Texaco Refining
and Marketing Inc

May 26, 1993

Mr. Thomas Peacock
Alameda County Environmental
Health Department
80 Swan Way, Room 200
Oakland, CA 94621

ST ID 1305

Re: **ENV-UST CASE CLOSURE REQUEST & WELL DESTRUCTION PLAN**
424 Martin Luther King Way
Oakland, California

Dear Mr. Peacock:

Enclosed is a copy of the UST Case Closure Report dated April 30, 1993, well log search, and a Work Plan for proper destruction of the remaining monitoring well, dated May 12, 1993. Texaco believes that the closure report meets the intent of Appendix 12, Recommended Format for Case Closure, as established by the RWQCB, and requests that Alameda County approve both the Case Closure and the Work Plan.

If you have any questions or would like to discuss the report or work plan further, please call me at (818) 505-2476.

Very truly yours,
Texaco Refining and Marketing

R Robles
Bob Robles
Environmental Protection Coordinator

RR:rr

pr

Enclosure
Mr. Lester Feldman - CRWQCB San Francisco Bay Region
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UST Case Closure Report
for the
Former Texaco Facility
424 Martin Luther King, Jr. Way
Oakland, California

Clayton Project No. 46565.00
April 30, 1993

This report prepared by:

D. Edward MacDaniel
Geologist

This report reviewed by:

Anthony S. McElligott, P.E.
Supervisor, Remediation
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REGISTERED PROFESSIONAL ENGINEER
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STATE OF CALIFORNIA

CONTENTS

CONTENTS
(continued)

Section **Page**

Tables

Appendices

1.0 INTRODUCTION

Texaco Refining and Marketing Inc. retained Clayton Environmental Consultants Inc. to prepare a site closure report for the former Texaco service station that had been located at 424 Martin Luther King Jr. Way in Oakland, California. A copy of a site location map is included in Appendix A. Mr. Bob Robles, Texaco Environmental Protection Coordinator, authorized the work on February 10, 1993, by accepting Clayton's Proposal No. 93-B-047, dated February 9, 1993. This work was completed in accordance with the terms and conditions agreed to by Texaco and Clayton.

2.0 SITE DESCRIPTION

The subject site is a former service station located at the intersection of Martin Luther King Jr. Way and Fifth Street in Oakland, California. The site is currently occupied by Grove Auto Repair.

3.0 PREVIOUS WORK

In June 1983, five underground storage tanks (USTs) were removed from the subject site: two 4,000-gallon USTs, two 6,000-gallon USTs, and one 550-gallon UST.

On August 19 and 27, 1987, five boreholes were installed at the site by Groundwater Technology Inc. (GTI). The drilling of the boreholes was conducted using continuous flight hollow stem auger by Sierra Pacific Drilling.

Three of the boreholes were converted to 2-inch diameter groundwater monitoring wells, MW-1 through MW-3. A site plan and locations of monitoring wells and soil borings are included in Appendix B.

Starting September 1, 1987, GTI collected groundwater samples from MW-1, MW-2, and MW-3; additional samples were collected at later dates.

On July 27, 1988, GTI performed a soil survey of the site to determine the lateral extent of soil contamination at the subject site.

On September 15, 1988, monitoring wells MW-1 and MW-3 were destroyed using a mobile drilling rig to remove the wells' casings, seals, and sand packs. The contaminated soil identified by the soil survey was excavated December 13 to 16, 1988. The excavation was backfilled with rod mill pea gravel to 8 feet below grade and with imported fill to the surface.

The excavated soil was remediated onsite using aboveground aeration and bioremediation. The treated soil was hauled offsite to a landfill. soil chain custody and bills of lading?

Soil samples were collected to monitor the effectiveness of the soil remediation.

4.0 INVESTIGATIVE METHODS

4.1 DRILLING AND SOIL BORINGS

On August 19 and 27, 1987, GTI installed five boreholes at the site to 20 to 30 feet bgs. The drilling of the boreholes was conducted using a truck mounted mobile drilling rig with 7.5-inch outer diameter continuous flight hollow stem auger by Sierra Pacific Drilling. The drilling was conducted under the supervision of GTI who kept a log of the borings. The GTI boring logs are included in Appendix C.

On September 15, 1988, monitoring wells MW-1 and MW-3 were abandoned in accordance with the permit issued by Alameda County and applicable regulations, using a mobile drilling rig to remove the wells' casings, seals, and sand packs. Cement grout was injected in the borings using a tremie pipe.

4.2 SOIL SAMPLING

Soil samples were collected during the drilling of the borings in September 1987 using a 2.5-inch diameter split spoon sampler lined with 2-inch diameter brass tubes. The sampler was driven into the soil at five foot intervals to collect samples starting at 3 to 5 feet bgs. The samples were sealed, labelled, and placed into a chilled cooler for shipment under chain-of-custody documentation to a State-certified laboratory for analysis.

On July 27, 1988, GTI performed a soil survey of the site to determine the lateral extent of soil contamination at the subject site. A 3/4-inch diameter steel rod was inserted into the ground at each survey location to 8.5 to 11 feet bgs. A 5/8-inch diameter rod with a 3/8-inch diameter sampling tube was inserted into the hole created by the 3/4-inch rod. The sampling tube was driven into the soil to collect a soil sample. A figure showing soil survey sample locations is included in Appendix D.

During the excavation of the contaminated soil from December 13 to 16, 1988, soil samples were collected each day from the excavation to document the removal of contaminated soil.

After the test run of the remediation system, soil samples were collected from the soil pile on February 1, 1989. Additional samples were collected during and after the operation of the system on May 9, May 31, and June 22, 1989. Soil samples were collected using a hand auger to dig to the desired sampling depth. A hand-driven soil sampler was used to collect samples by driving brass tubes into the soil for approximately 12 inches. The tubes were removed from the sampler, and were sealed, labelled, and placed in a chilled cooler for shipment to a State-certified laboratory for analysis under chain-of-custody documentation.

4.3 CONSTRUCTION OF MONITORING WELLS

Three of the boreholes were converted to 2-inch diameter groundwater monitoring wells, MW-1 through MW-3. The total depth of each of these wells was 30 feet. Twenty-four feet of 0.02-inch slotted PVC screened casing and 6 feet of solid casing were placed into each well. The wells' annular spaces were filled with No. 2 Lapis Luster sand to 1-foot above the screened casing. A 1-foot bentonite seal was placed on top of the sand, and the

wells were sealed to the surface with 4 feet of cement grout. A locking cap and traffic street box were installed to secure and protect each well.

4.4 WELL DEVELOPMENT

No information was present in the reports for this site on the methodology used to develop the subject site's wells.

4.5 GROUNDWATER SAMPLING

Approximately five well volumes were purged from each well before sampling. Water samples were collected using teflon samplers and were poured into glass vials with teflon lined caps. The pouring was conducted in such a way to eliminate head space in the vials. The sample vials were labelled and placed in a chilled cooler for shipment to a State certified laboratory under chain of custody documentation for analysis.

4.6 ANALYTICAL METHODS

4.6.1 Soil Samples

The soil samples collected during the August 1987 drilling of the soil borings and monitoring wells were analyzed for benzene, toluene, and xylenes (BTX) using USEPA Method 8015.

Soil samples collected and analyzed in the field during the July 1988 soil survey were analyzed in the mobile lab using USEPA Method 8015 for total volatile hydrocarbons (TVH). Duplicate soil samples were analyzed using USEPA Methods 8020 and 8015 in a State-certified laboratory.

Soil samples collected during the excavation of the contaminated soil were analyzed using USEPA Methods 8015 and 8020 for TPH-G and BTEX. Additional samples were collected and analyzed using Standard Method 429 for phosphate and WM417E for ammonium.

The soil samples collected from the soil pile, to determine the adequacy of the soil remediation, were analyzed using USEPA Methods 8015 and 8020. Additional samples were analyzed for organic lead using California Department of Health Services (DHS) methodologies.

4.6.2 Groundwater Samples

The water samples collected from the three onsite monitoring wells were analyzed using a number of different methods. Table 3 summarizes the methods used to analyze the groundwater samples.

5.0 EXTENT OF HYDROCARBON PRESENCE IN SOIL AND GROUNDWATER

5.1 HYDROCARBONS IN SOIL

On July 27, 1988, GTI performed a soil survey of the site to determine the lateral extent of soil contamination at the subject site. The soil samples were analyzed onsite using a mobile GC laboratory to find the extent of soil contamination in the field. Duplicate samples were collected to verify the results by analyzing them in a certified laboratory. A figure in Appendix E shows the sample locations and isocons for gasoline in the site's soil.

5.2 HYDROCARBONS IN GROUNDWATER

5.2.1 Floating Product

No floating product was noted by GTI in any of the wells.

5.2.2 Dissolved Hydrocarbons

When groundwater samples were collected from the three monitoring wells and analyzed, petroleum hydrocarbons were identified in monitoring wells MW-2 and MW-3. As much as 68,000 micrograms per liter (µg/L) total fuel hydrocarbons (TFH) and 33,000 µg/L benzene were present in groundwater samples from MW-3, and 31 µg/L TFH and 3 µg/L benzene were in samples from MW-2. Table 2 summarizes the levels of dissolved petroleum hydrocarbons found in the groundwater samples from the monitoring wells. GTI generated a figure depicting groundwater benzene concentration contours (Appendix F).

6.0 HYDROLOGY

6.1 REGIONAL HYDROLOGY

Based on a review of the Oakland, West 7.5-minute Quadrangle topographic map, the regional groundwater flow direction in the site's vicinity is assumed to be southwesterly.

6.2 LOCAL HYDROLOGY

Based on September 1, 1987, and July 27, 1988, depth to groundwater measurements and relative elevations of the wells, GTI determined that the groundwater flow direction at the site is northwest (Appendix G).

Based on the GTI water depth measurements and relative well elevations, the groundwater flow directions were determined and are included in Table 4.

6.3 GROUNDWATER GRADIENT

Based on the well data gathered for the site's groundwater monitoring wells, groundwater gradients have been computed and are summarized in Table 5.

6.4 SEASONAL VARIATION OF GROUNDWATER

Table 6 summarizes the depth to groundwater measurements and elevation variations for the site.

6.5 AQUIFER CHARACTERISTICS

The site is underlain by the Merritt Sand which consists of sands, clayey sands, and sandy clays. The Merritt Sand overlies the Alameda Formation which consists of Late Cenozoic continental and marine sediments of gravel, sands, silts, and clays. The known maximum thickness of the Merritt Sand is 65 feet, and the known maximum thickness of the Alameda Formation is 1,050 feet.

At the site, the Merritt Sand consisted of a dark brown sandy silt from the surface to 2 feet bgs, a light to dark brown clayey sand from 2 to 25 feet bgs, and light brown and light gray sandy clay to 30 feet bgs.

7.0 BENEFICIAL USES OF GROUNDWATER

7.1 WELL INVENTORY

An inventory of wells in the site's vicinity has not been conducted. Was conducted by GTI copy to follow.

7.2 CONTAMINANT FATE TRANSPORT

Gasoline

Gasoline is generally composed of 36 to 71 alkanes and 22 to 54 aromatic hydrocarbons; 5 to 13 percent of the gasoline composition also consists of alkenes. Gasoline, if introduced from the soil surface, tends to drain through the unsaturated soil zone replacing the air and possibly some water. The rate of migration is primarily controlled by viscosity and porosity or permeability of the soil. Gasoline has a low-viscosity and moves rapidly through soil. The gasoline that remains on the surface is rapidly loss through evaporation into the atmosphere, photolysis, and active microbial oxidation.

Gasoline is less dense than water and tends to float at the interface between the water-saturated and unsaturated zones and spread horizontally, usually in the direction of groundwater movement.

The solubilities in air and water are dependent on the composition and temperature and the amount of air and water to which the gasoline has been or is exposed. As the gasoline is exposed to increasing volumes of air (or water), it becomes depleted of the more volatile (or soluble) components and becomes less soluble in air (or water).

Monocyclic Aromatic Hydrocarbons

The monocyclic aromatic hydrocarbon constituents of gasoline; benzene, toluene, ethylbenzene, and xylenes (BTEX), have similar physical-chemical properties, and can be grouped together in a discussion of their fate and transport in the environment. Based on their high vapor pressures and relatively low water solubilities, the primary fate of these compounds in surface soil or surface water is expected to be volatilization to the atmosphere. Photo-oxidation in the troposphere is the dominant atmospheric fate of these compounds.

Monocyclic aromatic hydrocarbons may leach from soil into groundwater. The octanol-water partition coefficient (log Koc) values for the compounds range from 1.9 to 4.0, indicating that sorption to organic matter in soil or sediment may occur to a limited extent. The compounds have a liquid density less than water, and may form a separate phase above the water table. Vapor-phase diffusion may be a significant transport process in unsaturated soil.

Monocyclic aromatic hydrocarbons can be biologically transformed; the rate and extent of transformation is dependent on site-specific factors such as temperature, pH, and the microbial composition of the soil.

Monocyclic aromatic hydrocarbons do not appreciably concentrate in plant or animal tissues.

7.3 SOURCES OF DRINKING WATER DETERMINATION

Because of the site's relative proximity to the San Francisco Bay, it is likely that the level of total dissolved solids in the groundwater in the site's vicinity exceeds the levels considered by the RWQCB to be acceptable for use as drinking water.

8.0 REMEDIATION ACTIVITIES AND EFFECTIVENESS

8.1 SOIL REMEDIATION

The contaminated soil identified by the soil survey was excavated December 13 to 16, 1988, using a loader, to approximately 18 feet. The excavated soil was stockpiled onsite for treatment. Soil samples were collected each day to document the progress of the excavating. The excavation continued until TPH-G levels in the collected soil samples were below practical quantification levels when analyzed. The extent of the soil excavation is shown in Figure 3. The excavation was backfilled with rod mill pea gravel to 8 feet below grade and with imported fill to the surface. The fill was then compacted.

The excavated soil was remediated onsite using aboveground aeration and bioremediation. A layer of plastic was placed on the ground, and a layer of excavated soil was placed on the plastic sheeting. Three lengths of PVC casing were placed on top of the layer of soil, and nutrient-rich water mixture was sprayed on the soil. A second layer of soil was placed on top of the first layer, and two lengths of PVC casing were placed on top of the this layer. Again, the soil was sprayed with the nutrient-rich water mixture. The remainder of the soil was placed on top, and the entire pile was sprayed with the water

mixture. The pile was covered with a tarp to reduce evaporation from the pile. The figure in Appendix H includes the design of the soil pile.

The ends of the piping were connected to a blower which drew air through the pile and then through two canisters of activated carbon to remove the petroleum hydrocarbons from the air. After receipt of permission from the BAAQMD, the system was turned on as part of a test run which ran from January 9 though February 1, 1989. Permission to run the system was granted by the BAAQMD, and the system ran from April 4 through May 31, 1989.

The effluent air was monitored for breakthrough using a PID. Soil samples were collected to monitor the effectiveness of the soil remediation. By June 22, 1989, the TPH-G levels in the soil samples had declined to 2 ppm. Locations of the soil pile samples are indicated in Appendix I. According to GTI, the treated soil was hauled offsite to a landfill.

8.2 GROUNDWATER REMEDIATION

No groundwater remediation was conducted at the site. However, all identified contaminated soil was excavated, treated, and removed from the site, thereby removing the source for future groundwater contamination.

8.3 IMPACT OF RESIDUAL HYDROCARBONS ON BENEFICIAL USES

Because contaminated soil was excavated until no detectable levels of TPH-G were present, the source of groundwater contamination has been removed. Because of the expected high TDS levels expected in the vicinity's groundwater, we do not expect the groundwater in the site's vicinity to be used for agriculture or human consumption. Therefore, there should not be a human exposure to residual petroleum hydrocarbons that may be present in the groundwater. Also, because the Oakland Inner Harbor is located approximately 1/2-mile from the site, we would expect that natural attenuation and degradation of any residual groundwater contamination would occur, preventing any appreciable impact to the Oakland Inner Harbor.

9.0 SUMMARY AND CONCLUSIONS

Five USTs were removed from the subject site in 1983. Since that time, two borings and three monitoring wells have been installed onsite. Detectable levels of petroleum hydrocarbons were identified in soil samples and groundwater samples from MW-2 and MW-3.

In 1988, a soil survey was performed to determine the lateral extent of soil contamination at the subject site. Once this was determined, monitoring wells MW-1 and MW-3 were destroyed because they were in the excavation area. The excavation area is shown in Appendix J. The excavated soil was treated onsite using forced aeration and bioremediation. The remaining well, located downgradient from the former UST location, was periodically sampled. Four sequential sampling events have been conducted at the site, with the most recent in June 1992, and no detectable levels of suspect contaminants were found.

Because the contaminated soil and USTs have been removed from the site, the possibility of further significant groundwater contamination at the site has been eliminated.

It is expected that the level of total dissolved solids in the subject site's groundwater will be above drinking water levels allowed by the RWQCB. Therefore, it is unlikely that local groundwater will be used for drinking water or agriculture.

not validated

Although detectable levels of BTEX, TPH, and miscellaneous hydrocarbons were in the groundwater sampled from monitoring well MW-3 prior to its abandonment, none of the constituents were found in later samples from monitoring well MW-2. MW-2 is located in the determined downgradient direction from the UST excavation and from the former MW-3, and, in the four sequential samplings from March 1989 June 1992, no BTEX, TPH, or miscellaneous hydrocarbons have been detected. We believe that either any residual hydrocarbons have not migrated to MW-2 and offsite, or that there is no residual contamination. It is possible that the soil remediation process, during which the soil near MW-3 and the USTs was excavated to a depth of 18 ft bgs, may have also addressed the residual groundwater contamination near MW-3.

10.0 RECOMMENDATIONS

Because the source of soil contamination, the USTs, and the source for future groundwater contamination, the contaminated soil, have been removed, and that it is unlikely that the human population of the area will be impacted by any residual groundwater contamination that may exist, we recommend that this case be considered for closure and that the remaining groundwater monitoring well be abandoned following the applicable regulations.

11.0 REFERENCES

- "*Contamination Assessment Report, Texaco Service Station*" Jan Prasil, et al, GTI, September 17, 1987
- "*Analytical Report, Groundwater Samples, Log No. E87-09-050*", Brown and Caldwell Laboratories, Reported September 15, 1987
- "*Groundwater Gradient Data Form, GTI, August 20, 1987*"
- "*Groundwater Gradient Data Form, GTI, September 2, 1987*"
- "*Groundwater Gradient Data Form, GTI, November 5, 1987*"
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-1*", GT Environmental Laboratories (GTEL), November 19, 1987
- "*Groundwater Gradient Data Form, GTI, January 29, 1988*"
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-2*", GTEL, February 4, 1988
- "*Groundwater Gradient Data Form, GTI, March 3, 1988*"

- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-3*", GTEL, March 7, 1988
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-4*", GTEL, March 8, 1988
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-5*", GTEL, March 16, 1988
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-6*", GTEL, March 16, 1988
- "*Groundwater Gradient Form*", GTI, July 27, 1988
- "*Remediation Work Plan, Former Texaco. . .* ", GTI, September 1988
- "*Analytical Report, Groundwater Sample, Project No. 203-199-4314-12*", GTEL, February 7, 1989
- Letter, Bay Area Air Quality Management District (BAAQMD), March 23, 1989
- "*Analytical Report, Groundwater Sample*", GTEL, April 10, 1990
- "*Soil Excavation and Remediation Report, . . .*", June 5, 1990
- Letter, Alameda County Health Care Services Agency, May 26, 1992
- "*Groundwater Monitoring and Sampling. . .*", GTI, July 29, 1992
- "*The Acute Toxicology of Selected Petroleum Hydrocarbons. Applied Toxicology of Petroleum Hydrocarbons*", L.S. Beck, et al., Princeton Scientific Publishers, Inc., 1984
- "*The Water-Related Environmental Fate of 129 Priority Pollutants*", United States Environmental Protection Agency (USEPA), prepared for USEPA, Office of Water Planning and Standards, Washington, D.C., 1979

April 30, 1993

Table 1

Results of Soil Samples Analyses

Sample		B	T	E	X	BTEX	TVH	TPH-G	MH C	NH_4	P	Pb
Name	Date											
Soil Boring												
SB-1-B	08/19/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-1-C	08/19/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-1-D	08/19/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-2-B	08/19/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-2-C	08/19/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-3C 14-14.5	08/27/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-3B 9-9.5	08/27/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-4B 9-9.5	08/27/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-4C 14-14.5	08/27/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-5A 9-9.5	08/27/87	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA
SB-5B 14-14.5	08/27/87	ND	900[1]	700[1]	ND	NA	NA	NA	NA	NA	NA	NA
SB-5C 19-19.5	08/27/87	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Soil Survey												
1	07/27/88	NA	NA	NA	NA	NA	26[2]	NA	NA	NA	NA	NA
2	07/27/88	NA	NA	NA	NA	NA	2[2]	NA	NA	NA	NA	NA
3	07/27/88	NA	NA	NA	NA	NA	16[2]	NA	NA	NA	NA	NA
4	07/27/88	NA	NA	NA	NA	NA	1[2]	NA	NA	NA	NA	NA
5	07/27/88	NA	NA	NA	NA	NA	4,147[2]	NA	NA	NA	NA	NA
6	07/27/88	NA	NA	NA	NA	NA	1[2]	NA	NA	NA	NA	NA
7	07/27/88	NA	NA	NA	NA	NA	123[2]	NA	NA	NA	NA	NA
8	07/27/88	NA	NA	NA	NA	NA	5[2]	NA	NA	NA	NA	NA
9	07/27/88	NA	NA	NA	NA	NA	2[2]	NA	NA	NA	NA	NA
S-2	07/27/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
S-4	07/27/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
S-8	07/27/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
Soil Excavation												
1A	12/13/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
2A	12/13/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
3A	12/14/88	ND	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA
3B	12/14/88	ND	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA
4A	12/15/88	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
4B	12/15/88	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA

Table 1

Results of Soil Samples Analyses

Sample		B	T	E	X	BTEX	TVH	TPH-G	MHC	NH_4	P	Pb
Name	Date											
M1	12/15/88	NA	NA	NA	NA	NA	NA	NA	NA	0.16[3]	ND	NA
M2	12/15/88	NA	NA	NA	NA	NA	NA	NA	NA	0.07[3]	ND	NA
M3	12/15/88	NA	NA	NA	NA	NA	NA	NA	NA	0.09[3]	ND	NA
Soil Pile												
SS-1	02/01/89	ND	ND	ND	ND	ND	NA	140[3]	NA	NA	NA	NA
SS-2	02/01/89	3[3]	22[3]	110[3]	22[3]	160[3]	NA	1,500[3]	NA	NA	NA	NA
SS-3	02/01/89	ND	ND	ND	ND	ND	NA	180[3]	NA	NA	NA	NA
SS-4	02/01/89	ND	ND	21[3]	ND	21[3]	NA	1,200[3]	NA	NA	NA	NA
SS-1	05/09/89	ND	ND	ND	ND	ND	NA	80[3]	NA	NA	NA	NA
SS-2	05/09/89	ND	ND	ND	ND	ND	NA	530[3]	NA	NA	NA	NA
SS-3	05/09/89	ND	ND	ND	ND	ND	NA	18[3]	NA	NA	NA	NA
SS-4	05/09/89	ND	ND	ND	ND	ND	NA	250[3]	NA	NA	NA	NA
2	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
3	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
4	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
5	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
6	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
8	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
9	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	13[3]	NA	NA	ND	ND
10	05/31 - 06/02/89	ND	ND	ND	ND	ND	ND	590[3]	NA	NA	ND	ND
SEC 10	06/22/89	ND	ND	ND	ND	ND	NA	2[3]	NA	NA	NA	NA

ND = Not detected
NA = Not analyzed
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylenes
BTEX = Benzene, toluene, ethylbenzene, and xylenes
TVH = Total volatile hydrocarbons
TPH-G = Total petroleum hydrocarbons identified as gasoline
MHC = Miscellaneous hydrocarbons
NH_4 = Ammonia
P = Phosphate
Pb = Lead

[1]units reported as micrograms per kilogram (µg/kg)
[2]units reported as parts per million (ppm)
[3]units reported as milligrams per kilogram (mg/kg)

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Void does not include test data of 5/12/8
see fax copy attached

Table 2

Results of Groundwater Sample Analyses
[all results reported in micrograms per liter (ug/L)]

Well Name	Date	B	T	E	X	TFH	TPH	MHC	TVH
MW-1	09/01/87	BDL	BDL	BDL	BDL	BDL	NA	NA	NA
	11/06/87	NS							
	01/29/88	BDL	BDL	BDL	BDL	BDL	NA	NA	NA
	03/03/88	NS							
	03/04/88	NS							
	03/07/88	BDL	BDL	BDL	BDL	NA	BDL	BDL	NA
	03/07/88	NS							
	02/01/89	NS							
	03/28/90	NS							
	06/30/92	NS							
MW-2	09/01/87	1.4	0.5	BDL	BDL	BDL	NA	NA	NA
	11/06/87	NS							
	01/29/88	2	1	BDL	BDL	NA	31	NA	NA
	03/03/88	NS							
	03/04/88	NS							
	03/07/88	3	BDL	BDL	BDL	NA	11	8	NA
	03/07/88	NS							
	02/01/89	BDL	BDL	BDL	BDL	NA	8	NA	NA
	03/28/90	BDL	BDL	BDL	BDL	NA	BDL	NA	NA
	06/30/92	BDL	BDL	BDL	BDL	NA	BDL	NA	NA
MW-3	09/01/87	33,000	13,000	1,900	9,100	68,000	NA	NA	NA
	11/06/87	1,600	1,100	200	520	NA	NA	1,100	4,500
	01/29/88	4,700	2,100	340	1,100	NA	14,000	5,800	NA
	03/03/88	770	26	7	18	NA	2,600	1,800	NA
	03/04/88	4,500	2,100	390	1,200	NA	19,000	11,000	NA
	03/07/88	9,500	4,500	740	2,900	NA	28,000	10,000	NA
	03/07/88	13,000	6,800	1,100	4,400	NA	35,000	10,000	NA
	02/01/89	NS							
	03/28/90	NS							
	06/30/92	NS							

B = Benzene
E = Ethylbenzene
TPH = Total petroleum hydrocarbons
TFH = Total fuel hydrocarbons
NA = Not analyzed
TVH = Total volatile hydrocarbons
T = Toluene
X = Xylenes
MHC = Miscellaneous hydrocarbons
BDL = Below detection limits
NS = Not sampled

Clayton
ENVIRONMENTAL
CONSULTANTS

Table 2

Results of Groundwater Sample Analyses
[all results reported in micrograms per liter (ug/L.)]

Well Name	Date	B	T	E	X	TPH	TPH	MHC	TVH
MW-1	09/01/87	BDL.	BDL	BDL	BDL	BDL	NA	NA	NA
	11/06/87	NS							
	01/29/88	BDL	BDL	BDL	BDL	BDL	NA	NA	NA
	03/03/88	NS							
	03/04/88	NS							
	03/07/88	BDL	BDL	BDL.	BDL	NA	BDL	BDL	NA
	03/07/88	NS							
	02/01/89	NS							
	05/12/89	NS							
	03/28/90	NS							
	06/30/92	NS							
MW-2	09/01/87	1.4	0.5	BDL.	BDL	BDL.	NA	NA	NA
	11/06/87	NS							
	01/29/88	2	1	BDL	BDL	NA	31	NA	NA
	03/03/88	NS							
	03/04/88	NS							
	03/07/88	3	BDL	BDL.	BDL	NA	11	8	NA
	03/07/88	NS							
	02/01/89	BDL	BDL.	BDL	BDL	NA	8	NA	NA
	05/12/89	BDL.	BDL	BDL	BDL	NA	BDL	NA	NA
	03/28/90	BDL	BDL	BDL	BDL	NA	BDL	NA	NA
	06/30/92	BDL	BDL	BDL	BDL	NA	BDL	NA	NA
MW-3	09/01/87	33,000	13,000	1,900	9,100	68,000	NA	NA	NA
	11/06/87	1,600	1,100	200	520	NA	NA	1,100	4,500
	01/29/88	4,700	2,100	340	1,100	NA	14,000	5,800	NA
	03/03/88	770	26	7	18	NA	2,600	1,800	NA
	03/04/88	4,500	2,100	390	1,200	NA	19,000	11,000	NA
	03/07/88	9,500	4,500	740	2,900	NA	28,000	10,000	NA
	03/07/88	13,000	6,800	1,100	4,400	NA	35,000	10,000	NA
	02/01/89	NS							
	05/12/89	NS							
	03/28/90	NS							
	06/30/92	NS							

B = Benzene
E = Ethylbenzene
TPH = Total petroleum hydrocarbons
TFH = Total fuel hydrocarbons
NA = Not analyzed
TVH = Total volatile hydrocarbons
T = Toluene
X = Xylenes
MHC = Miscellaneous hydrocarbons
BDL = Below detection limits
NS = Not sampled

Table 3

Analytical Methods for Water Samples

Sample Date	Analytical Methods
September 1, 1987	USEPA 8015 & 602
November 7, 1987 (MW-3 only)	USEPA 8015 & 602
January 29, 1988	USEPA 8015 & 8020
March 3, 1988 (MW-3 only)	USEPA 8015 & 8020
March 4, 1988 (MW-3 only)	USEPA 8015 & 8020
March 7, 1988 (MW-3 sampled twice)	USEPA 8015 & 8020
February 1, 1989*	USEPA 8015 & 8020
March 28, 1990	USEPA 8015 & 8020
June 30, 1992	USEPA 8015 & 8020

* Monitoring wells MW-1 and MW-3 were destroyed on September 15, 1988.

Table 4

Well Elevations, Depth to Water Measurements, Groundwater Elevations, and Groundwater Flow Directions

Date	Well Name	Well Elevation[1] (ft)	Depth to Water (ft)	Groundwater Elevation[2] (ft)	Groundwater Flow Direction
09/02/87	MW-1	100.00	11.98	88.02	N63W
	MW-2	98.45	11.40	87.05	-
	MW-3	99.65	11.77	87.88	-
01/29/88	MW-1	100.00	11.60	88.40	N61W
	MW-2	98.45	11.07	87.38	-
	MW-3	99.65	11.37	88.28	-
03/08/88	MW-1	100.00	11.81	88.19	N57W
	MW-2	98.45	11.32	87.13	-
	MW-3	99.65	11.52	88.13	-
07/27/88	MW-1	100.00	12.49	87.51	N60W
	MW-2	98.45	11.88	86.57	-
	MW-3	99.65	12.24	87.41	-

1 Relative elevations in ft of top of casing
2 Relative elevations in ft

Table 5

Groundwater Gradient

Date	Groundwater Gradient (ft/100 ft)
09/02/87	2.6
01/29/88	3.1
03/03/88	3.3
07/27/88	2.8

Table 6

Variations in Groundwater Depths and Elevations

Well	Date	DTW[1] (ft)	GWE[2] (ft)
MW-1	08/20/87	11.71	88.29
	09/01/87	11.98	88.02
	11/05/87	NM	-
	01/29/88	11.60	88.40
	03/03/88	11.81	88.19
	07/27/88	12.49	87.51
MW-2	08/20/87	11.49	86.96
	09/01/87	11.40	87.05
	11/05/87	NM	-
	01/29/88	11.07	87.38
	03/03/88	11.32	87.13
	07/27/88	11.88	86.57
MW-3	08/20/87	NM	-
	09/01/87	11.77	87.88
	11/05/87	11.92	87.73
	01/29/88	11.37	88.28
	03/03/88	11.52	88.13
	07/27/88	12.24	87.41

[1] DTW = Depth to water from top of casing
[2] GWE = Groundwater elevation based on relative elevation of top of casings
MW-1 = 100 ft.; MW-2 = 98.45 ft.; MW-3 = 99.65 ft.

Note: Monitoring wells MW-1 and MW-2 were destroyed 09/15/88.

FIGURE 1
SITE LOCATION MAP

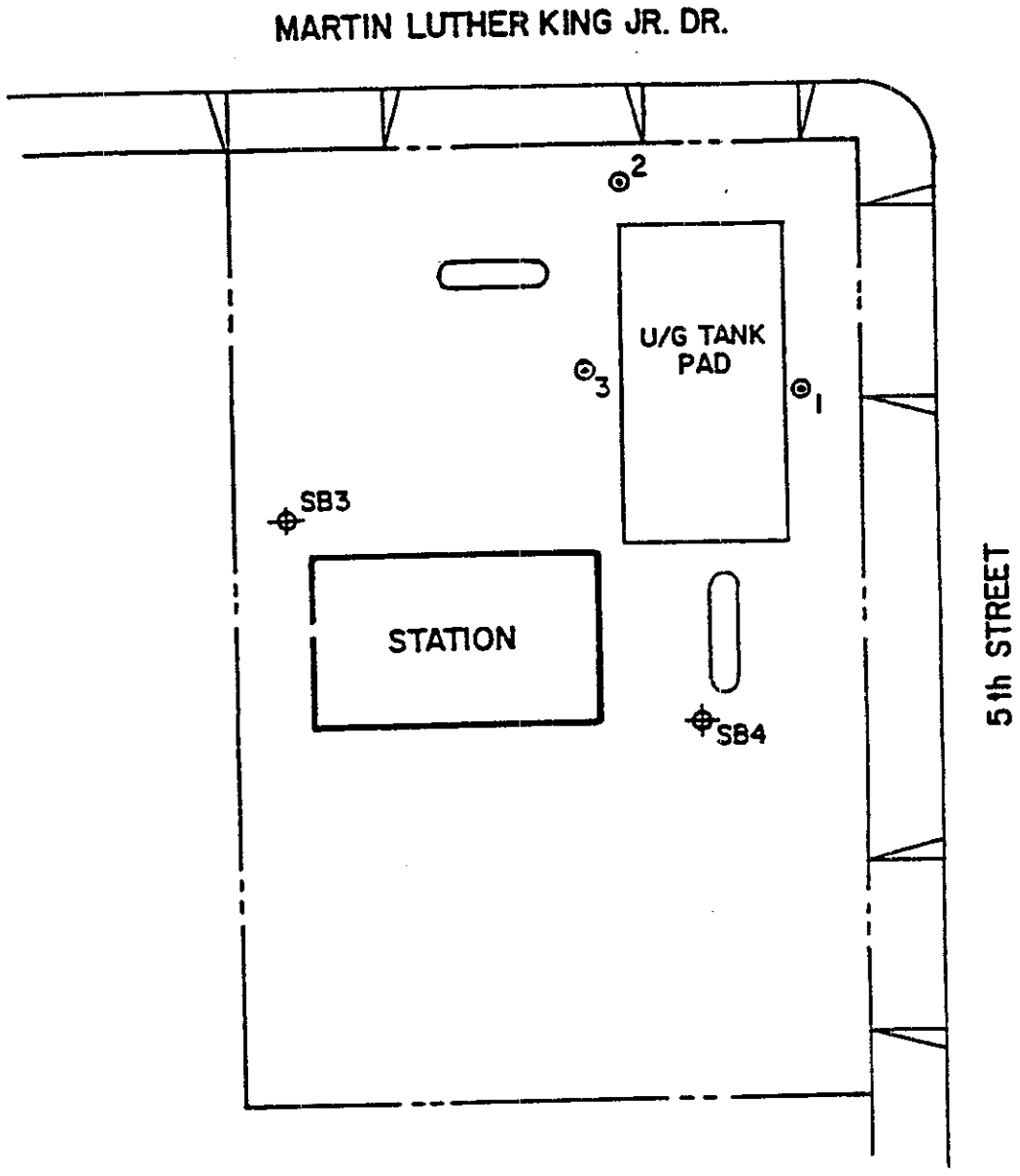
TEXACO REFINING
& MARKETING INC.
MARTIN LUTHER KING JR. DR.
OAKLAND, CALIFORNIA

0 MILES 1

GROUNDWATER
TECHNOLOGY

APPENDIX B

GTI SITE PLAN AND LOCATIONS OF MONITORING WELLS AND SOIL BORINGS



LEGEND
⊙ MONITORING WELL
⊕ SOIL BORING

FIGURE 2
SITE PLAN

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWAT
TECHNOLOG

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 1

Drilling

Project Texaco Martin Luther Owner Texaco Refin. & Marketing

Location Oakland, CA Project Number 203 150 4314

Date Drilled 08/19/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation ____ Water Level, Initial 15.4 ft. 24-hrs. ____

Screen: Dia. 2 in. Length 24 ft. Slot Size .020 in.

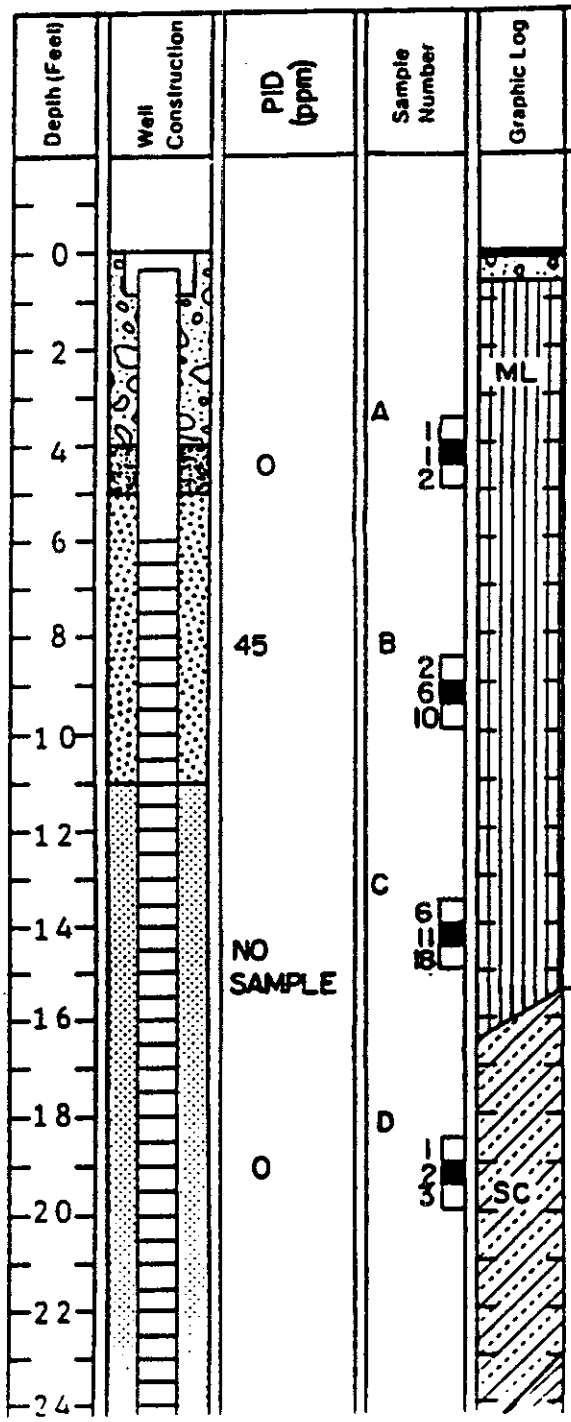
Casing: Dia. 2 in. Length 6 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Todd Byard Log by S. Fischbein, J. Prasil

Sketch Map

Notes Old name of M. L. King Jr.-424 Grove



Description/Soil Classification

2 inch Asphalt over 6 inch base course

Dark brown sandy silt (soft, dry, no product odo

(grades light brown, moist)

(grades slight product odor)

(grades brownish green with green decompo product, moderate product odor)

(grades brown, medium stiff, wet, no product odor)

Encountered water 8/19/87 (1020 hours)

Medium brown clayey fine to medium sand (well sorted, loose, wet, no product odor)

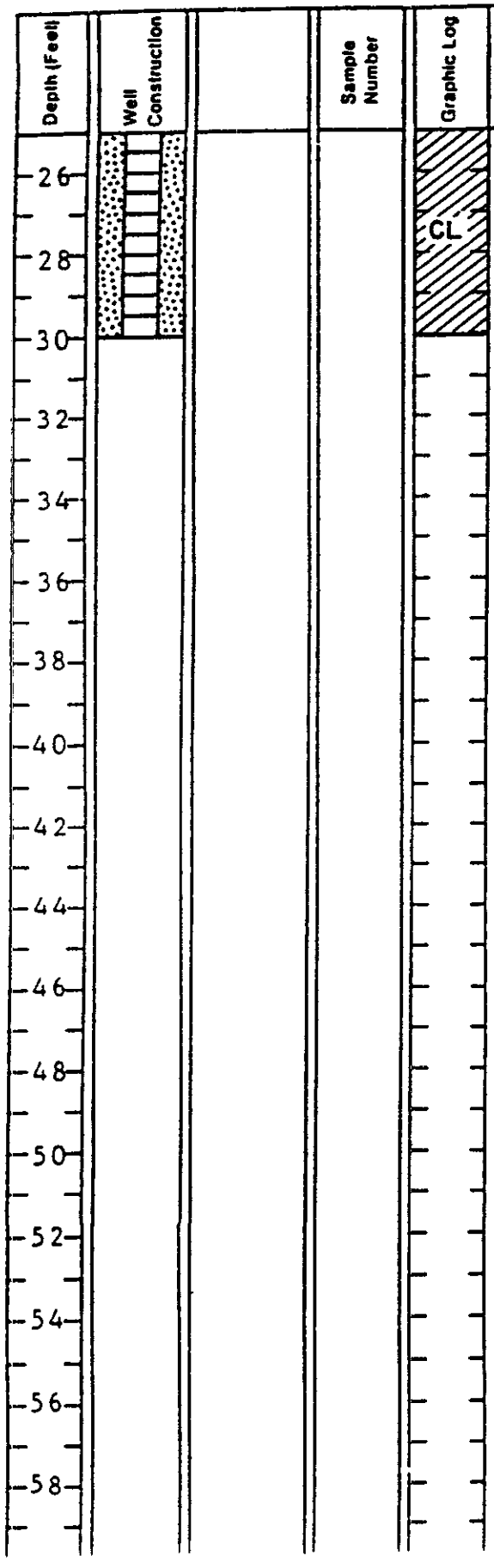
(grades brown-gray mottled)

(grades clayey)

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 1

Drilling Log



Description/Soil Classification (Color, Texture, Structures)

Light brown sandy clay (medium stiff, wet, no product odor)

End of boring, installed monitoring well

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 2

Drilling L

Project Tx R&M Martin Luther Owner Texaco Ref. & Marketing

Location Oakland, CA Project Number 203 150 4314

Date Drilled 08/19/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation ____ Water Level, Initial 16.5 ft. 24-hrs. ____

Screen: Dia. 2 in. Length 24 ft. Slot Size .020 in.

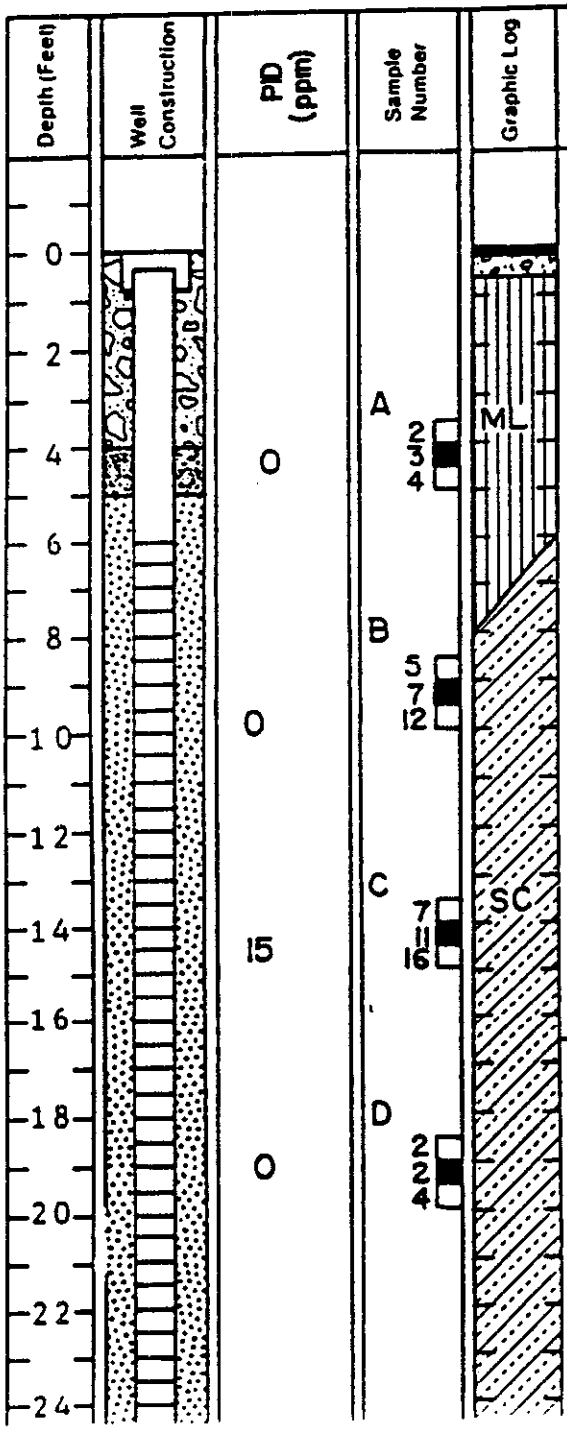
Casing: Dia. 2 in. Length 6 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Todd Byard Log by S. Fischbein, J. Prasil

Sketch Map

Notes Old Name of M. L. King Jr.-424 Grove



Description/Soil Classification

2 inch Asphalt over 6 inch base course

Dark brown, sandy silt (soft, moist, no product odor)

(grades less silty)

(grades clayey and moist)

Reddish brown, clayey fine to medium sand (medi dense, moist, no product odor)

(grades wet)

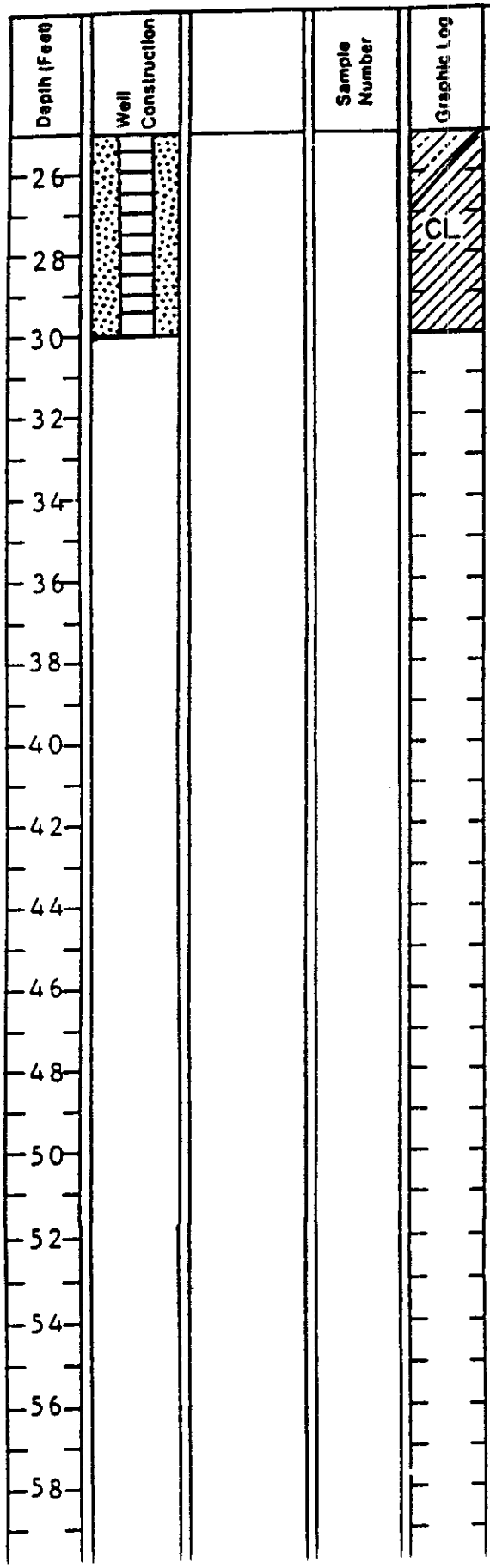
Encountered water 8/19/87 (1215 hours)
(grades clayey)

(grades gray-red mottled)

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 2

Drilling Lo



Description/Soil Classification (Color, Texture, Structures)

(grades clayey)

Light gray, silty clay (soft, very wet, no produc odor)

End of boring, installed monitoring well

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 3

Drilling L

Project Texaco Martin Luther Owner Texaco Refin. & Marketing

Location Oakland, CA Project Number 203 150 4314

Date Drilled 08/27/87 Total Depth of Hole 25 ft Diameter 7.5 in.

Surface Elevation Water Level, Initial 13.5 ft 24-hrs.

Screen: Dia. 2 in. Length 25 ft Slot Size .020 in.

Casing: Dia. 2 in. Length 5 ft Type PVC

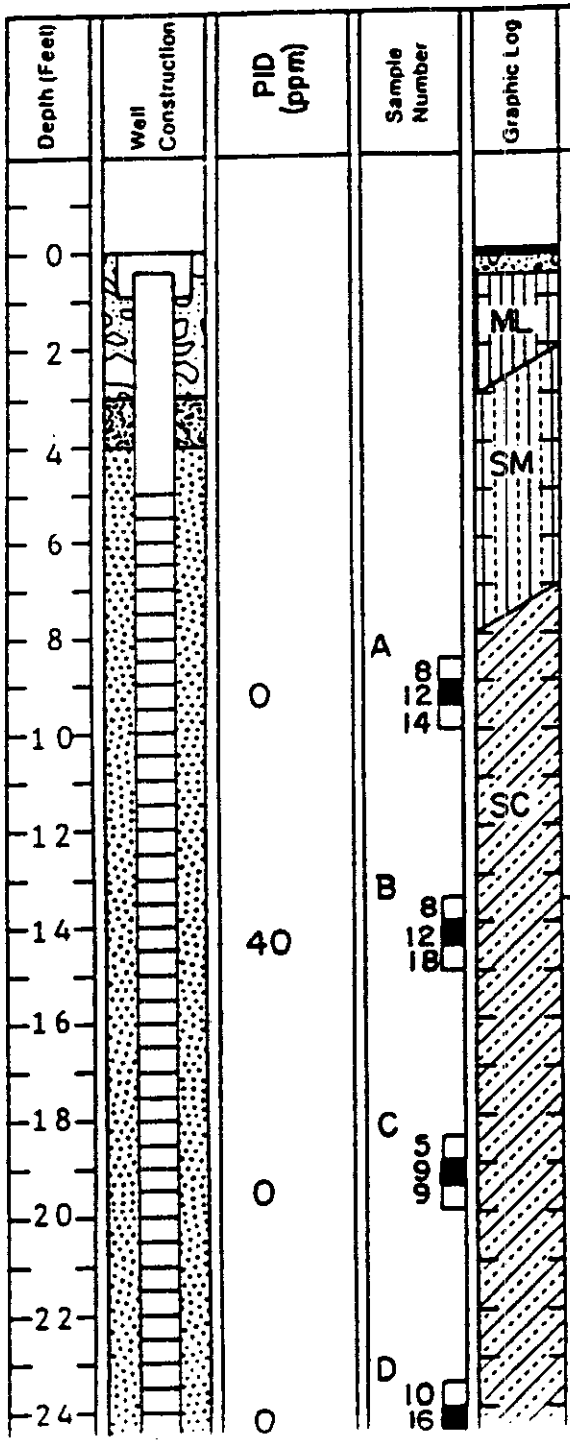
Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Todd Byard Log by Jan Prasil

Sketch Map

See Site Map

Notes



Description/Soil Classification

2 inch Asphalt over 4 inch base course

Dark brown sandy silt with broken fragments of brick and asphalt (loose, dry, no product odor)

Brownish gray, silty fine sand (loose, moist, slight product odor)

Reddish brown-gray mottled clayey sand (medium dense, slightly moist, slight product odor)

(grades moist, increasing product odor)

Encountered water 8/27/87 (1320 hours)
(grades brown, wet, strong product odor)

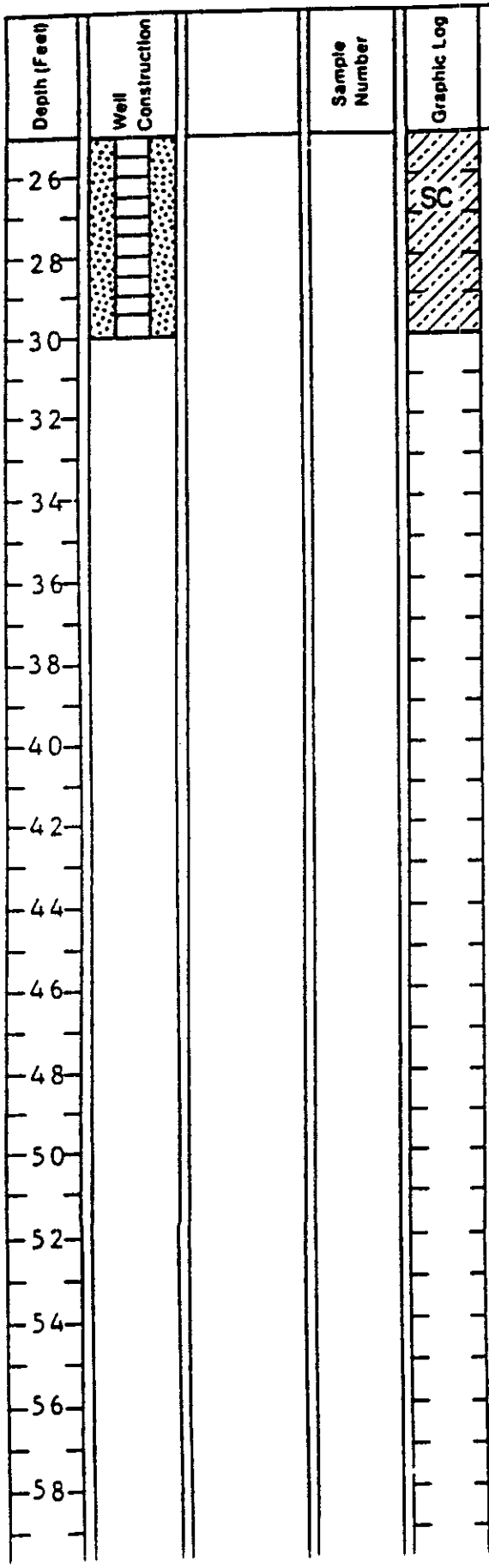
(grades no product odor)

(grades more clayey)

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 3

Drilling Log



Description/Soil Classification
(Color, Texture, Structures)

Brown clayey sand (cont'd)

End of boring, installed monitoring well

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Soil Boring 3

Drilling L

Project Texaco Martin Luther Owner Texaco Refin. & Marketing

Location Oakland, CA Project Number 203 150 4314

Date Drilled 08/27/87 Total Depth of Hole 20 ft. Diameter 7.5 in.

Surface Elevation ____ Water Level Initial 13.5 ft. 24-hrs. ____

Screen: Dia. ____ Length ____ Slot Size ____

Casing: Dia. ____ Length ____ Type ____

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Todd Byard Log by Jan Prasil

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification
0					2 inch Asphalt over 6 inch base course
					Dark brown sandy silt (soft, moist, no product odor) (grades sandier)
2				ML	
			A 4 4 4		Light brown, silty, fine to medium sand (loose, moist, no product odor)
4					
					(grades more clayey, less silty)
6					
			B 10 13 21		Brown clayey medium sand (dense, moist, no product odor)
8					
					(grades clayey)
10				SM	
					Encountered water 8/27/87 (1015 hours)
12			C 10 12 17		
					(grades more clayey)
14					
16					
18			D 4 5 6		
					End of boring, backfilled wieth concrete
20					
22					
24					

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

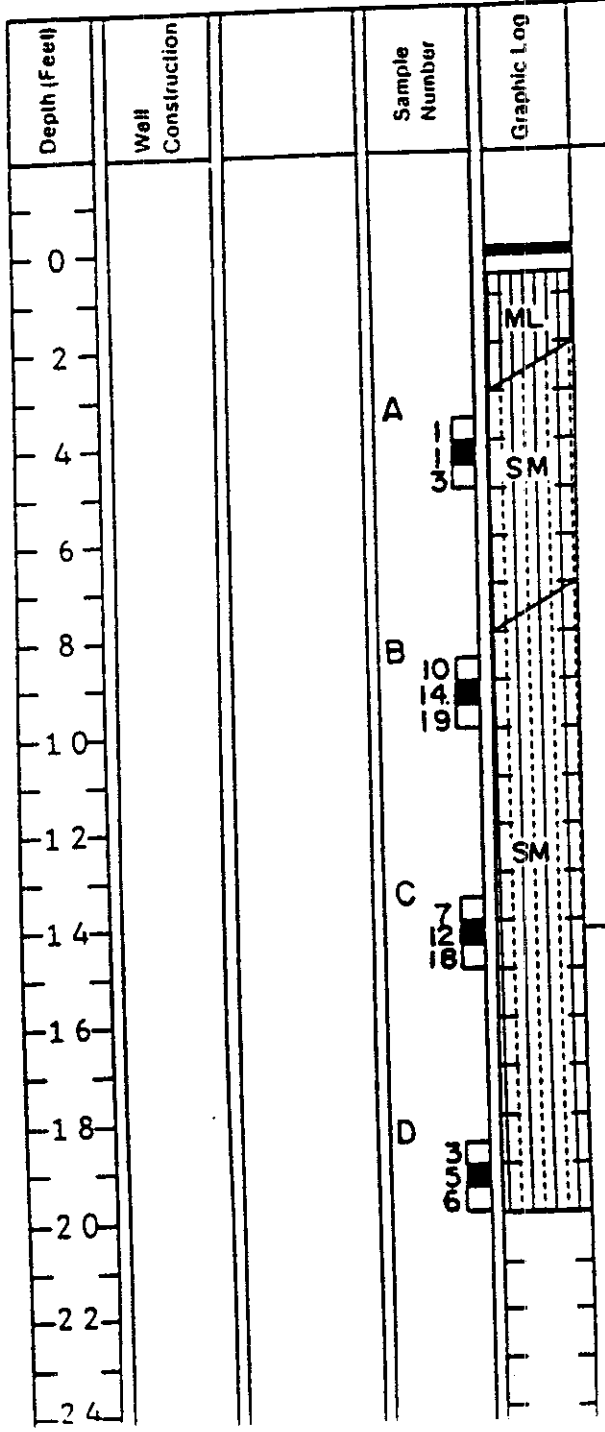
Soil Boring 4

Drilling Lo

Project Texaco Martin Luther Owner Texaco Refin. & Marketing
Location Oakland, CA Project Number 203 150 4314
Date Drilled 08/27/87 Total Depth of Hole 20 ft. Diameter 7.5 in.
Surface Elevation ____ Water Level, Initial 14.25 ft 24-hrs. ____
Screen: Dia. ____ Length ____ Slot Size ____
Casing: Dia. ____ Length ____ Type ____
Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger
Driller Todd Byard Log by Jan Prasil

Sketch Map

Notes



Description/Soil Classification

2 inch Asphalt over 4 inch brown base course
Dark brown sandy silt (soft, dry, no product odor

(grades more sandy)

Light brown silty fine sand (very loose, slightly moist, no product odor)

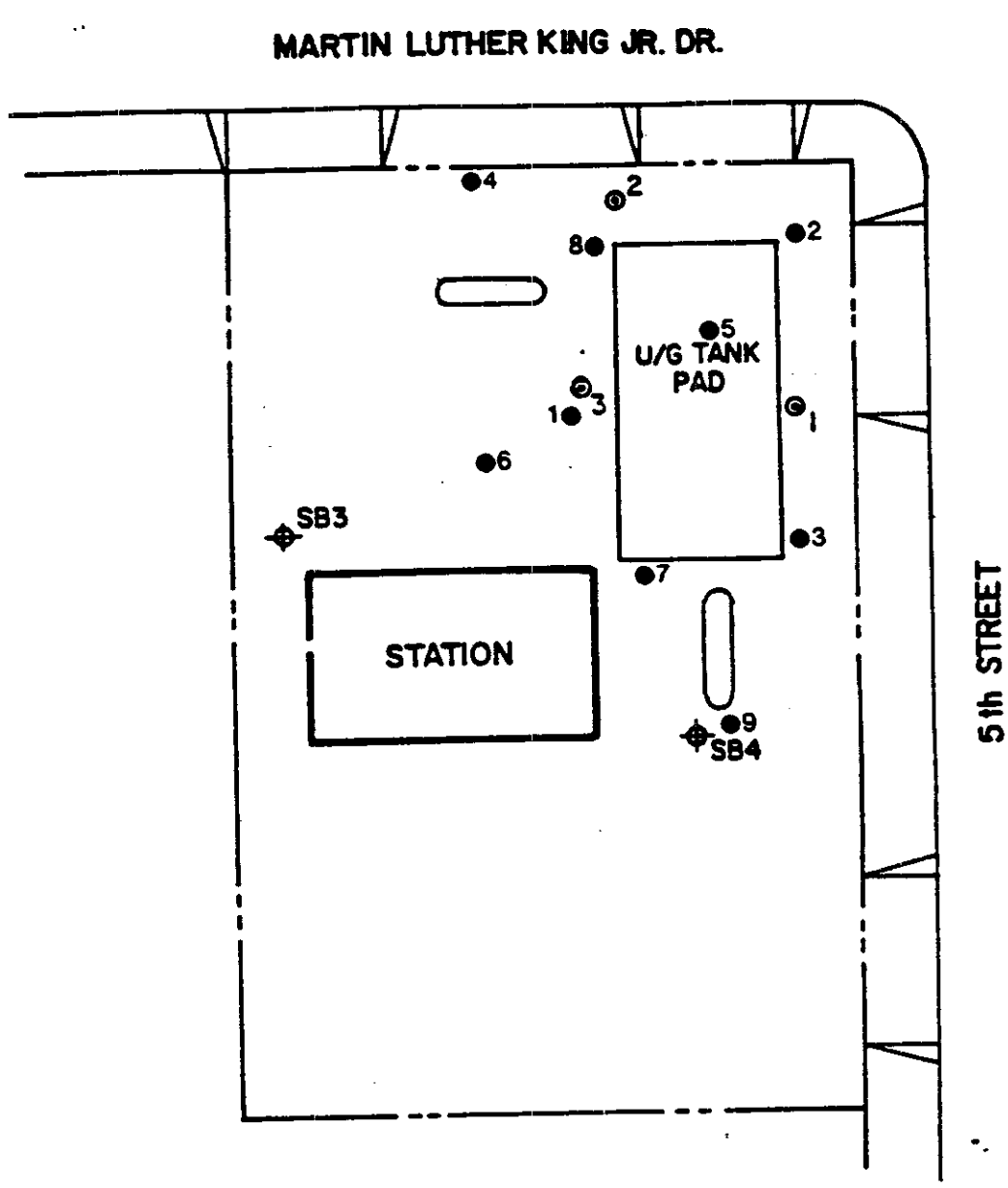
(grades clayey)

Reddish brown-gray mottled clayey medium sand (dense, moist, no product odor)

Encountered water 8/27/87 (1130 hours)

(grades gray-brown mottled

End of boring, backfilled with concrete



LEGEND

- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- ● SOIL SAMPLE LOCATION

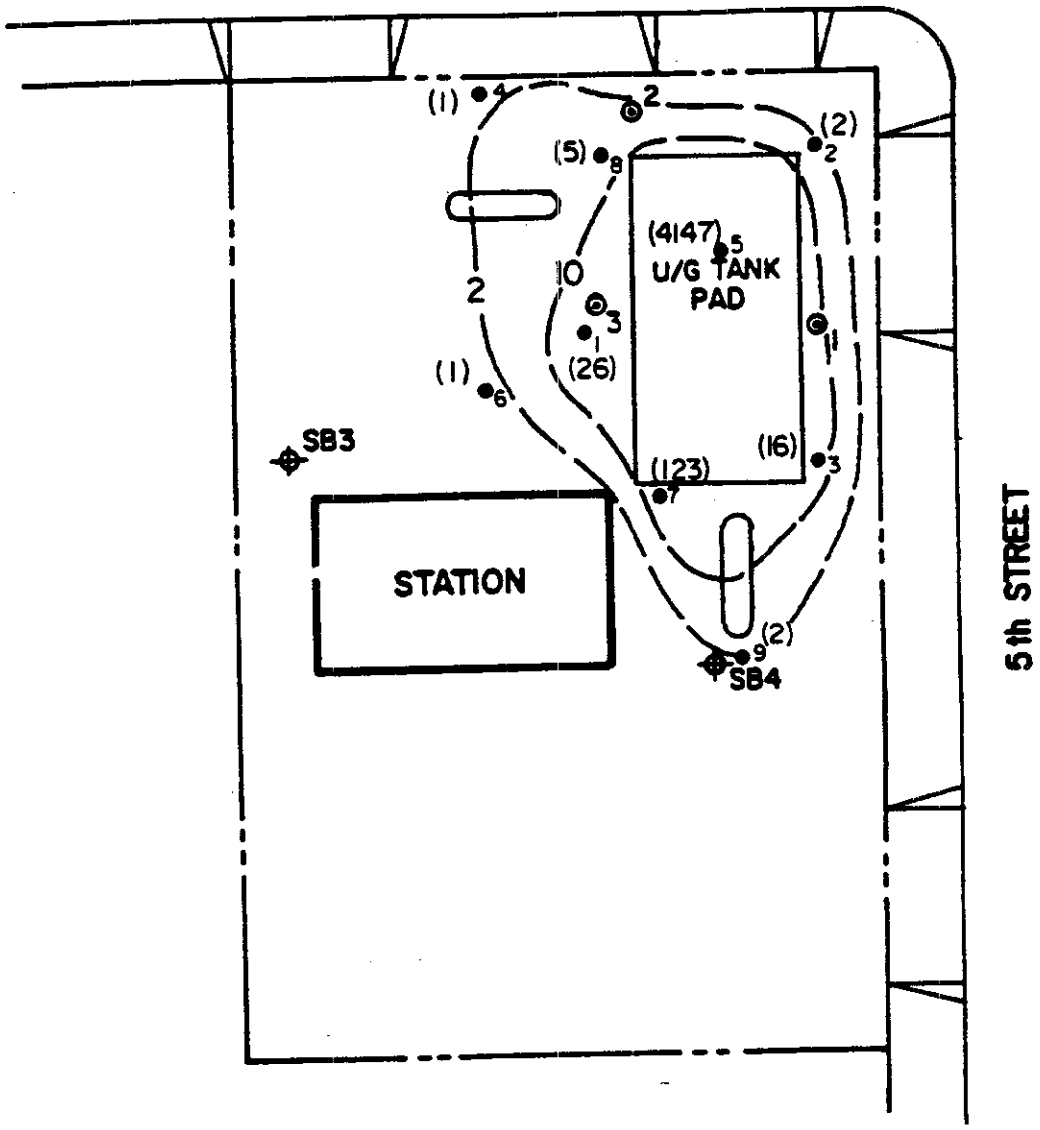
FIGURE 2
SITE PLAN

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER
TECHNOLOGY, I



LEGEND
- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- ● SOIL-PROBE LOCATION
- ( ) TVH CONCENTRATION (ppm)
- – – – TVH CONTOUR

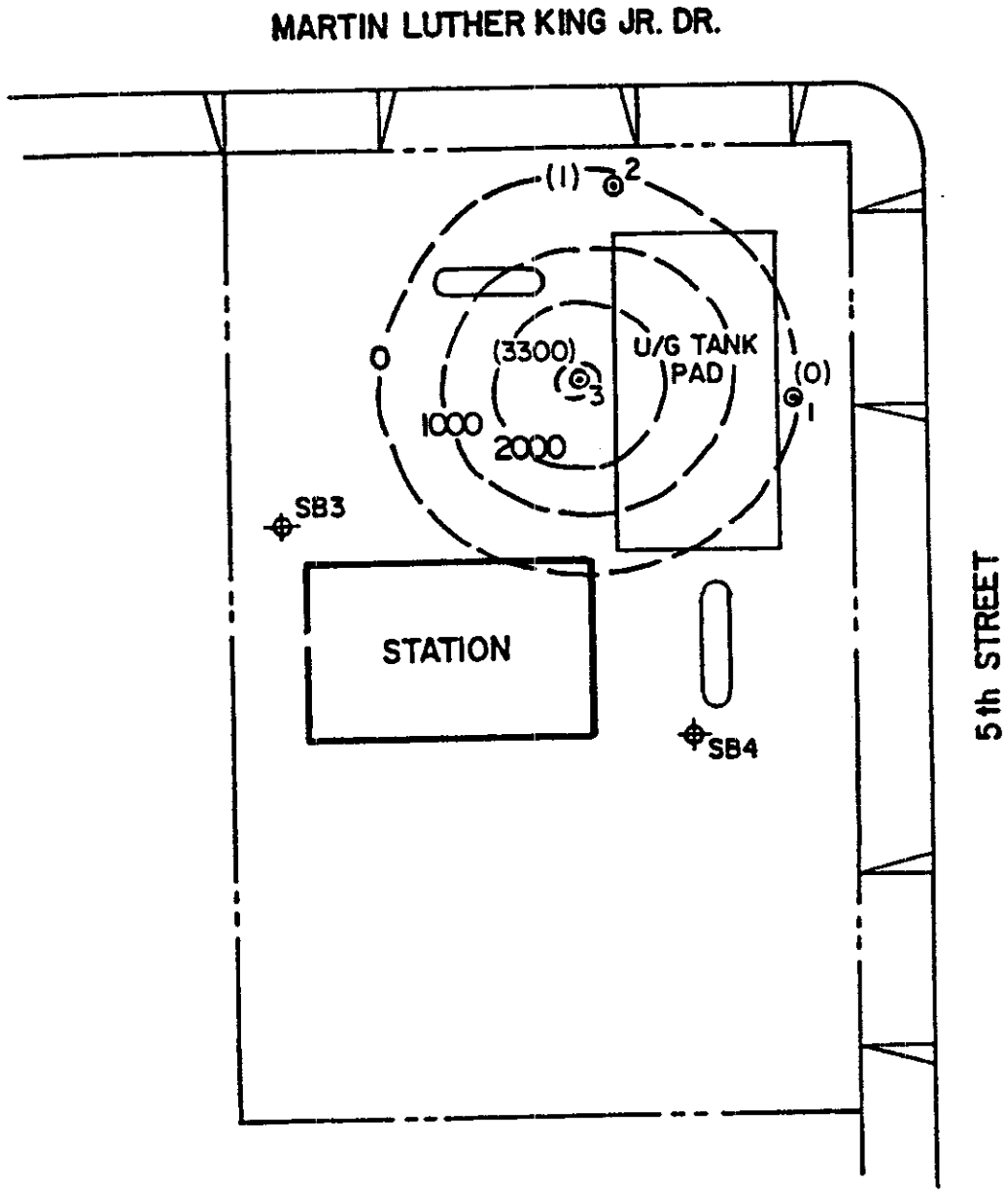
FIGURE 3
TVH AS GASOLINE IN SOIL
7/27/88

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER
TECHNOLOGY



LEGEND

- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- - - BENZENE CONCENTRATION CONTOUR
- ( ) BENZENE CONCENTRATION (ppb)

FIGURE 4

BENZENE CONCENTRATION MAP (ppb)

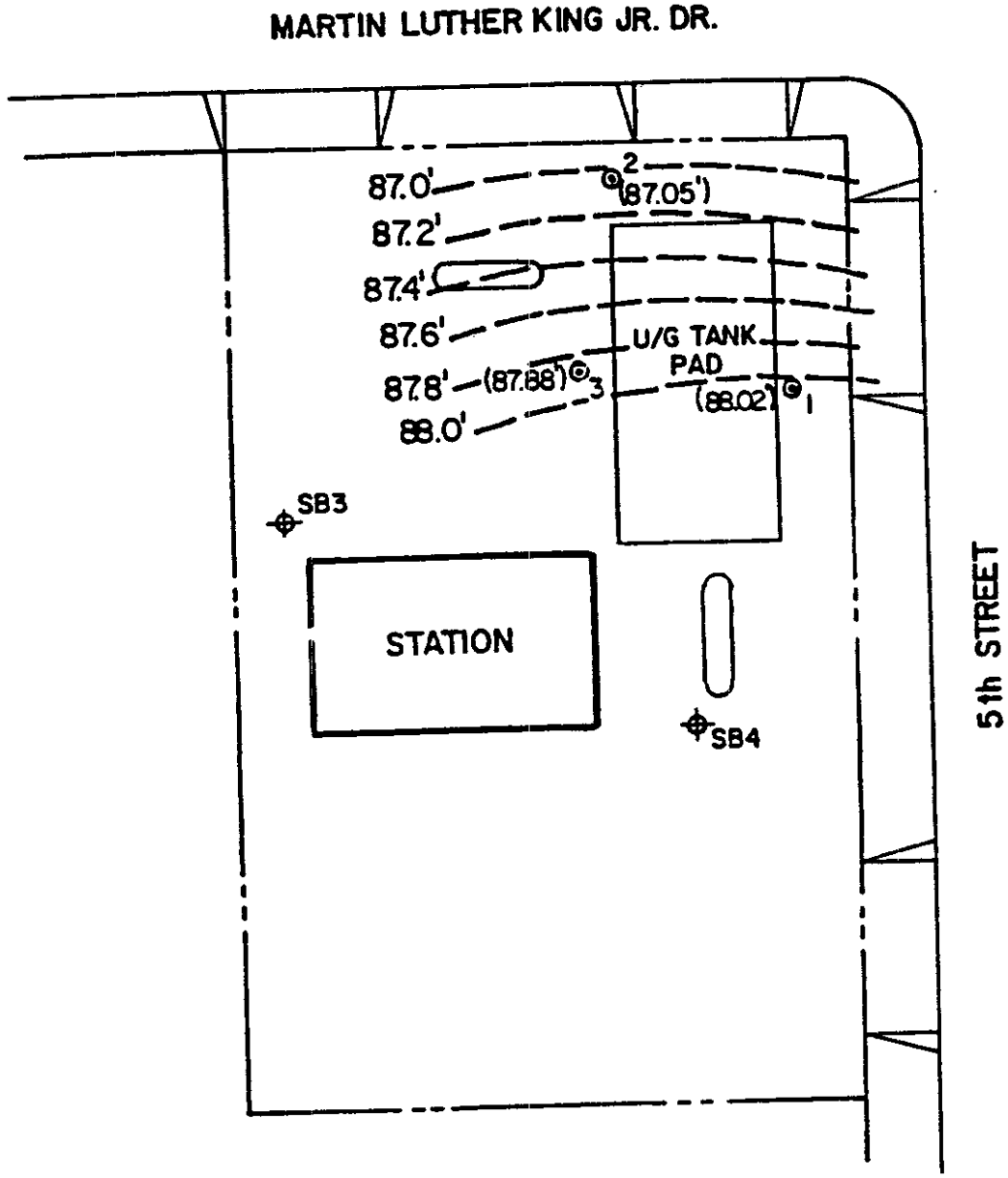
9/1/87

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER TECHNOLOGY



LEGEND

- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- ( ) RELATIVE GROUNDWATER ELEVATION
- GROUNDWATER CONTOUR

FIGURE 3

GROUNDWATER GRADIENT MAP

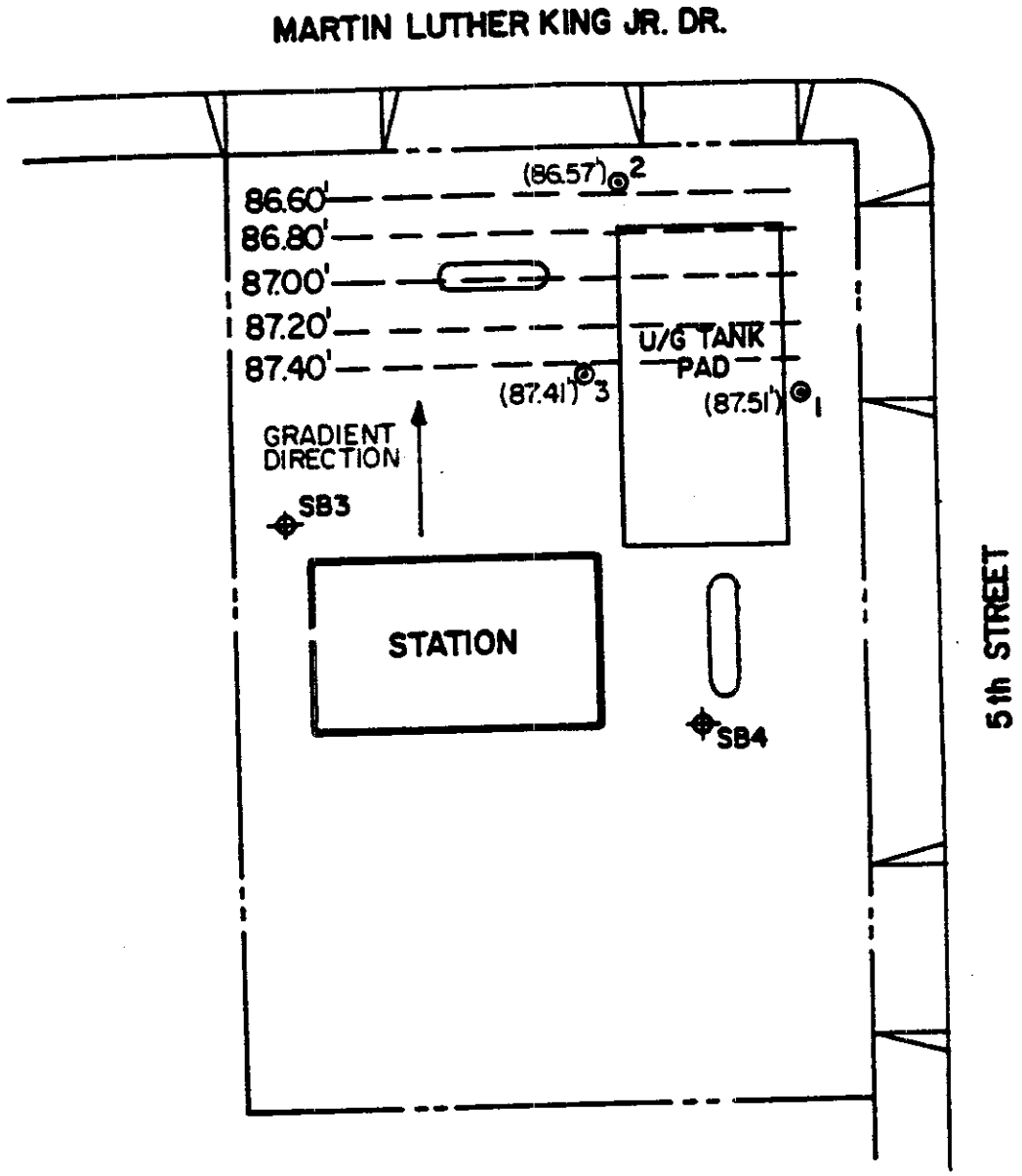
9/1/87

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER TECHNOLOGY



LEGEND
- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- ( ) GROUNDWATER ELEVATION
- — — GROUNDWATER CONTOUR

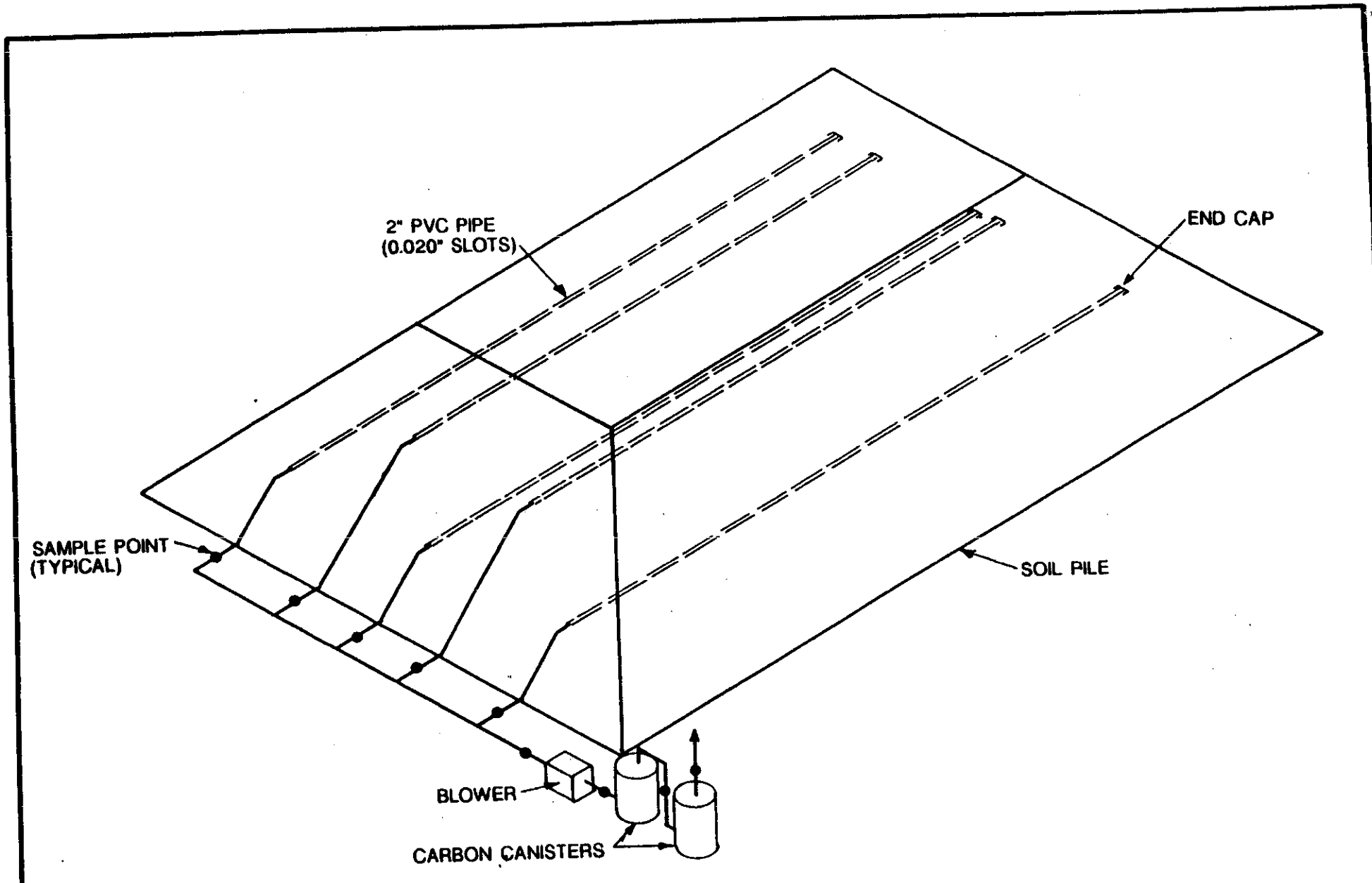
FIGURE 2
GROUNDWATER GRADIENT MAP
7/27/88

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER TECHNOLOGY

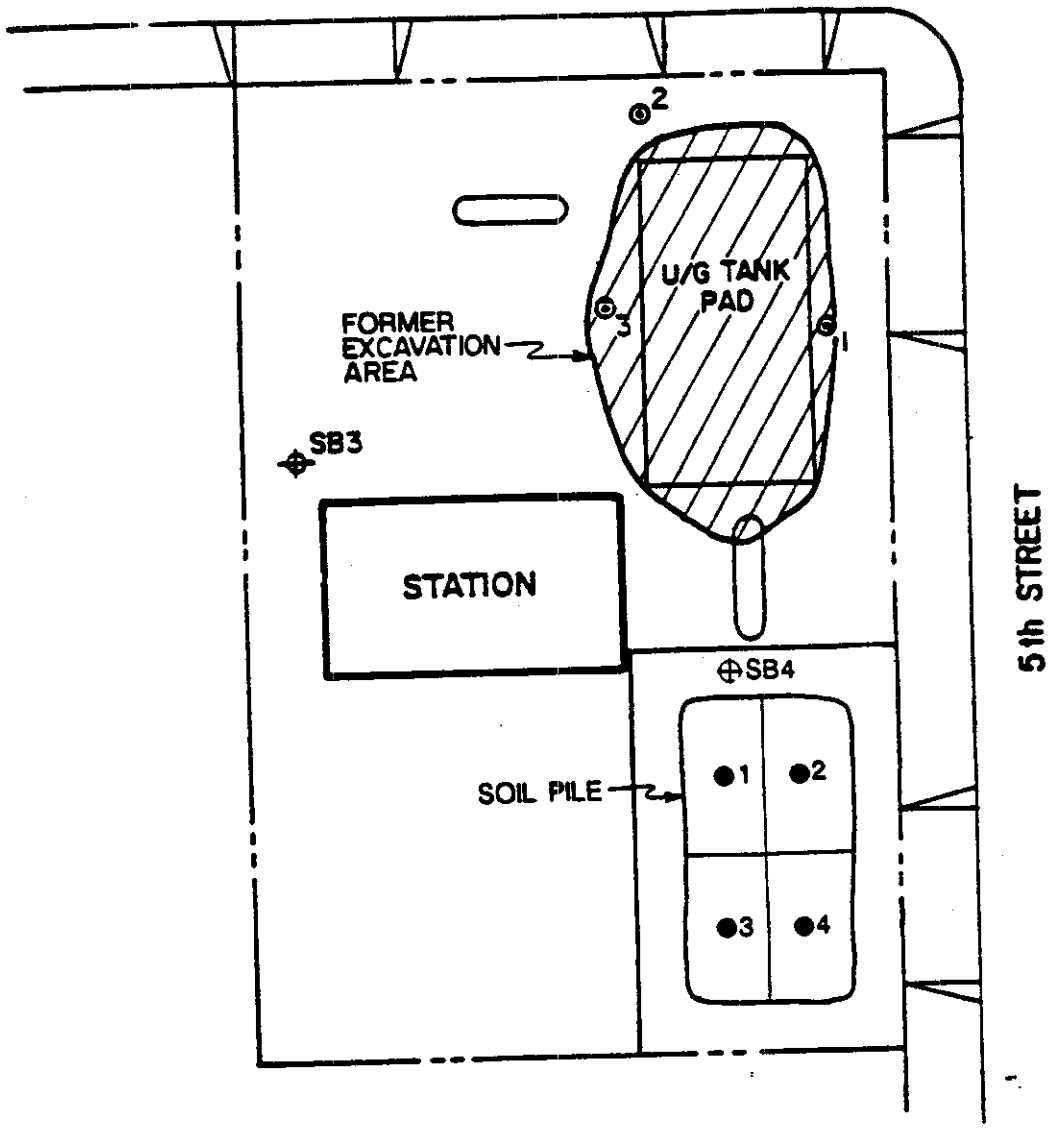


NO SCALE

FIGURE 3
SPATIAL ARRANGEMENT OF VENT LINES

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER
TECHNOLOGY, INC.



LEGEND
- MONITORING WELL
- SOIL BORING
- SOIL SAMPLE LOCATION

FIGURE 6
SOIL PILE SAMPLE LOCATIONS
FEB. 1 - MAY 9, 1989

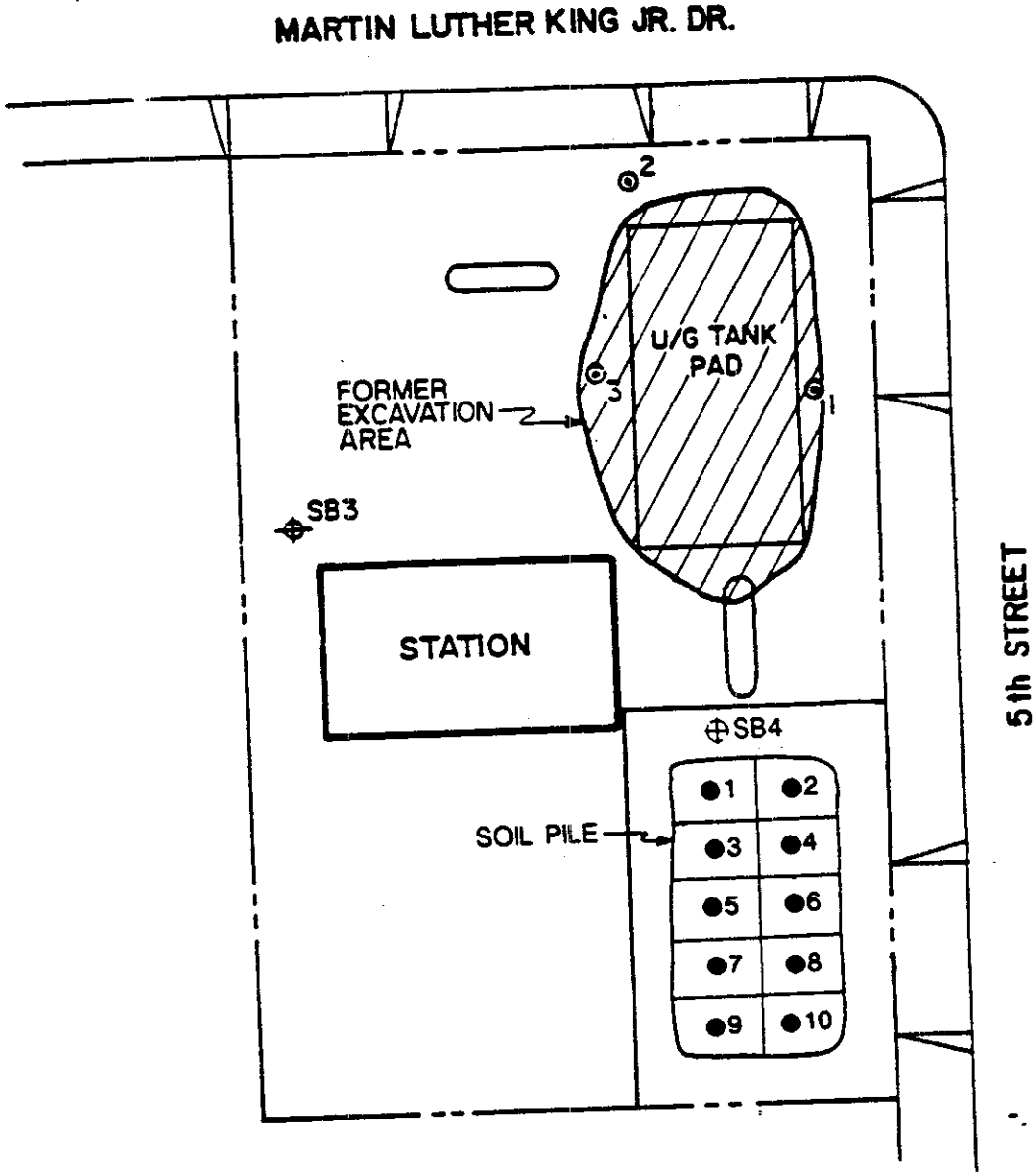
N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

ML 5/90

GROUNDWATER TECHNOLOGY, I



LEGEND
- ⊙ MONITORING WELL
- ⊕ SOIL BORING
- ◐ SOIL SAMPLE LOCATION

FIGURE 7
SOIL PILE SAMPLE LOCATIONS
MAY 31 - JUNE 22, 1989

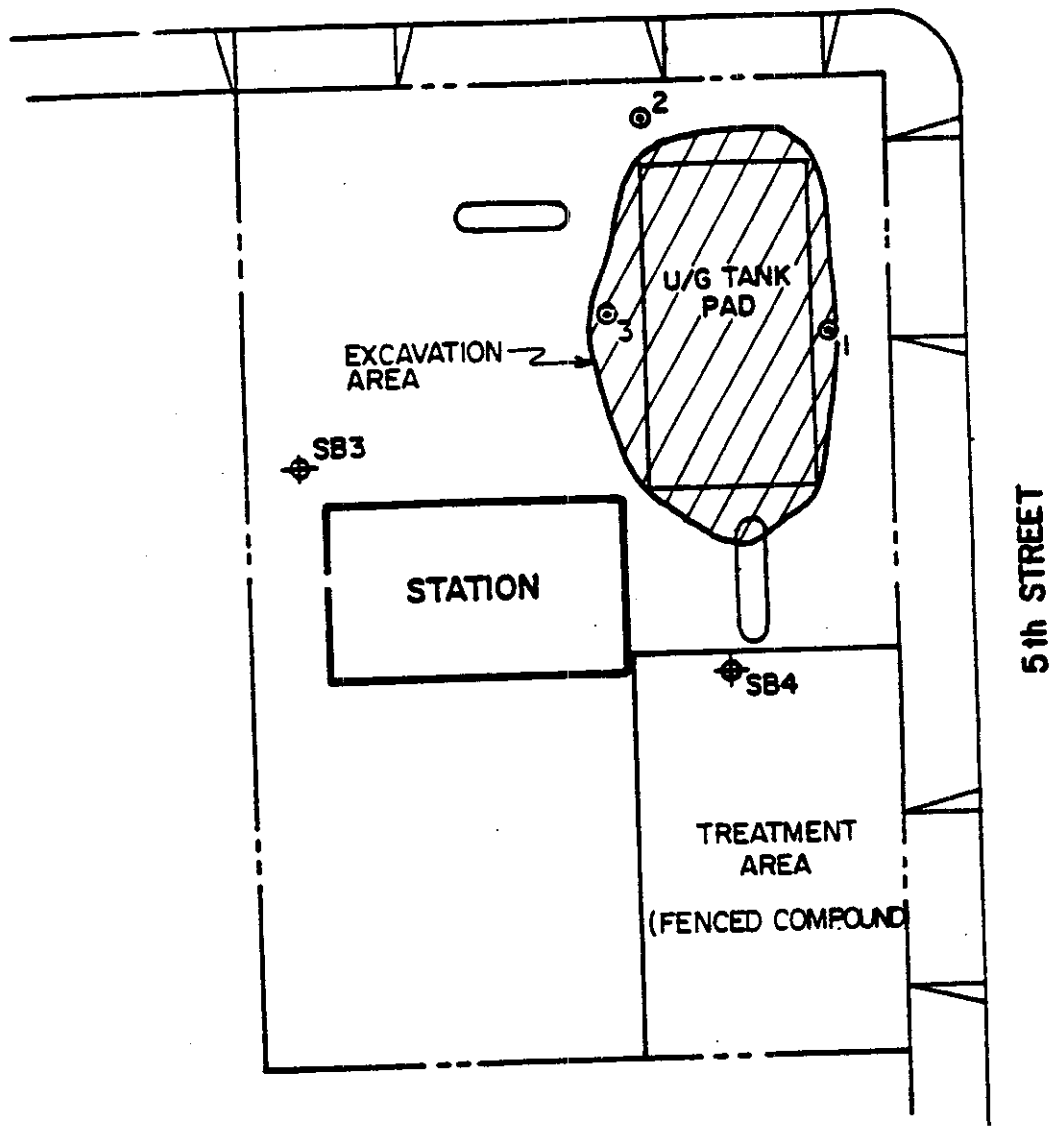
N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

ML 5/90

GROUNDWATER TECHNOLOGY, I



LEGEND
- ⊙ MONITORING WELL
- ⊕ SOIL BORING

FIGURE 4
EXCAVATION PLAN

N

0 FEET 30

TEXACO REFINING
& MARKETING INC.
OAKLAND, CALIFORNIA

GROUNDWATER TECHNOLOGY