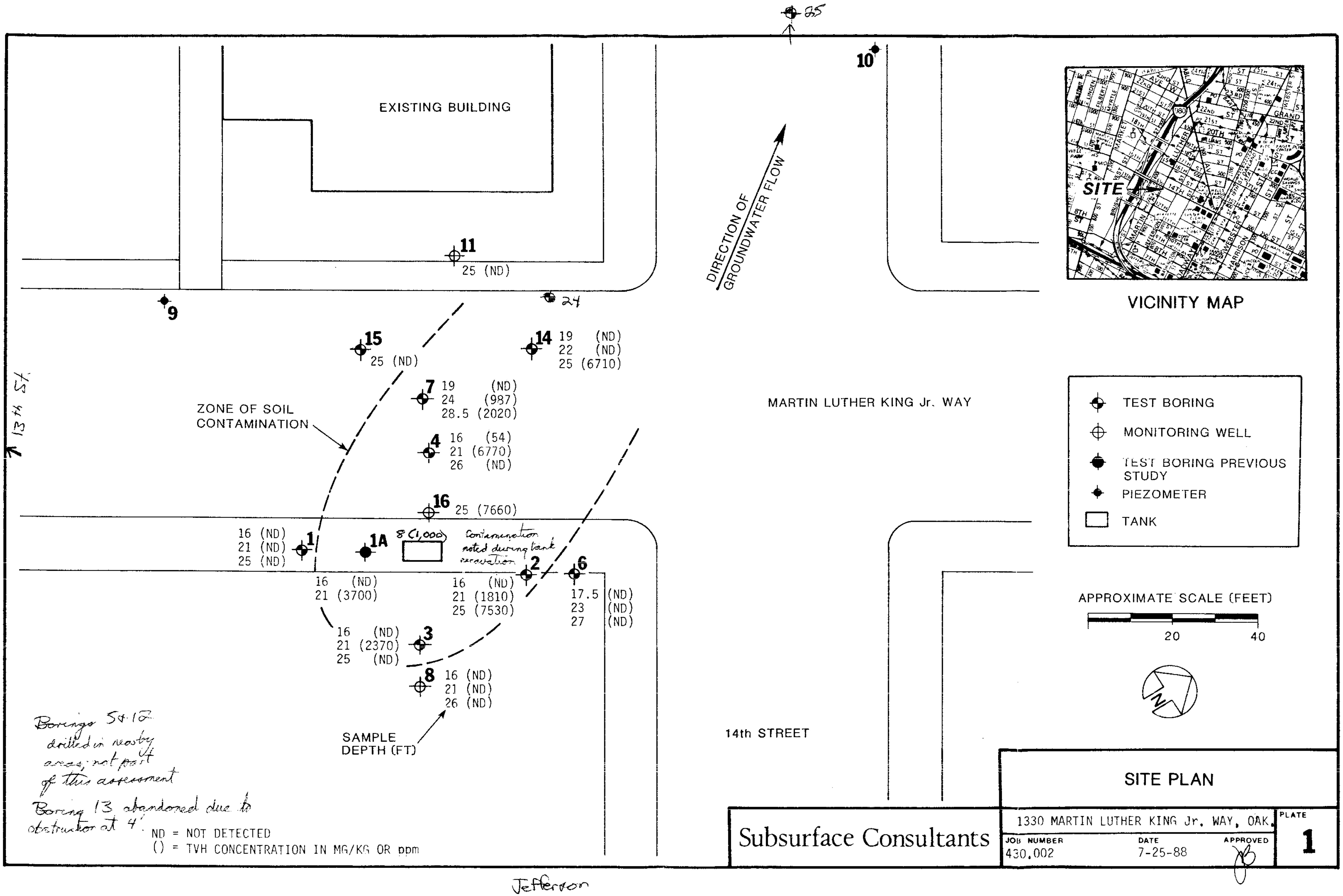


Borings 5 & 12 drilled in nearby areas; not part of this assessment

Boring 13 abandoned due to obstruction at 4'.

ND = NOT DETECTED
() = TVH CONCENTRATION IN MG/KG OR ppm

SITE PLAN

Subsurface Consultants

1330 MARTIN LUTHER KING Jr. WAY, OAK.

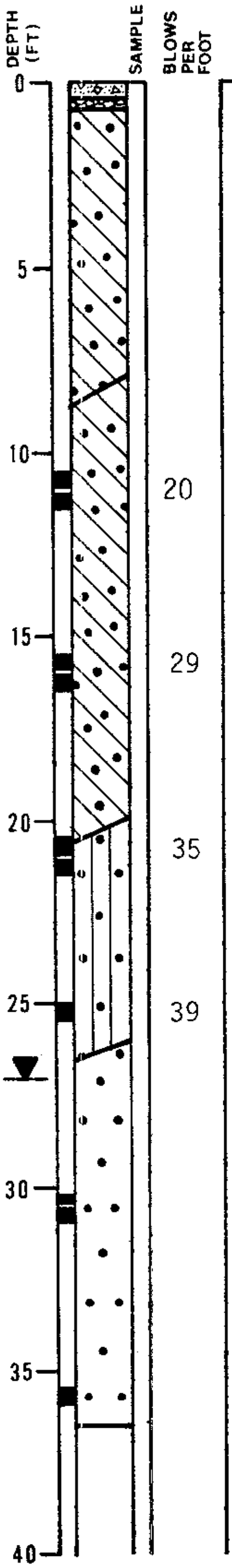
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-25-88		1

LOG OF TEST BORING 1

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6/23/88

ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT	
				6" CONCRETE 3" BASE ROCK BROWN CLAYEY SAND (SC) medium dense, moist
				MOTTLED BROWN CLAYEY SAND (SC) medium dense, moist
UC = 705	14.2	122	20	
			29	
%-200 = 14.0	17.2	98	35	GRAY BROWN SILTY SAND (SM-SP) dense, moist
			39	
				groundwater level 6/23/88
				GRAY BROWN SAND (SP) medium dense, saturated
				boring backfilled with a cement/ bentonite grout upon completion of drilling

UC = UNCONFINED COMPRESSIVE SHEAR STRENGTH

%-200 = % PASSING #200 SIEVE (0.074mm)

SAMPLE TYPE:

CALIFORNIA DRIVE SAMPLE
O.D.: 2.5 INCHES
I.D.: 2.0 INCHES

HAMMER WEIGHT: 140 POUNDS
HAMMER DROP : 30 INCHES

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1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		2

Drilled before tank removed

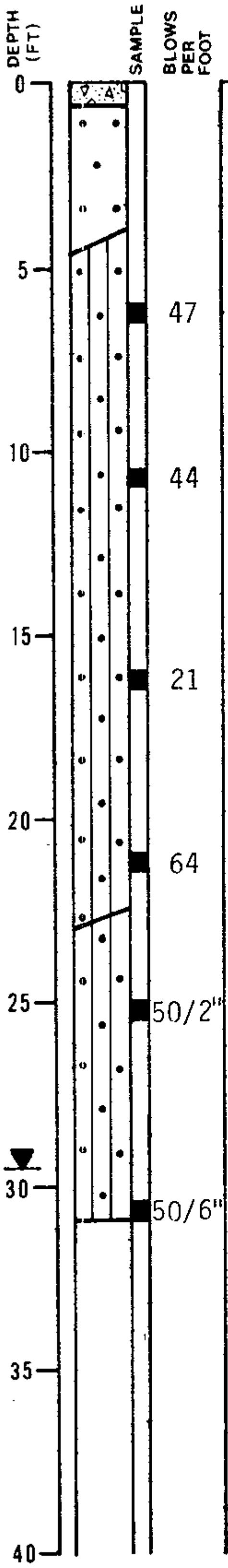
LOG OF TEST BORING 1A

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-6-88

ELEVATION --

LABORATORY TESTS | MOISTURE CONTENT % | DRY DENSITY (PCF)



6" CONCRETE SLAB

BROWN SAND (SP)
loose, moist (fill)

BROWN SILTY SAND (SM)
dense, moist

becomes very dense, gasoline odor noted

GREY BROWN SILTY SAND (SM/SP)
very dense, moist

groundwater level during drilling

boring backfilled with cement/ bentonite grout

Subsurface Consultants

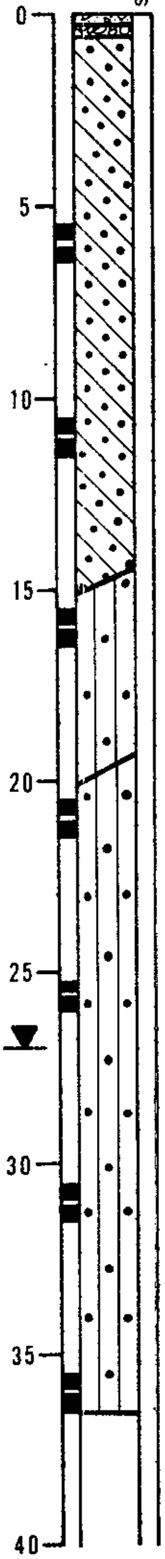
1330 MARTIN LUTHER KING JR. WAY

JOB NUMBER	DATE	APPROVED
430.001	6/30/88	

PLATE
3

LOG OF TEST BORING 2

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION ——



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	DEPTH (FT)	BLOWS PER FOOT	
			0		3" THICK CONCRETE 3" BASE ROCK BROWN CLAYEY SAND (SC) medium dense to dense, moist
			5	26	
					becomes mottled brown and gray below 9'
UC = 1021	13.7	121	10	35	
			15	31	BROWN SILTY SAND (SM) dense, moist
					interbedded with some clayey sand
%-200 = 15.4	16.0	106	20	27	BROWN SILTY SAND (SM) medium dense to dense, moist
%-200 = 26.6			25	20	
			▼		groundwater level 30 minutes after drilling
			30	36	
			35		boring backfilled with cement/bentonite grout upon completion of drilling
			40		

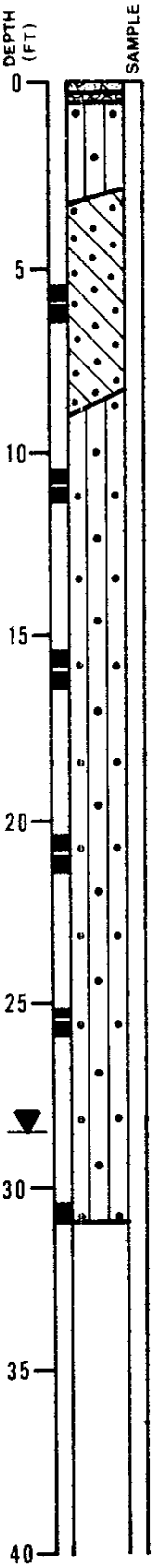
Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		4

LOG OF TEST BORING 3

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6/23/88
ELEVATION ——



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
			27
%-200 = 37.3	12.9	118	33
%-200 = 18.3			29
%-200 = 13.5	17.0	105	29
			30
			16

3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM)
loose, moist, with numerous pieces of glass, brick, etc. (fill)

BROWN CLAYEY SAND (SC)
dense, moist

BROWN SILTY SAND (SM)
dense, moist

groundwater level 6/23/88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002
DATE 6/29/88
APPROVED

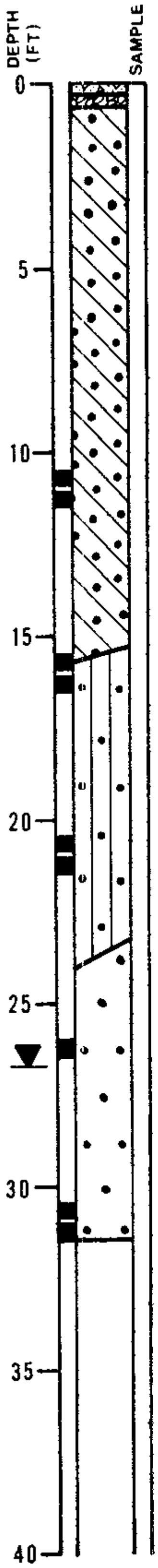
PLATE 5

LOG OF TEST BORING 4

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6/23/88

ELEVATION --



LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)	BLOWS PER FOOT
UC = 1329	13.1	123	32
			25
%-200 = 22.5	16.9	99	25
			17
			17

4" ASPHALTIC CONCRETE
3" BASE ROCK

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray brown below 8'

GRAY BROWN SILTY SAND (SM)
dense, moist

GRAY BROWN SAND (SP)
medium dense, saturated

groundwater level 6/24/88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002

DATE 6/29/88

APPROVED

PLATE 6

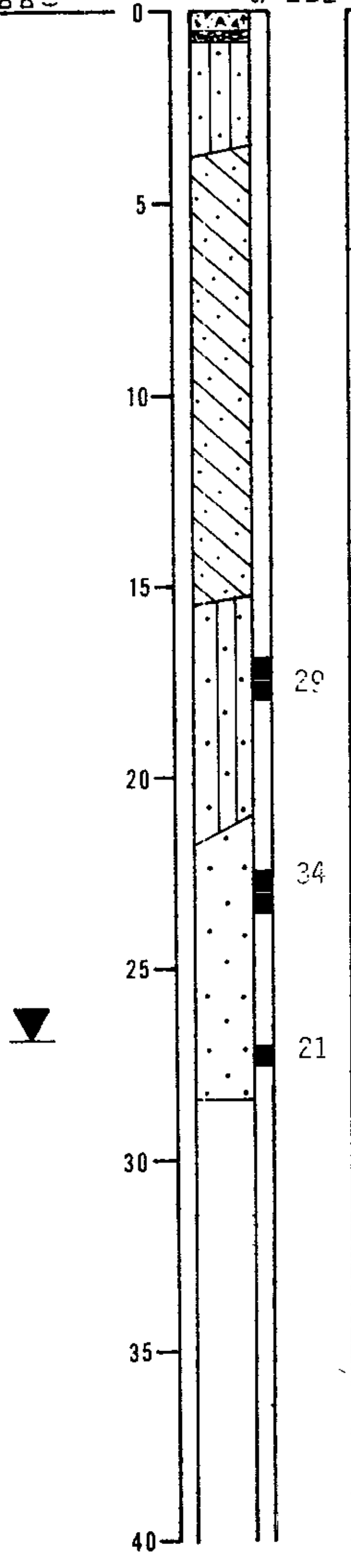
LOG OF TEST BORING 6

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-24-88

ELEVATION --

LABORATORY TESTS | **MOISTURE CONTENT %** | **DRY DENSITY (PCF)** | **DEPTH (FT)** | **SAMPLE** | **BLOWS PER FOOT**



6" CONCRETE

3" BASE ROCK

DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)

BROWN SILTY CLAYEY SAND (SC)
medium dense, moist

color change to mottled brown and gray below 10 feet

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

BROWN SAND (SP)
medium dense to dense, moist

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

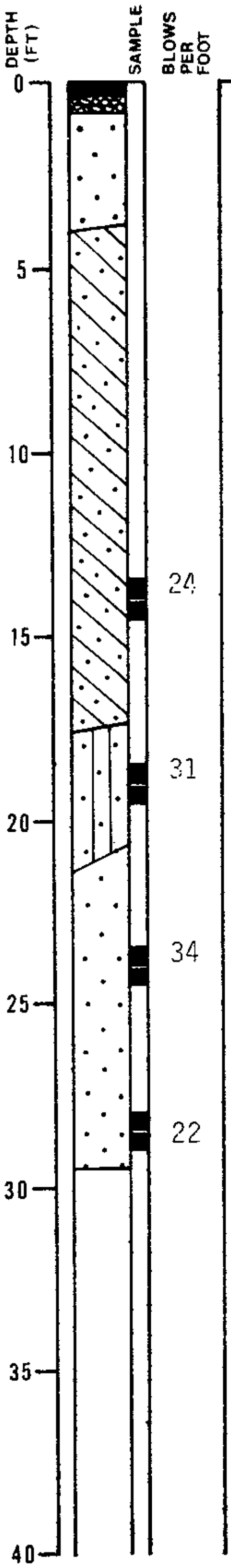
Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK	PLATE 7
	JOB NUMBER 430.002 · DATE 7-11-88 · APPROVED	

LOG OF TEST BORING 7

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 25.5	14.4	183
%-200 = 5.6	12.4	104

▼



4" ASPHALTIC CONCRETE
6" BASE ROCK
BROWN SAND (SP)
medium dense, moist (fill)

BROWN CLAYEY SAND (SC)
medium dense, moist

color change to mottled gray and brown below 8 feet

GRAY BROWN SILTY SAND (SM)
dense, moist, fine grained

BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL 6-24-88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

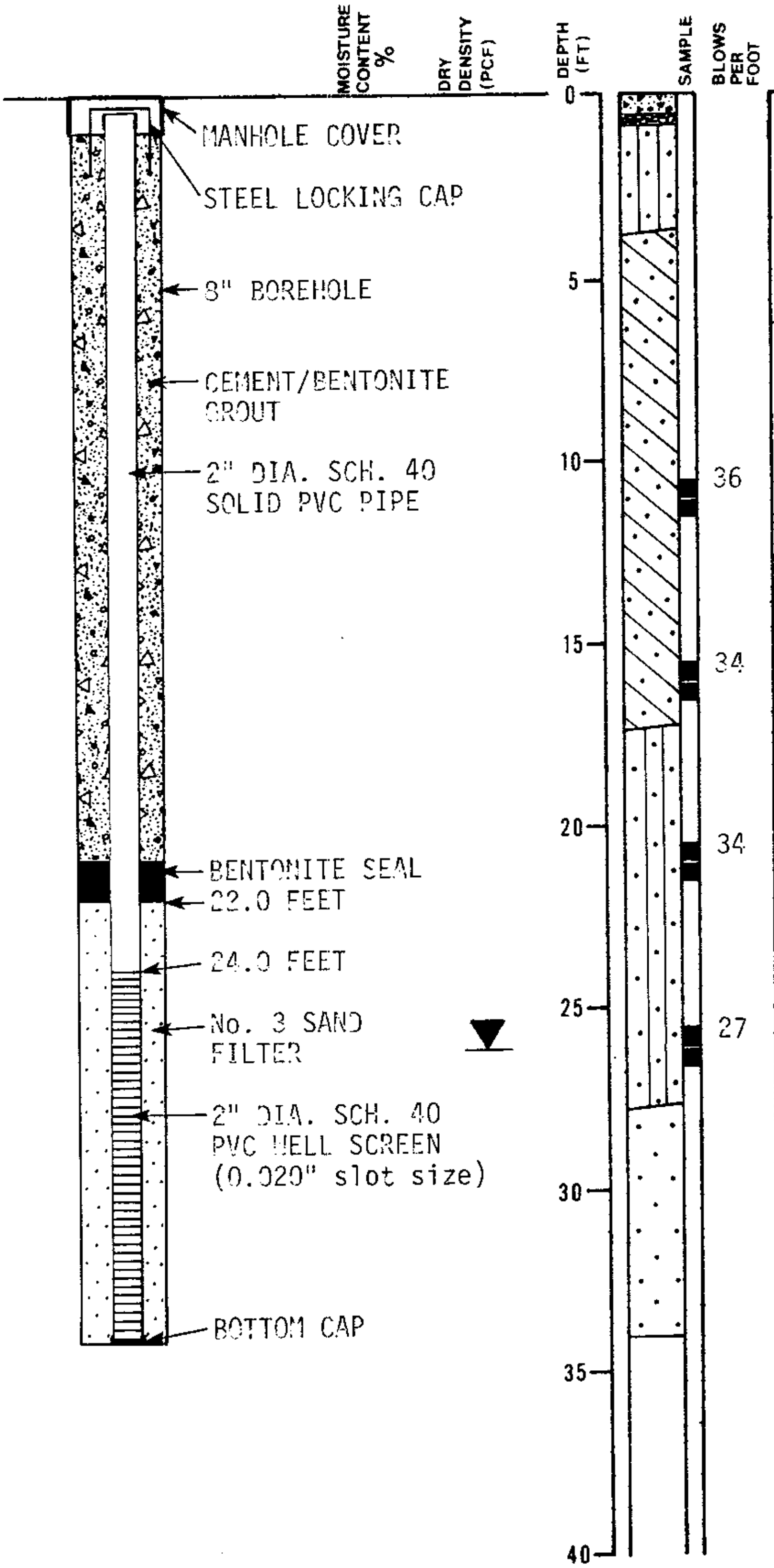
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002
DATE 7-11-88
APPROVED

PLATE 8

LOG OF TEST BORING 8

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-24-88
ELEVATION --



6" CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist with numerous pieces of glass and brick (fill)
BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SILTY SAND (SM)
medium dense, moist, fine grained

GROUNDWATER LEVEL 6-30-88

BROWN SAND (SP)
medium dense to dense, saturated, fine grained

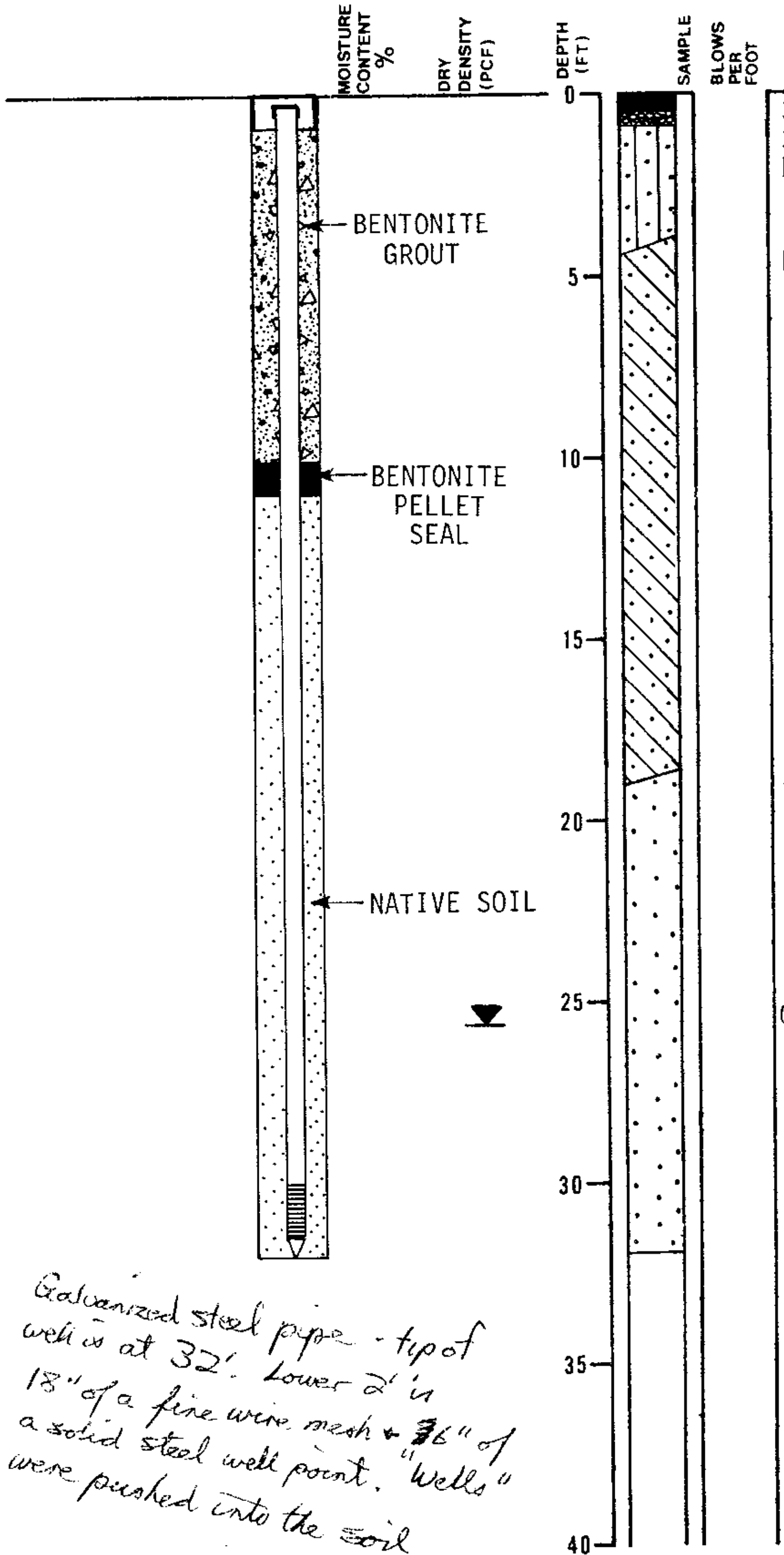
Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.			PLATE
	JOB NUMBER 430.002	DATE 7-11-88	APPROVED	9

LOG OF TEST BORING 9 Piezometer

EQUIPMENT 8" Hollow Stem

DATE DRILLED 6-30-88

ELEVATION --



3" ASPHALT CONCRETE
3" BASE ROCK
BROWN SILTY SAND (SM)
medium dense to dense, moist, fine grained
BROWN CLAYEY SAND (SC)
dense, moist

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 6-30-88

Galvanized steel pipe - tip of well is at 32'. Lower 2' is 18" of a fine wire mesh + ~~3~~6" of a solid steel well point. "Wells" were pushed into the soil.

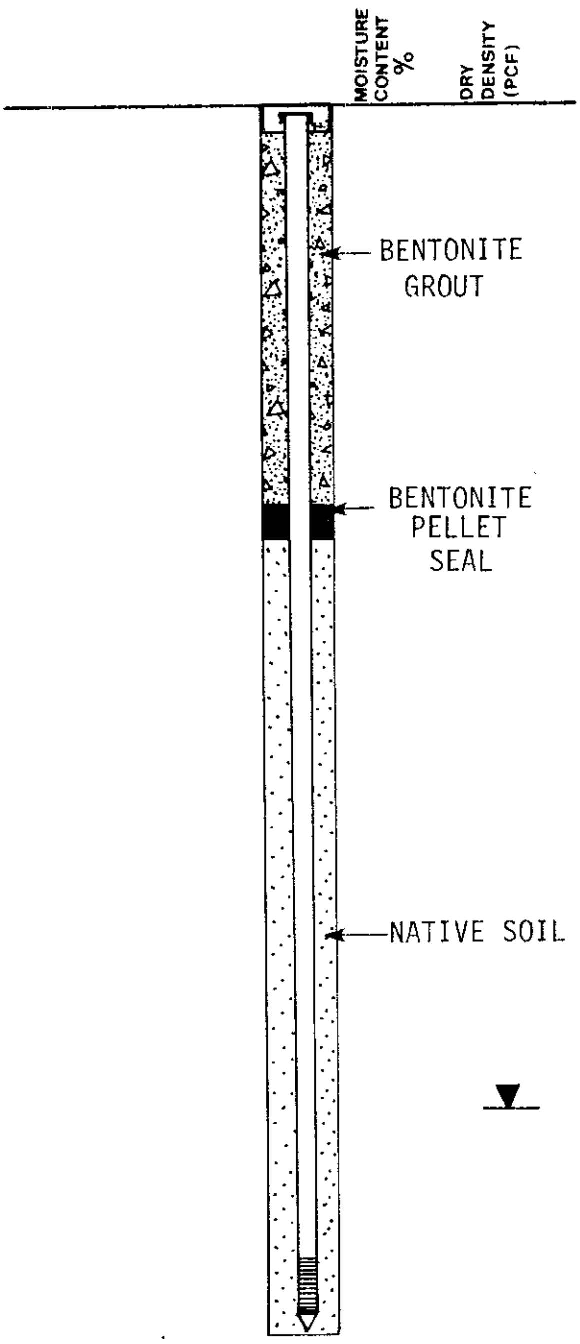
Subsurface Consultants

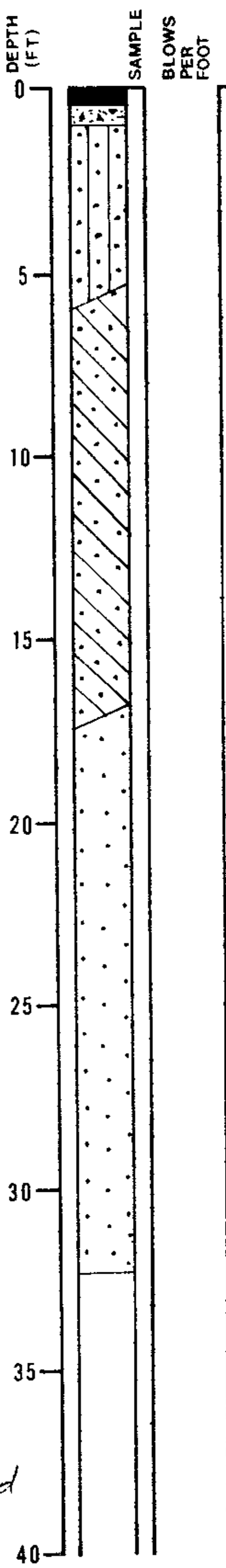
1330 MARTIN LUTHER KING Jr. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88		10

LOG OF TEST BORING 10 Piezometer

EQUIPMENT 8" Hollow Stem
DATE DRILLED 6-30-88
ELEVATION --





3" ASPHALT CONCRETE
4" CONCRETE
BROWN SILTY SAND (SM)
mediun dense, moist, fine grained

BROWN CLAYEY SAND (SC)
dense, moist, fine grained

BROWN SAND (SP)
very dense, moist, fine grained

GROUNDWATER LEVEL 6-30-88
measured during drilling

Galvanized steel pipe - tip of well is at 32'. Lower 2' is 18" of a fine wire mesh + 6" of a solid steel well point. "Wells" pushed into the soil.

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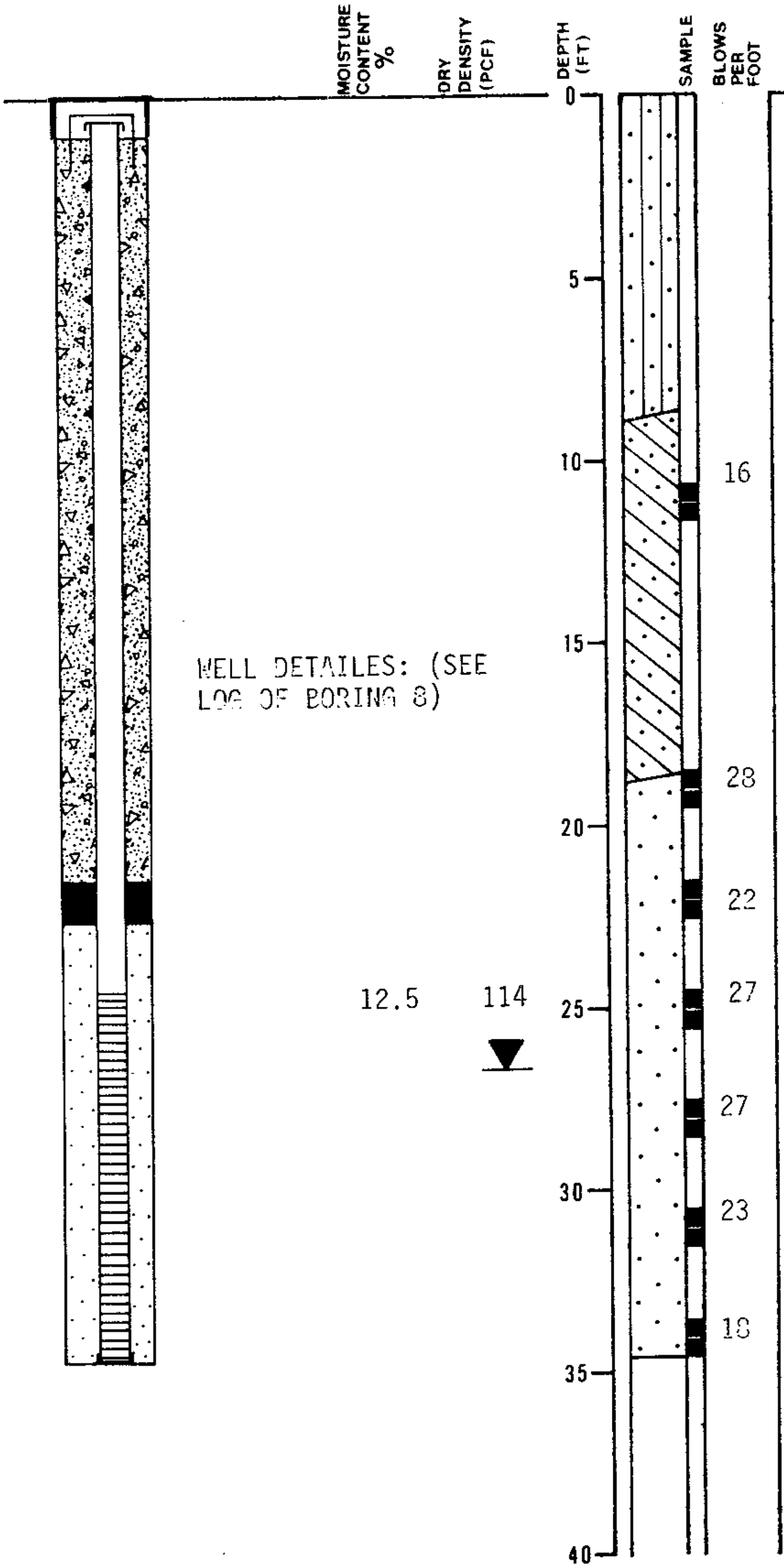
JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88	JB	11

LOG OF TEST BORING 11

EQUIPMENT 8" Hollow stem
DATE DRILLED 6-30-88
ELEVATION --



WELL DETAILES: (SEE LOG OF BORING 8)

BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED GRAY AND BROWN CLAYEY SAND (SC)
medium dense, moist

GRAY BROWN SAND (SP)
medium dense, moist, fine grained

GROUNDWATER LEVEL 7-5-88

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JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		12

LOG OF TEST BORING 13

LABORATORY TESTS

MOISTURE CONTENT %

DRY DENSITY (PCF)

DEPTH (FT)

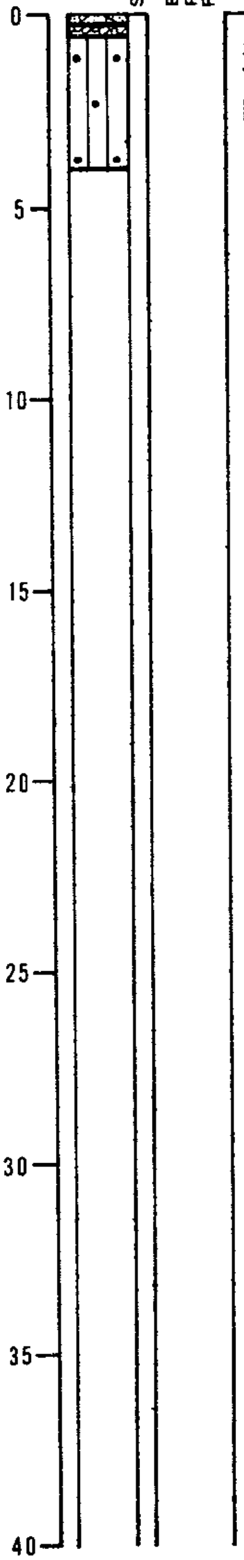
SAMPLE

BLOWS PER FOOT

EQUIPMENT

DATE DRILLED

ELEVATION



3" CONCRETE
3" BASE ROCK

DARK BROWN SILTY SAND (SM)
medium dense, moist, with numerous bricks, pebbles and debris (fill)

hit obstruction, boring terminated at 4.0 feet

Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER 430.002

DATE 7/14/88

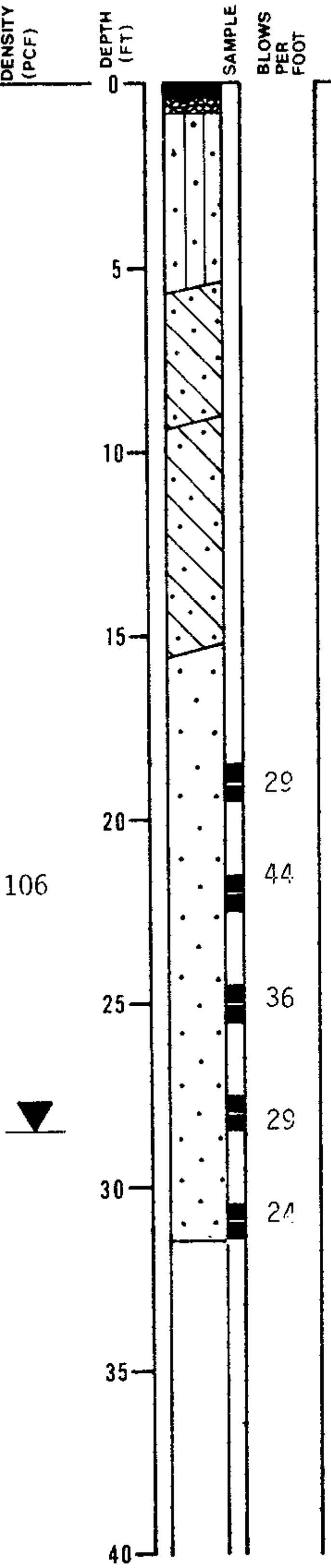
APPROVED

PLATE 13

LOG OF TEST BORING 14

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 7.2	10.8	106
%-200 = 5.9		



4" ASPHALTIC CONCRETE
4" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

MOTTLED OLIVE GREEN AND BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN CLAYEY SAND (SC)
medium dense, moist

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER LEVEL 7-1-88

boring backfilled with a cement/bentonite grout upon completion of drilling

Subsurface Consultants

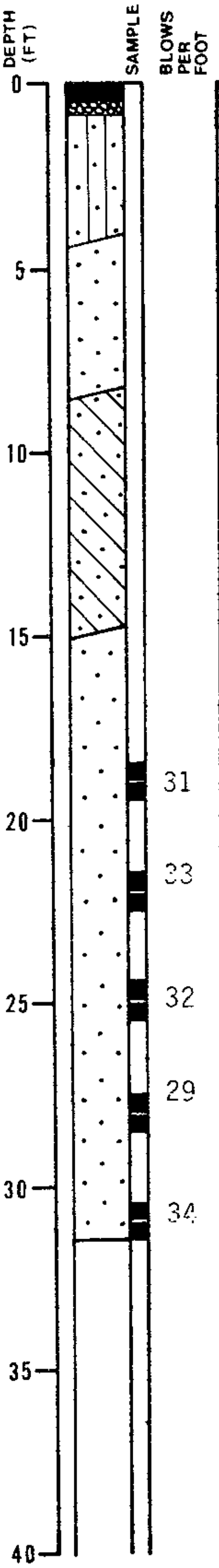
1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		14

LOG OF TEST BORING 15

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-83
ELEVATION --

LABORATORY TESTS	MOISTURE CONTENT %	DRY DENSITY (PCF)
%-200 = 7.2		
	12.5	114
		▼



4" ASPHALTIC CONCRETE
4" BASE ROCK
BROWN SILTY SAND (SM)
medium dense, moist (fill)

GRAY BROWN SAND (SP)
medium dense, moist, fine grained

DARK GRAY BROWN CLAYEY SAND (SC)
medium dense, moist
color change to brown below 10 feet

BROWN SAND (SP)
dense, moist, fine grained

color change to gray brown below 20 feet

GROUNDWATER LEVEL 7-1-83
color change to brown below 26 feet

boring backfilled with a cement/bentonite grout upon completion of drilling

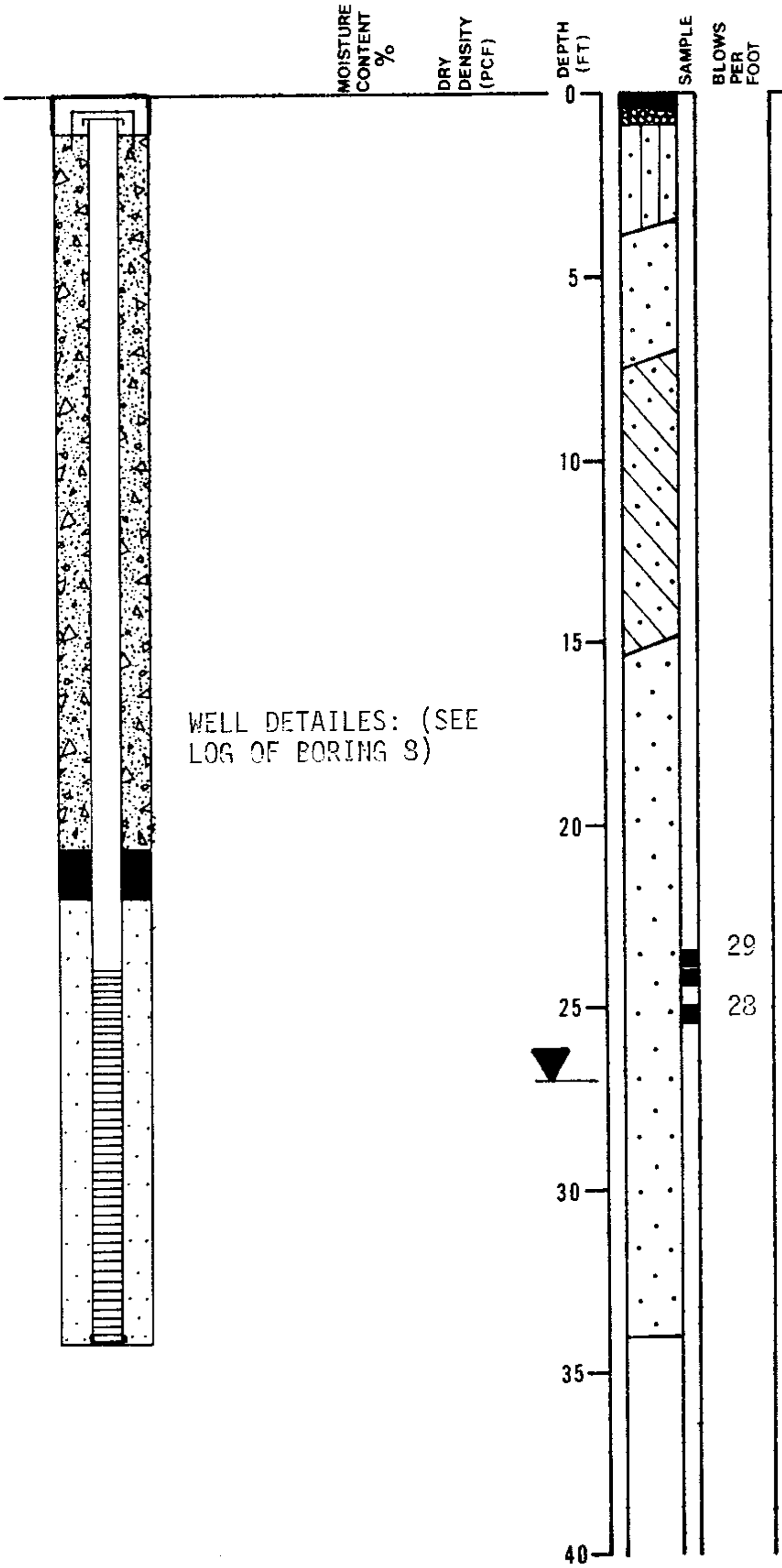
Subsurface Consultants

1330 MARTIN LUTHER KING, JR. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-11-88		**15**

LOG OF TEST BORING 16

EQUIPMENT 8" Hollow Stem
DATE DRILLED 7-1-88
ELEVATION --



WELL DETAILES: (SEE LOG OF BORING 8)

4" ASPHALT CONCRETE
3" BASE ROCK
DARK BROWN SILTY SAND (SM)
medium dense, moist (fill)

BROWN SAND (SP)
medium dense, moist
fine grained

BROWN CLAYEY SAND (SC)
medium dense, moist

becomes mottled gray and brown below 12 feet

GRAY BROWN SAND (SP)
dense, moist, fine grained

GROUNDWATER LEVEL MEASURED 7-1-88

Subsurface Consultants	1330 MARTIN LUTHER KING, JR. WAY, OAK.			**PLATE**
	JOB NUMBER 430.002	**DATE** 7-11-88	**APPROVED**	**16**

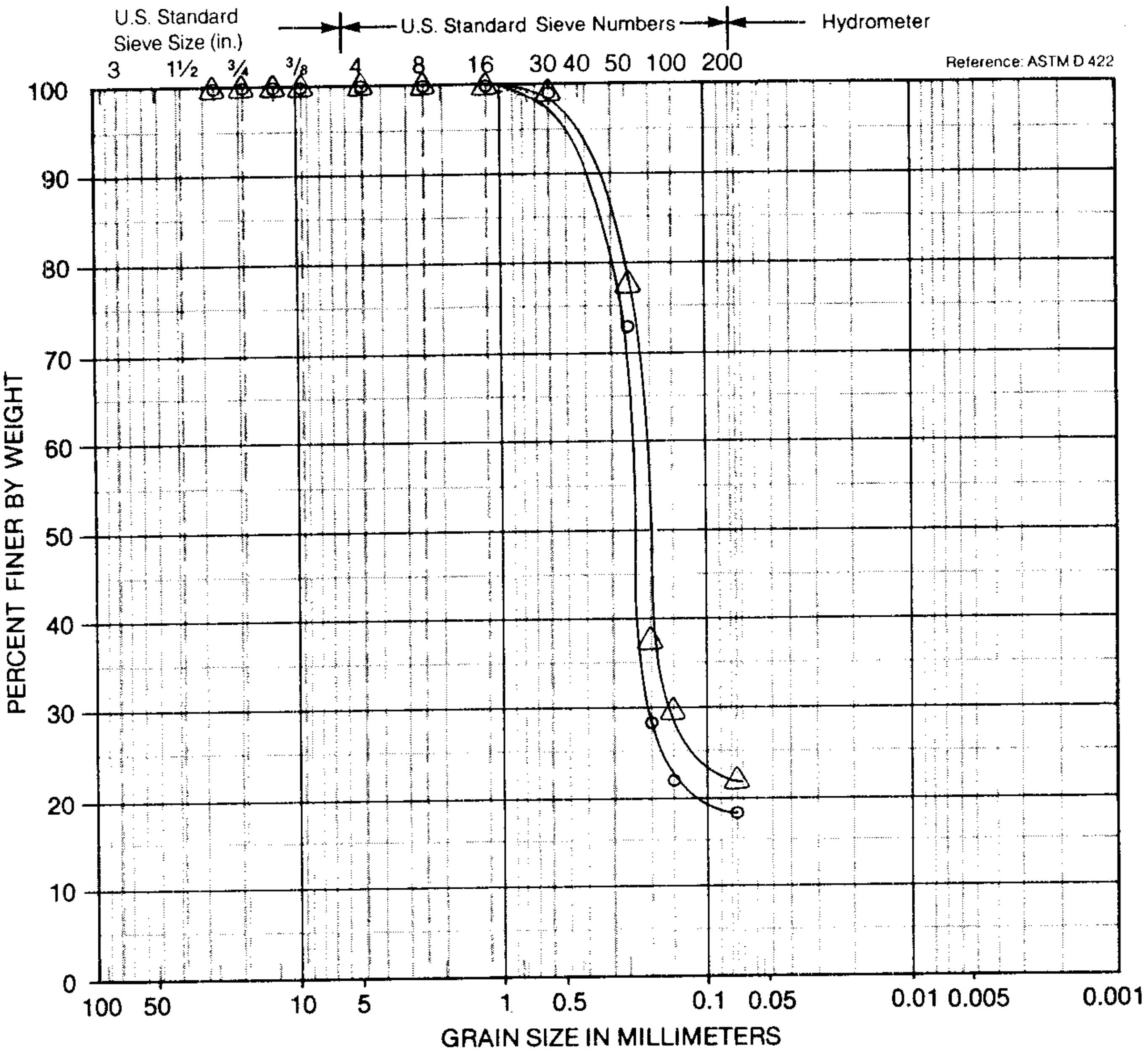
GENERAL SOIL CATEGORIES			SYMBOLS	TYPICAL SOIL TYPES
COARSE GRAINED SOILS More than half is larger than No. 200 sieve	**GRAVEL** More than half coarse fraction is larger than No. 4 sieve size	Clean Gravel with little or no fines	GW	Well Graded Gravel, Gravel-Sand Mixtures
			GP	Poorly Graded Gravel, Gravel-Sand Mixtures
		Gravel with more than 12% fines	GM	Silty Gravel, Poorly Graded Gravel-Sand-Silt Mixtures
			GC	Clayey Gravel, Poorly Graded Gravel-Sand-Clay Mixtures
	SAND More than half coarse fraction is smaller than No. 4 sieve size	Clean sand with little or no fines	SW	Well Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sand with more than 12% fines	SM	Silty Sand, Poorly Graded Sand-Silt Mixtures
			SC	Clayey Sand, Poorly Graded Sand-Clay Mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 sieve	**SILT AND CLAY** Liquid Limit Less than 50%		ML	Inorganic Silt and Very Fine Sand, Rock Flour, Silty or Clayey Fine Sand, or Clayey Silt with Slight Plasticity
			CL	Inorganic Clay of Low to Medium Plasticity, Gravelly Clay, Sandy Clay, Silty Clay, Lean Clay
			OL	Organic Clay and Organic Silty Clay of Low Plasticity
	SILT AND CLAY Liquid Limit Greater than 50%		MH	Inorganic Silt, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silt
			CH	Inorganic Clay of High Plasticity, Fat Clay
			OH	Organic Clay of Medium to High Plasticity, Organic Silt
HIGHLY ORGANIC SOILS			PT	Peat and Other Highly Organic Soils

UNIFIED SOIL CLASSIFICATION SYSTEM

1330 MARTIN LUTHER KING, JR. WAY, OAK.

Subsurface Consultants

JOB NUMBER	DATE	APPROVED	PLATE
430.002	6/29/88		17



COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT OR CLAY
	GRAVEL		SAND			

Symbol	Sample Source	Classification
○	BORING 3 @ 15.5	BROWN SILTY SAND (SM)
△	BORING 4 @ 20.5	GRAY SILTY SAND (SM)

PARTICLE SIZE ANALYSIS

Subsurface Consultants

1330 MARTIN LUTHER KING jr. WAY, OAK.

JOB NUMBER	DATE	APPROVED	PLATE
430.002	7-28-88		**18**

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

LABORATORY NUMBER: 14984A
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 1 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-1	1 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-2	1 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-3	1 @ 25.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-4	2 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-5	2 @ 21.0	1,810	26.3	42.5	154	24.8
14984-6	2 @ 25.5	7,530	29.5	447	752	87.9
14984-7	3 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-8	3 @ 21.0	2,370	15.9	39.2	199	31.0
14984-9	3 @ 25.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 14984
CLIENT: SUBSUFACE CONSULTANTS
JOB NUMBER: 430.002
PROJECT: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 07-12-88
DATE REPORTED: 07-12-88
PAGE 2 OF 2

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14984-10	4 @ 16.0	54.0	ND(0.1)	ND(0.1)	3.0	0.5
14984-11	4 @ 21.0	6,770	21.9	158	598	101
14984-12	4 @ 26.0	ND(10)	ND(0.1)	0.2	ND(0.1)	ND(0.1)
14984-13	6 @ 17.5	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-14	6 @ 23.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-15	6 @ 27.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-16	7 @ 19.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-17	7 @ 28.5	2,020	32.8	74.6	152	26.5
14984-18	8 @ 16.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-19	8 @ 21.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
14984-20	8 @ 26.0	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)

ND = None Detected; Limit of Detection is Indicated in Parentheses.

QA/QC SUMMARY

	%RPD	%RECOVERY
TVH	9	94
TOLUENE	9	75
TOTAL XYLENES	7	73
ETHYL BENZENE	6	72

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

LABORATORY NUMBER: 14983
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY FUEL TANK

DATE RECEIVED: 06-27-88
DATE ANALYZED: 06-28-88
DATE REPORTED: 06-29-88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
14983-1	7 @ 24.0	987	ND(1)	16	64	12

QA/QC SUMMARY

%RPD	<1
%RECOVERY	81

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15050
CLIENT: SUBSURFACE CONSULTANTS
JOB NUMBER: 430.002
JOB LOCATION: ML KING JR. WAY, FUEL TANK

DATE RECEIVED: 07/05/88
DATE EXTRACTED: 07/12/88
DATE ANALYZED: 07/15/88
DATE REPORTED: 07/18/88

Total Volatile Hydrocarbons (TVH) by EPA 8015
Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	TOTAL XYLENES (mg/kg)	ETHYL BENZENE (mg/kg)
15050-1	11@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-2	12@ 23.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-3	14@ 19.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-4	14@ 22.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-5	14@ 25.0'	6,710	38.9	324	735	122
15050-6	15@ 25.0'	ND(10)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
15050-7	16@ 25.0'	7,660	39.3	257	719	117

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

%RPD	4	--	3	1	1
%RECOVERY	--	93	96	95	91

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-08-88
DATE REPORTED: 07-20-88
PAGE 1 OF 4

Total Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
15066-1	WELL #8	TRACE	ND(0.05)	ND(0.05)
15066-2	WELL #11	10	ND(0.05)	ND(0.05)
15066-3	WELL #16	90	ND(0.05)	ND(0.05)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	7
Spike: % Recovery	112

LABORATORY DIRECTOR

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

LABORATORY NUMBER: 15066-1
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #8

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

LABORATORY NUMBER: 15066-2
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #11

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	1,800	100
Toluene	ND	100
Ethyl Benzene	ND	100
Total Xylenes	1,200	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

LABORATORY NUMBER: 15066-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.002
PROJECT: ML KING JR. WAY TANK
CLIENT ID: WELL #16

DATE RECEIVED: 07-06-88
DATE ANALYZED: 07-19-88
DATE REPORTED: 07-20-88
PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	3,100	100
Toluene	2,700	100
Ethyl Benzene	ND	100
Total Xylenes	5,500	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

SPIKE RECOVERY %	106

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

JOB NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-22-88
DATE REPORTED: 07-01-88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
14932-1	1,000	ND(10)	ND(10)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	21
Spike: % Recovery	87

Laboratory Director

LABORATORY NUMBER: 14932
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001
PROJECT: MLK JR. TANK
SAMPLE ID: FILL END OF TANK

DATE RECEIVED: 06-20-88
DATE ANALYZED: 06-30-88
DATE REPORTED: 07-01-88
PAGE 2 OF 2

EPA 8020: Volatile Aromatic Hydrocarbons in Soils & Wastes
Extraction Method: EPA 5030 - Purge & Trap

COMPOUND	Result ug/Kg	LOD ug/Kg
Benzene	790	100
Toluene	1,200	500
Ethyl Benzene	7,300	100
Total Xylenes	38,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	6
Average Spike Recovery %	89

BORING 1A

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

JOB NUMBER: 14810
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK

DATE RECEIVED: 06/07/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 1 OF 2

Results of Analysis for Petroleum Hydrocarbons in Soils and Wastes

Method References: TPH: Total Petroleum Hydrocarbons, EPA 3550/8015

LAB ID	SAMPLE ID	GASOLINE (mg/Kg)	KEROSINE (mg/Kg)	DIESEL (mg/Kg)
	Sample 1A			
14810-1	1 @ 16'	ND(10)	ND(10)	ND(10)
14810-2	1 @ 21'	3,700	ND(10)	ND(10)

		GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)
14810-3	BORING 1	68	ND(10)	ND(10)

ND = NONE DETECTED. LIMIT OF DETECTION IS INDICATED IN PARENTHESES.

QA/QC SUMMARY

Duplicate: Relative % Difference	4
Spike: % Recovery	112

Laboratory Director

BORING 1A

LABORATORY NUMBER: 14810-3
CLIENT: SUBSURFACE CONSULTANTS
JOB #: 430.001, BRAMALEA PACIFIC TANK
SAMPLE ID: BORING 1

DATE RECEIVED: 06/08/88
DATE ANALYZED: 06/07/88
DATE REPORTED: 06/13/88
PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	4,200	100
Toluene	4,800	500
Ethyl Benzene	1,700	100
Total Xylenes	12,000	100
Chlorobenzene	ND	100
1,4-Dichlorobenzene	ND	100
1,3-Dichlorobenzene	ND	100
1,2-Dichlorobenzene	ND	100

ND = None Detected

QA/QC SUMMARY

%RPD	4
%RECOVERY	118

June 14, 88

6-14-88

■ Subsurface Consultants, Inc.

SITE SAFETY PLAN
TANK REMOVAL
1330 MARTIN LUTHER KING JR. WAY
OAKLAND, CALIFORNIA
SCI 430.001

Prepared for:

Ms. Lois Parr
City of Oakland
Office of Economic Development
 and Employment
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June 14, 1988

I INTRODUCTION

This Site Safety Plan has been prepared to outline the minimum standards regarding hazardous conditions which should be applied to the site. This plan will be followed by the City of Oakland during their involvement in the project. The contractor will be responsible for the preparation and implementation of a Health and Safety Plan for his/her own personnel.

One underground gasoline storage tank is currently situated below the sidewalk adjacent to the west side of Martin Luther King Jr. Way, between 13th and 14th Streets, in Oakland, California. The tank is reportedly 8 feet long and 4 feet in diameter, and has a capacity of 550 gallons. The bottom of the tank is approximately 7 feet below the sidewalk grade.

A preliminary investigation of the tank site was conducted by Subsurface Consultants, Inc. (SCI) on June 6, 1988. The investigation consisted of drilling and sampling one test boring adjacent to the tank. Two samples and a grab groundwater sample from the test boring were analyzed for total petroleum hydrocarbons (TPH); the groundwater sample was also analyzed for benzene, toluene, xylene and ethylbenzene (BTXE). The analyses indicated that soil and water near the tank contain significant concentrations of TPH and BTXE.

Presently, an adjacent building is being demolished and the property owner, Oakland Redevelopment Agency, is requesting that the tank be removed. Since the contractor has demolition crews and equipment currently on-site it would be most cost effective to remove the tank and backfill the excavation at this time. SCI will characterize the site by identifying the horizontal and lateral extent of contamination and the impact of contamination on the groundwater after demolition activities have ceased. Analytical tests will be performed to monitor the remediation during a subsequent phase of work.

Must collect min. one sample at time tank removal

This plan outlines a personnel and work site safety program to minimize the risks of endangering surrounding personnel and/or property.

II HEALTH AND SAFETY CONSIDERATIONS

A. Key Personnel

Health and Safety Officer

SCI will designate a Health and Safety Officer who will be responsible for planning, implementing and auditing the health and safety program for the project.

Who?

B. Hazardous Substance Description

Light petroleum hydrocarbons (gasoline), including BTX&E have been detected in the soil and groundwater at the site. The range of concentrations that have been measured at the site is presented in the following table.

Material	**Concentration (ppm=mg/L)**
Soil:	
TPH(as gasoline)	0 - 3700
Water:	
Benzene	4.2
Toluene	4.8
Ethylbenzene	1.7
Xylene	12
TPH (as gasoline)	68

C. Chemical Distribution

Gasoline was encountered by SCI in the soil above the groundwater level. The gasoline concentrations are likely to be greatest adjacent to the existing tanks, becoming less with distance from the tanks.

D. Chemical Hazards

Potential chemical hazards include skin and eye contact and inhalation or exposure to potentially toxic concentrations of chemical vapors. The identified toxic compounds that exist at the site are listed below with descriptions of specific effects of each. The list includes the main toxic constituents of gasoline (Benzene, Toluene, Xylene and Ethylbenzene).

1. Benzene

a. Characteristics:

Clear, colorless, highly flammable liquid with characteristic odor

b. **High exposure levels may cause:**

Acute restlessness, convulsions, depression, respiratory failure, suspected carcinogen

c. **Permissible exposure level in air (PEL) for a time weighted average (TWA) over an eight hour period:**

TLV= 10 ppm (PEL = 1 ppm)

2. Toluene

a. **Characteristics:**

Refractive, flammable liquid with benzene-like odor

b. **High exposure levels may cause:**

Headache, nausea, eye irritation, mild macrocytic anemia, but not leukopenia (less toxic than benzene)

c. **PEL for an 8-hour TWA:**

PEL= 200 ppm TLV= 100

3. Xylene

a. **Characteristics:** Clear, mobile, flammable liquid

b. **High exposure levels may cause:** severe eye irritation, skin irritation, narcosis

c. **PEL for an 8-hour TWA:** 100 ppm TLV= 100

4. Ethylbenzene

a. **Characteristics:**

Colorless liquid, aromatic odor, highly flammable

b. **High exposure levels may cause:**

Skin, nose and eye irritation, dizziness, ataxia, loss of consciousness and respiratory failure

c. **PEL for and 8-hour TWA:** 100 ppm

E. Physical Hazards

Other on-site hazards may include physical injuries due to the proximity of workers to engine-driven heavy equipment and tools. Heavy equipment used during excavation will likely include a backhoe. Only trained personnel will operate machines, tools, and equipment; all of which will be kept clean and in good repair. Safety apparel required around heavy equipment will include a hard hat and hard tip shoes.

The perimeter of the excavation will be shored and/or sloped to create acceptable stable temporary cut slopes. All work will be performed in accordance with OSHA guidelines.

only needed if anyo enters excavatio >5' deep

III WORK PLAN INSTRUCTIONS

A. Level of Protection

Regular surveys of the site and knowledge of the anticipated hazards will determine the level of protection and the proper safety procedures to be employed. The workers coming into contact with the excavated materials will wear hard tip boots, disposable latex gloves and a hard hat. (Level D)

The level of protection for personnel working in the area will be upgraded if organic vapor levels exceed 0.5 ppm above background levels continuously for more than 5 minutes. In this event, personnel protective equipment will include double cartridge respirators for organic vapors, tyvex coveralls, gloves, hard hat with safety shield or safety glasses and hard

Level C

full face or half fac

Full face PF=100
Half, quarter face PF=10

tip boots.

B. Combustible Gas and Organic Vapor Monitoring

SCI will monitor ambient levels of combustible gas vapors using a Gastech Hydrocarbon Supersurveyor, Model 1314 and a portable Photo-Ionization Detector (PID). The Health and Safety Officer will be notified if combustible gas vapor levels exceed ambient concentrations in the samples. Excavation will cease, equipment will be shut down, and personnel will withdraw from the area if either (1) the organic vapor concentration in the operators' breathing zone exceeds 5 ppm → 50ppm if full face respirator or (2) the combustible gas vapor concentration two feet above the excavation exceeds 5000 ppm 1000 ppm or ~~50~~ 10 percent of the lower explosive limit. The Health and Safety Officer will determine when personnel may return to the work area.

explosion proof?
lead
pre-filter

?

? ←

K.C.

In the event low levels of organic vapors are detected, personnel will wear appropriate respirators (using NIOSH approved combination cartridges for organic vapors and dusts).

C. Site Entry Procedures

The tank area is shown on the Site Plan. Access to the site will be controlled with barricades. All personnel entering the work zone will be qualified field personnel wearing the proper level of protection. Eating, drinking, smoking and any other practices which increase the probability of combustion or hand-to-mouth transfer will be prohibited in the work zone. A first aid kit and a 20-pound ABC fire extinguisher and potable water will be available at the site.

D. Decontamination Procedures and Disposal

All disposable protective clothing will be put into plastic bags and disposed of in a garbage receptacle. In the event of a medical emergency, the injured party will be taken through decontamination procedures, if possible. However, the procedures will be omitted when it may aggravate or cause more harm to the injured party. A member of the work team will accompany the injured party to the medical facility to advise on matters concerning chemical exposure.

IV EMERGENCY MEDICAL CARE

In the event of an injury or suspected chemical exposure, the first responsibility of the Health and Safety Officer will be to prevent further injury. This objective will normally require an immediate end to work until the situation is rectified. The Health and Safety Officer may order an evacuation of the work party.

The Health and Safety Officer's primary responsibility in the event of an accident will be evacuation, first aid, and decontamination of injured team members. The Health and Safety Officer will determine safe evacuation areas and begin first aid.

V EMERGENCY PROCEDURES

A. Response to Emergency

In case of an injury, the Health and Safety Officer will use the appropriate first aid kit and contact off-site medical help, if appropriate.

B. Emergency Contacts

Ambulance, Fire, Police: **911**

Hospital - Peralta Hospital
450 30th Street
Oakland, California
(415) 451-4900

Chemical Spills: National Response Center (24 hours)
(800) 424-9300

Chemtrec: Chemical Releases (24 hours)
(800) 424-9300

Environmental Protection Agency
Emergency Response Section:
(415) 974-7511

Poison Control Center (24 hours)
(415) 428-3248

Cal-OSHA District Office: / Fed OSHA
Occupational Injuries
(415) 557-1677

Regional Water Quality Control Board:
(415) 464-1255

C. Acute Exposure Symptoms and First Aid

Exposure Route	Symptoms	First Aid
Skin	Dermatitis	Wash immediately with soap and water, contact ambulance if evacuation is necessary

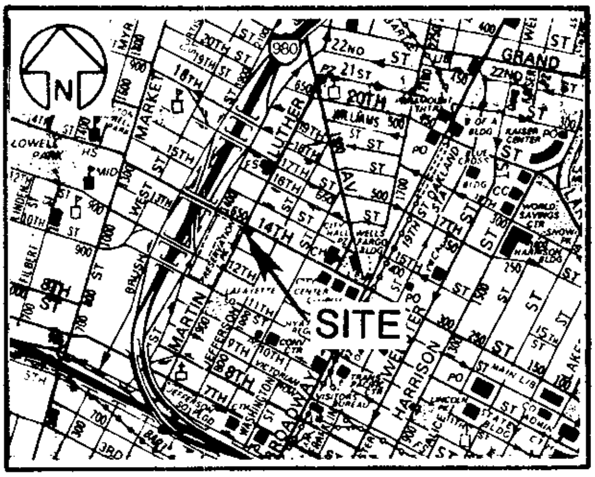
Eye	Irritated eyes	Flush eyes with water, contact ambulance
Inhalation	Vertigo, tremor	Move person to fresh air, cover source of chemicals
Ingestion	Nausea, vomiting	Call Poison Control Center

D. Contingency Plan

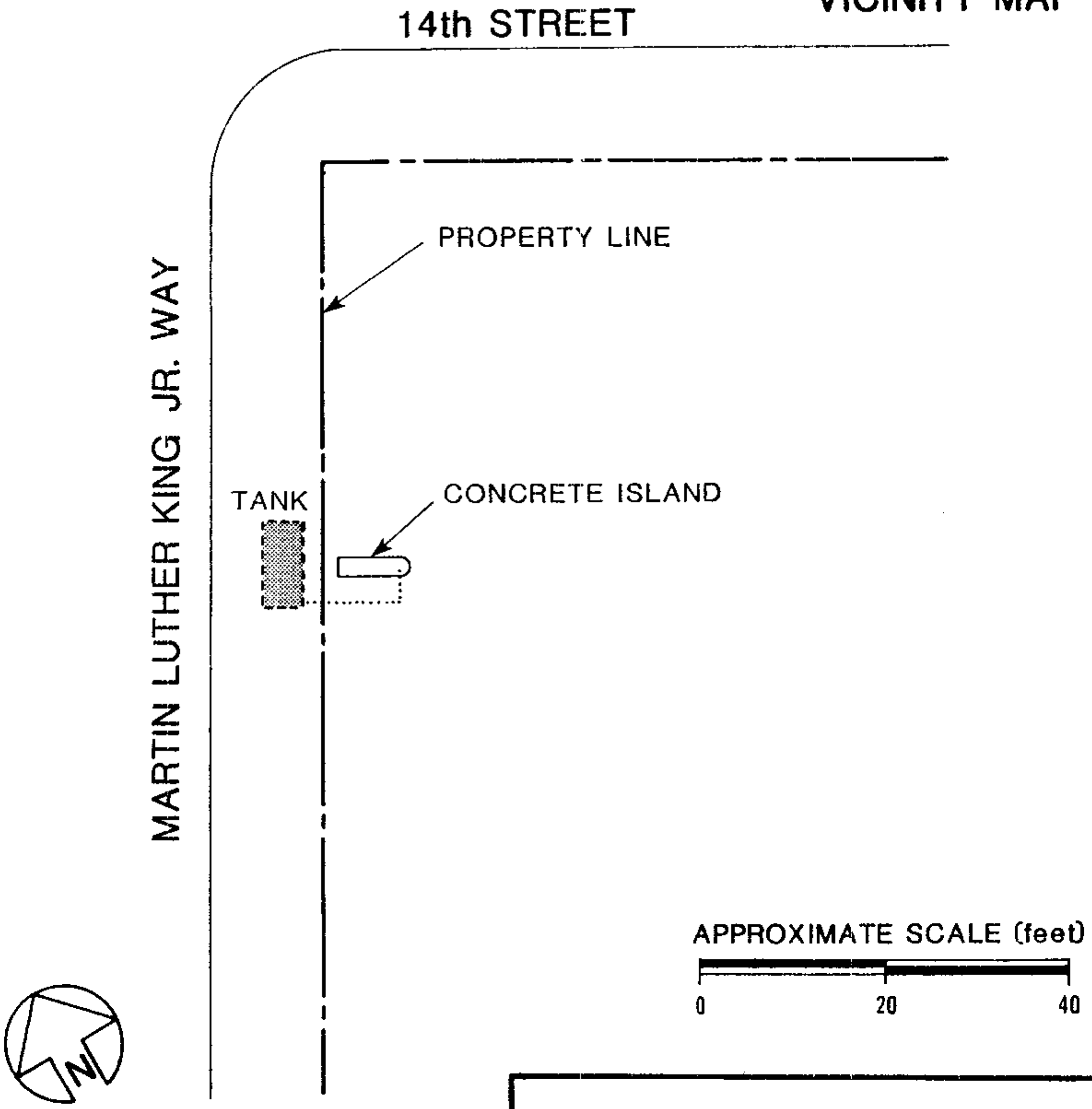
The following procedures will be used in case of an unpredictable event:

Fire:	Use fire extinguisher if localized and call the fire department if uncontrolled
Chemical Exposure:	Follow first aid treatment specified previously
Physical Injury:	Provide First aid treatment and contact ambulance for evacuation, if appropriate

NOTE: Groundwater was encountered at a depth of 29.5 feet below the sidewalk during drilling. This does not represent a stabilized condition.



VICINITY MAP



SITE PLAN

Subsurface Consultants

MARTIN LUTHER KING JR. WAY - OAKLAND, CA

JOB NUMBER	DATE	APPROVED	PLATE
430.001	6/14/88		1