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REPORT
SUBSURFACE HYDROCARBON INVESTIGATION
1088 MARINA BOULEVARD
SAN LEANDRO, CALIFORNIA
[redacted] 15, 1987

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

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OIL RECOVERY SYSTEMS
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REPORT
SUBSURFACE HYDROCARBON INVESTIGATION
1088 MARINA BOULEVARD
SAN LEANDRO, CALIFORNIA
MAY 15, 1987

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R20-8224

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REPORT
SUBSURFACE HYDROCARBON INVESTIGATION
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INTRODUCTION

This report presents the results of Groundwater Technology, Inc's hydrogeologic investigation and site assessment at the Econo Gas station located at 1088 Marina Boulevard in San Leandro, California. (See Figure 1 - Site Location Map). Groundwater Technology was retained by Kayo Oil to perform the investigation and provide an assessment of potential subsurface contamination by petroleum hydrocarbons following a replacement of the underground storage tanks in January and February 1987.

BACKGROUND

SITE SETTING

The project site is located approximately two miles east of the San Francisco Bay in San Leandro, California. The closest open water body is the San Leandro Creek which flows generally westward toward San Francisco Bay and is located approximately one mile north of the site. A historic alluvial fan deposited by this creek has created the present surface topography which slopes gently toward the southwest in the vicinity of the site. The site is at an elevation of approximately 35 feet (National Geodetic Vertical Datum, 1929).

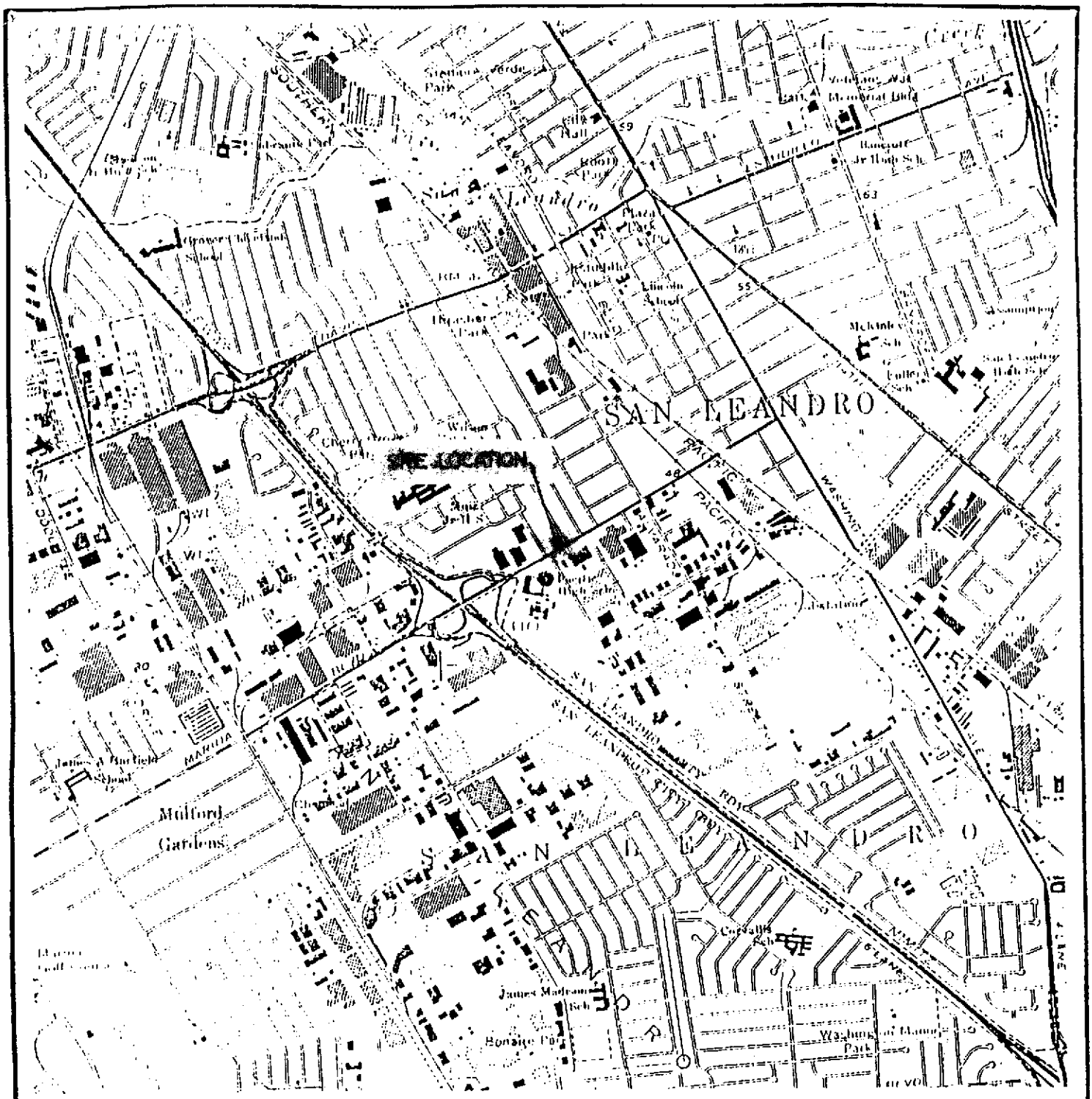


FIGURE 1
SITE LOCATION MAP

KAYO OIL CO.
SAN LEANDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY

Land use in the area of the site is a mixture of commercial and residential buildings. A one half mile radius of the site is occupied by single and multi-family residential homes, three schools, a shopping center, office buildings and many small businesses.

PREVIOUS WORK

On 21 January 1987, the following four underground fuel storage tanks were removed:

1) One waste oil tank.
2) One 7500 gallon Unleaded Gasoline Tank.
3) One 10,000 gallon Super Gasoline tank.
4) One 10,000 gallon Regular Gasoline tank.

CHIPS Environmental Consultants (CEC) were on-site during the tank excavation to retrieve soil samples per local regulations. The initial set of analyses reported hydrocarbon concentrations exceeding the action level of 1000 ppm, which typically warrants excavation as per San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-II) guidelines.

Excavation of additional material from the tank pit was conducted and a second set of soil samples were received by CEC on 22 January 1987. Analysis of those soil samples reported all levels below 1000 ppm, although two samples were above 100 ppm which requires the installation of a monitoring well for ground-

water quality verification per RWQCB-II's guidelines. The results of CEC's work is presented in their two letters to Kayo Oil dated 22 January 1987, and 23 January 1987.

SCOPE OF WORK

The purpose of this investigation was to provide a general assessment of potential hydrocarbon contamination underlying the site. Specifically, our scope of services was as follows:

- Explore the subsurface soil and groundwater conditions by drilling, logging and sampling five soil borings at various locations on the site.

- Conduct Laboratory analyses of the one soil sample per boring which exhibited the highest hydrocarbon concentration as determined by field screening utilizing a photoionization detection (PID) for volatile hydrocarbons and visual analysis. The samples were analyzed for total petroleum hydrocarbons (THC), benzene, toluene, xylene (BTX) and total lead concentrations.

- Convert the five soil borings into monitoring wells.

- Develop the monitoring wells to enhance the hydraulic communication with the aquifer prior to obtaining groundwater samples for laboratory analyses of THC and BTX.

- Survey well head elevations and monitor groundwater levels to establish a groundwater gradient.

- Conduct a site sensitivity analysis based upon environmental, hydrogeologic and political factors.

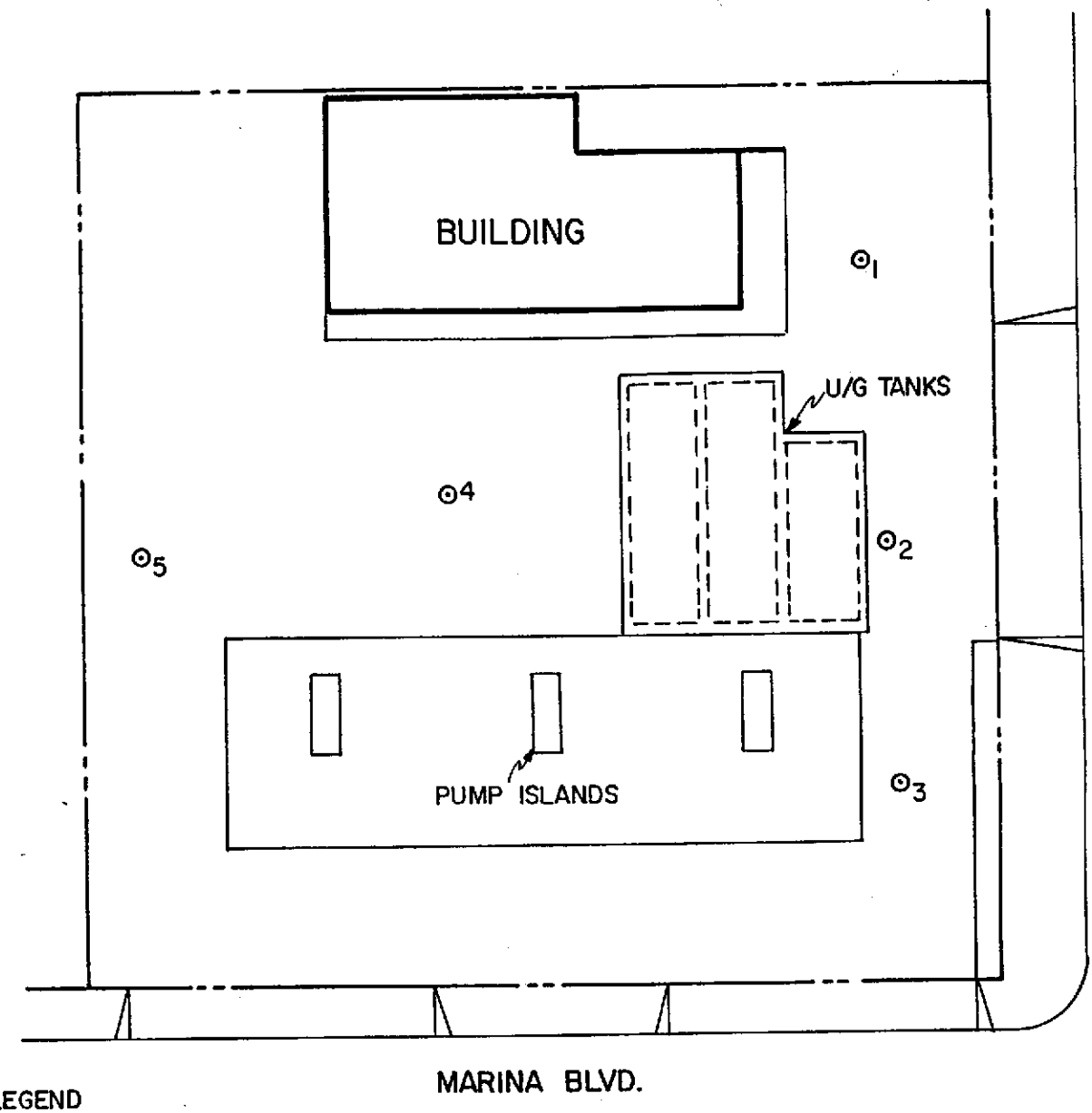
- Present the results of our investigation and findings in a report with a summary of work performed.

SOIL BORINGS

The purpose of the soil borings was to explore the site for the presence of subsurface hydrocarbon contamination, and to obtain a preliminary definition of the vertical and areal extent of the contamination, should any be found. The borings were located as per Kayo Oil's direction, to explore near the underground tanks and pump island in the assumed down gradient direction. (See Figure 2, Site Plan).

All of the soil borings were drilled with a truck mounted drill rig using 7.5 inch O.D. (outside diameter) hollow stem augers. The drilling was performed under the direction of a field geologist who also maintained a continuous log of the materials encountered (See Appendix I, Drill Logs).

The soil from the borings was left on-site for disposal at a later date pending the results of laboratory testing.



LEGEND

⊙ MONITORING WELL

FIGURE 2

SITE PLAN

N

0 FEET 30

KAYO OIL CO.
SAN LEANDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY

SOIL SAMPLING

Soil samples were obtained during drilling using a 2.5 inch O.D. split spoon sampler lined with three, 2 inch by 6 inch, brass sample tubes. The sampler was driven eighteen inches at each sampling point. Samples were collected at five foot intervals beginning from 3.5 feet below the ground surface to the bottom of each boring. The collected samples were sealed, capped and packed on ice in an insulated cooler for subsequent delivery to the laboratory for analysis. Each sample was labeled with the boring number, sample designation number, time of day and depth. All samples remained in the possession of the field geologist until delivery to the laboratory. A Chain-of-Custody manifest was included with the samples at all times (See Appendix II, Standard Operating Procedures).

SOIL SAMPLE ANALYSIS

The soil sample analyses were performed by Groundwater Technology Environmental Laboratory in Concord, California. The soil samples were analyzed for total lead, benzene, toluene, ethylbenzene, and total petroleum hydrocarbon concentrations. Analysis of hydrocarbons was performed by purge and trap gas chromatography, with flame-ionization detection and photo-ionization detection as per a modified EPA Method 5030/8020/8015. Total hydrocarbon concentrations are a laboratory summation of Total BTEX and Miscellaneous Aromatics. Analyses of lead concentrations were conducted in accordance with EPA Method 3050/7420.

MONITORING WELL INSTALLATION

All of the borings were converted to groundwater monitoring wells immediately after drilling. The wells were constructed with two inch diameter PVC pipe and well screen. The 0.020 inch machine slotted, well screen was installed from the bottom of each boring to five feet below the ground surface. Blank casing was then installed to the surface. A well pack consisting of #2 Monterey sand was placed in the annulus (the space between the bore hole and well casing) from the bottom of each boring to approximately 3.5 feet below ground surface. The wells were completed with a bentonite seal, cement and a traffic rated street box to provide access to the well. (See Appendix I for well construction details).

WATER SAMPLING AND ANALYSES

On April 16, 1987 all of the wells were monitored for depth to water prior to well development and sampling. A hydrocarbon sheen and product droplets appeared in wells 2 and 3, therefore, they were not sampled on this date for laboratory analysis. Wells 1, 4 and 5 were developed by hand bailing and sampled with and EPA approved Teflon and glass sampler. The samples were collected in glass vials with Teflon caps in a manner such that no air was trapped inside. The samples were labeled immediately with job I.D., the sample number, date, time and type of analysis requested. The samples were then stored on ice in a thermally insulated cooler until delivery to Groundwater Technology Environmental Laboratory where they were then analyzed for BTEX and total hydrocarbons. Chain-of-Custody manifests were

completed and enclosed as required. (See Appendix II, Standard Operating Procedures 9, 10 and 11). Analyses were performed by purge and trap gas chromatography with photo-ionization and flame ionization detection as per a modified EPA Method 602.

Mr. Taylor from Kayo Oil requested that the two wells with a product sheen (numbers 2 and 3) also be sampled and submitted for analysis. On April 28, 1987, wells 2 and 3 were developed and sampled following the above mentioned procedures.

SURVEYING

All wells associated with the site were surveyed according to standard engineering practices for vertical control. The local groundwater gradient was determined by surveying the elevation of the top of each monitoring well casing and subtracting the measured depth to groundwater levels to obtain water elevations.

SITE CONDITIONS

GEOLOGY

The study area lies within the San Leandro Alluvial Cone which is located between the Diablo Mountains and the easterly shore of San Francisco Bay. The San Leandro Cone is composed of unconsolidated sediments of Quaternary age deposited by the San Leandro Creek. The creek deposited sands and gravels in its braided channel and during times of flood flow, the overbank spread of water deposited finer grained silts and clays. These sediments were derived from erosion of consolidated Cretaceous

age marine sediments which make up the highlands. Underlying the alluvium are older semi-consolidated deposits of Tertiary-Quarternary sediments.

The subsurface materials encountered in the borings drilled for this investigation consisted of; a stiff, silty clay to the depths explored, 25 feet, in monitoring wells 1 and 2; a stiff silty clay with a gravelly sand lense from 15 to 18 feet in MW-3; a stiff silty clay with a sandy clay lense from 9 to 16 feet in MW-4; and a stiff silty clay with a clayey sand lense from 10 to 15 feet in MW-5.

HYDROGEOLOGY

The San Leandro Alluvial cone is composed of inter-layered deposits of relatively impervious clay and permeable alluvial sands and gravels which form a series of small confined aquifers with limited lateral extent.

Recharge in the area is poorly understood, but streamflow from the apex of the cone is the most probable source. The northwesterly trending Hayward fault, located at the base of the mountains to the east of the site, provides a lateral barrier to deep groundwater movement.

A shallow unconfined groundwater system was encountered during drilling in the lower stiff silty clay unit in all borings at a depth of approximately twenty feet below grade. However, as shown in the following Table I the water level had risen to a depth of about 14 feet below grade by 16 April 1987.

TABLE I

GROUNDWATER MONITORING

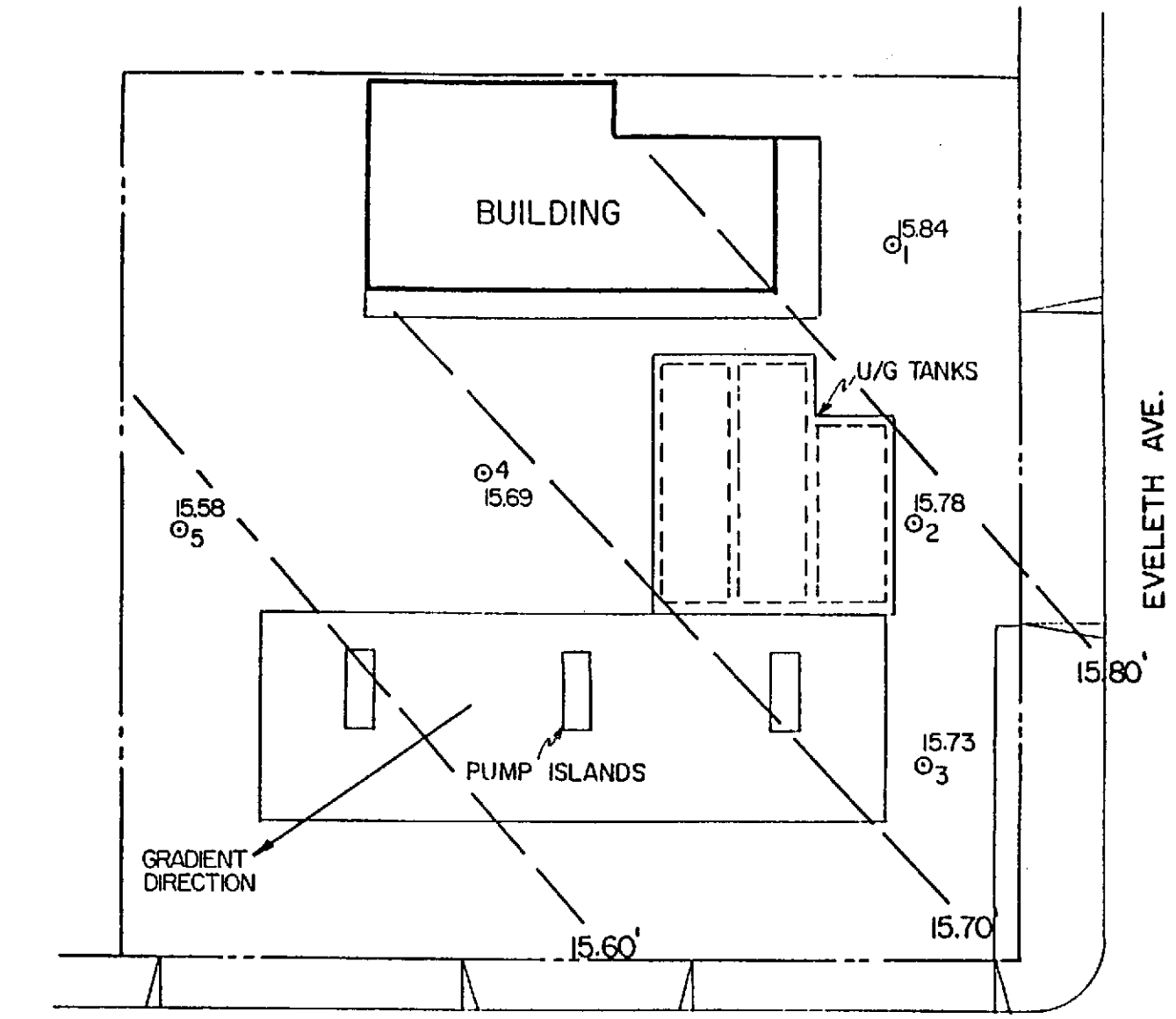
APRIL 16, 1987

	WELL HEAD ELEVATION	ADJUSTED PRODUCT THICKNESS	ADJUSTED DEPTH TO WATER (ft)	WATER ELEVATION (ft)
MW-1	29.89	-	14.05	15.84
MW-2	29.57	[illegible]	13.79	15.78
MW-3	29.13	[illegible]	13.40	15.73
MW-4	29.72	-	14.03	15.69
MW-5	29.55	-	13.97	15.58

Although a sheen was observed on MW-2 and 3, measurable free product was not encountered in the monitoring wells on April 16, 1987.

The groundwater gradient appears to flow to the southwest, however, additional monitoring is necessary to verify that this is the true local gradient (See Figure 3, Groundwater Gradient Map).

Research of available records for the presence of water wells in the area indicates that approximately 17 wells exist within a 1/2 mile radius of the site. (See Figure 4, Well locations). The recorded applications of these wells are for both irrigation and domestic use with total depths ranging from 30 to 350 feet below ground surface.



LEGEND

⊙ MONITORING WELL

FIGURE 3

GROUNDWATER GRADIENT MAP

APRIL 16, 1987

N

0 FEET 30

KAYO OIL CO.
SAN LEANDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY

SOIL CONTAMINATION

Analysis of the data collected during the subsurface investigation at the San Leandro station indicates that contamination is present in the soils beneath the site. Hydrocarbon odors were noted starting at depths of nine feet and continuing to seventeen feet below grade. The strongest odors were noted at the water table at approximately fourteen feet below grade (See Appendix I, Drill Logs).

Field screening of volatile organic vapor concentrations was performed using a HNU-101 photoionization detector (PID). The measured concentrations ranged from 0 to greater than 2000 ppm (2000 ppm is the instrument detection limit), which generally corresponds to the intensity of gasoline odor noted by field inspection.

The results of laboratory analyses of the soil samples are presented in Table II below and indicate the presence of hydrocarbons above the method detection limits in four of the five soil borings drilled for this investigation.

TABLE II

SOIL ANALYSES

BORING NUMBER	SAMPLE DEPTH (ft)	THC ppm	B ppm	T ppm	X ppm	Pb ppm
[illegible]-1	[illegible]	[illegible]	2.7	28.0	74.2	4
[illegible]-2	14	[illegible]	1.3	10.4	18.8	4
MW-3	14	ND	ND	ND	ND	6
[illegible]-4	[illegible]	[illegible]	16.8	179.1	427.3	7
[illegible]-5	[illegible]	[illegible]	7.9	91.6	228.2	5

NOTE: ND = below method detection limits of 1.0 ppm

The highest total hydrocarbon concentration was in the soil sample collected at the water table in MW-4, down gradient to the underground tanks. The sample analyzed at the water table east of the underground tanks, MW-3 contained non-detectable levels of THC and BTX concentrations. Minor amounts of total lead were detected in all borings and varied from 4 to 7 ppm. (See Appendix III, Laboratory Soil Analyses).

WATER CONTAMINATION

Laboratory analysis of the groundwater samples from all wells reported concentrations of total dissolved hydrocarbons and benzene, toluene and xylene above method detection limits. The laboratory test results for the analyses performed are presented in the following Table III and Appendix IV.

TABLE III

WATER ANALYSES

APRIL 16, 1987

SAMPLE NUMBER	THC ppm	B ppm		T ppm	X ppm
MW-1	17.3	2.3	2300	3.8	3.3
MW-4	19.3	5.9	5900	3.8	4.1
MW-5	17.7	2.3	2300	3.3	4.5
		APRIL 28, 1987			
MW-2	17.9	3.1		4.2	4.6
MW-3	10.0	1.4		2.4	2.6

NOTE: Laboratory Analyses were reported in ppb but were changed to ppm for comparison purposes

WATER QUALITY ANALYSES

Three analyses, Title 22-General Mineral, Total Plate Count and Total Iron Bacteria, were performed on a water sample collected from MW-1 to determine the inorganic and microbial constituents of the groundwater beneath the site. (See Appendix V, Water Quality Analyses). Examination of the Laboratory results shows a generally good water quality with a high iron content and the possibility of a scale formation or biofouling in pumping activity.

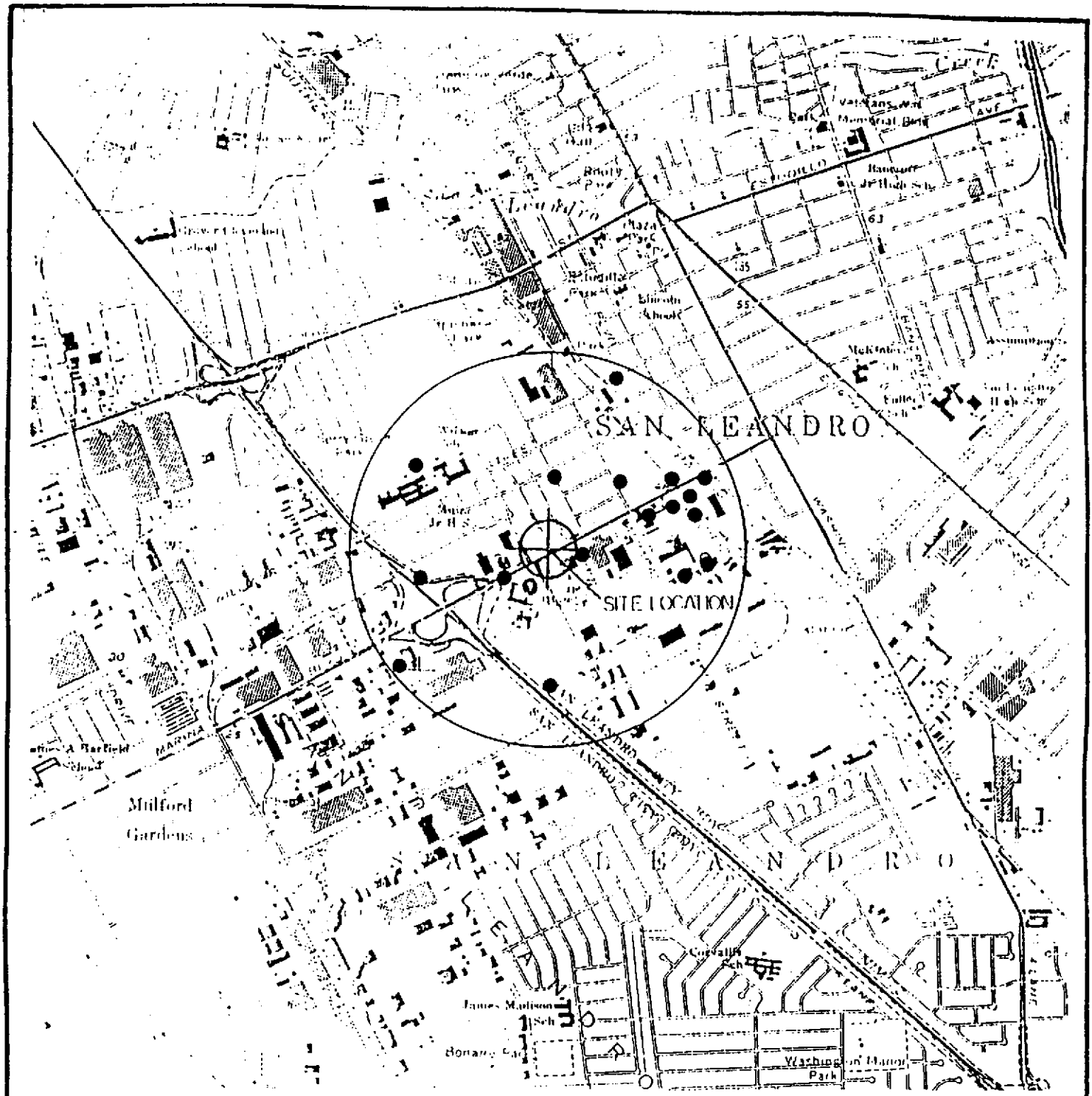


FIGURE 4
WELL LOCATIONS
(WITHIN 1/2 MILE RADIUS OF SITE)

KAYO OIL CO.
SAN LEANDRO, CALIFORNIA

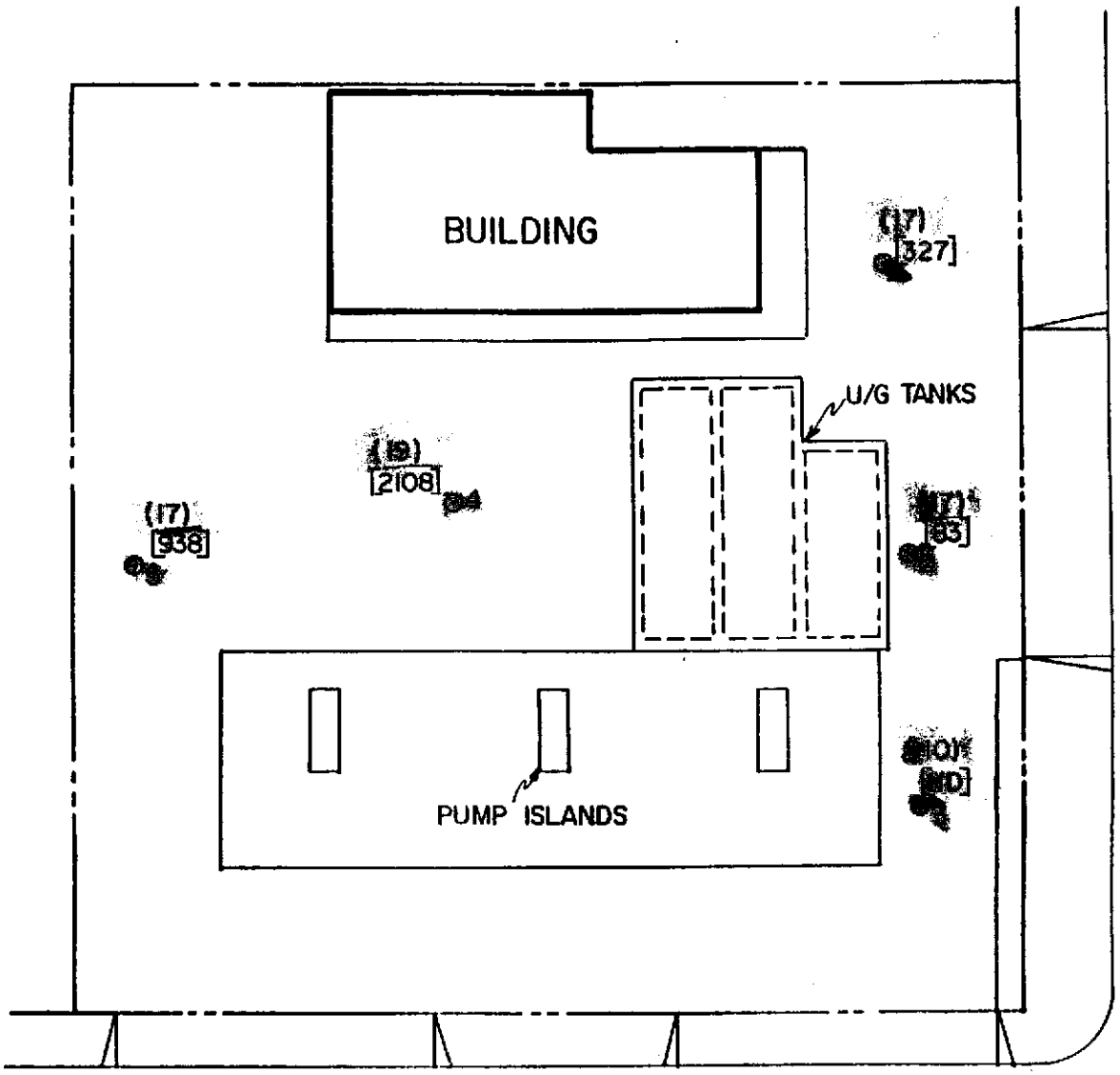
0 MILES 1

GROUNDWATER TECHNOLOGY

SUMMARY

Groundwater Technology's findings from both field observations and interpretations of the laboratory analyses are as follows:

- A shallow unconfined groundwater system exists at approximately fourteen feet below grade.
- The local groundwater gradient is to the southwest following the topographic expression.
- Hydrocarbon odors were noted during drilling at depths of nine to seventeen feet below grade with the strongest odors at the water table.
- Laboratory analyses of the soil samples detected total hydrocarbon concentrations ranging from 83 to 2108 ppm in MW 1, 2, 4, and 5 at fourteen feet below grade. (See Figure 5, Contamination Map).
- Measurable free product was not encountered in the monitoring wells on April 16, 1987.
- Dissolved hydrocarbon concentrations of 10.0 to 19.3 ppm were detected by Laboratory analyses in all groundwater samples. (See Figure 5, Contamination Map).



LEGEND

⊙ MONITORING WELL

(17) DISSOLVED HYDROCARBONS ppm water

[938] ADSORBED HYDROCARBONS ppm soil

FIGURE 5

CONTAMINATION MAP

N

0 FEET 30

KAYO OIL CO.
SAN LEANDRO, CALIFORNIA

GROUNDWATER TECHNOLOGY

CLOSURE

Groundwater Technology would like to thank Kayo Oil Company for the opportunity to conduct this site assessment.

Should you have any questions or require additional information with respect to this site, please contact us.

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well [redacted]

Drilling Log

Project Kayo Oil/San Leandro Owner Kayo Oil Co.

Location San Leandro, CA Project Number 20-8224

Date Drilled 3/30/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation ____ Water Level, Initial [redacted]

Screen: Dia. 2 in. Length 20 ft. Slot Size .020 in.

Casing: Dia. 2 in. Length 10 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Mel Isom Log by Eric Schniewind

Sketch Map

See Site Map

Notes

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification
0					4 inch Asphalt over 8 inch base course
2					Black mottled silty clay with trace organics (medium stiff, slightly moist, no product odor)
4		600	A 3 3 4	CH	
6					
8			B 4 4 7		Green silty clay (stiff, slightly moist, no product odor)
10		600			
12					
14		>2000	C 2 3 4	CH	(grades with [redacted] gravels) (moderate-strong product odor)
16					
18			D 3 7 8		(grades green-brown)
20		300			Encountered water 3/30/87 (grades brown)
22					
24		300	E 3 4 6		

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GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 1

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Brown silty clay (cont'd)
28				CH	
30					End of boring, installed monitor well
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well

Drilling Log

Project Kayo/San Leandro Owner Kayo Oil Co

Location San Leandro, CA Project Number 20-8224

Date Drilled 3/30/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation Water Level, Initial 19 ft. 24-hrs.

Screen: Dia. 2 in. Length 20 ft. Slot Size .020 in.

Casing: Dia. 2 in. Length 10 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Mel Isom Log by Eric Schniewind

Sketch Map

See Site Map

Notes

Depth of hole

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification
0					4 inch Asphalt over 8 inch base course
2					Black-brown silty clay (stiff, slightly moist, no product odor)
4		500	A 3 5 5		
6					(grades green-brown)
8		500	B 3 3 3	CH	(grades with [redacted])
10					
12		>2000	C 3 3 3		(moderate product odor)
14					
16					
18		700	D 3 6 10		▼ Encountered water 3/30/87 (1435 hours)
20					Green silty clay (stiff, [redacted], no product odor)
22				CH	
24		600	E 3 4 6		

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 2

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Green silty clay (cont'd)
28				CH	
30					End of boring, installed monitor well
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well [redacted]

Drilling Log

Project Kayo San Leandro Owner Kayo Oil Co.

Location San Leandro, CA Project Number 20-8224

Date Drilled 3/30/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation ____ Water Level, Initial 19 ft. 24-hrs ____

Screen: Dia 2 in. Length 20 ft. Slot Size .020 in.

Casing: Dia 2 in. Length 10 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Mel Isom Log by Eric Schniewind

Sketch Map

See Site Map

Notes

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification
0					4 inch Asphalt over 8 inch base course
2		50	A 7 10 7	CH	**Black silty clay** with trace organics (stiff, slightly moist, no product odor)
4					(grades brown)
6					
8		100	B 3 6 7		
10					**Green silty clay** (stiff, slightly moist, no product odor)
12				CH	
14		>2000	C 3 6 8		
16					Green gravelly fine sand (medium dense, moist, [redacted] odor)
18		300	D 2 3 5		Green-brown silty clay (stiff, [redacted], no product odor)
20				CH	▼ Encountered water 3/30/87 (1645 hours)
22					
24		300	E 6 10 16		(grades with trace gravel)

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 3

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Green-brown silty clay (cont'd)
28				CH	
30					End of boring, installed monitor well
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well

Drilling Log

Project Kayo San Leandro Owner Kayo Oil Co.

Location San Leandro, CA Project Number 20-8224

Date Drilled 3/31/87 Total Depth of Hole 30 ft. Diameter 7.5 in.

Surface Elevation Water Level, Initial 21 ft. 24-hrs.

Screen: Dia. 2 in. Length 20 ft. Slot Size .020 in.

Casing: Dia. 2 in. Length 10 ft. Type PVC

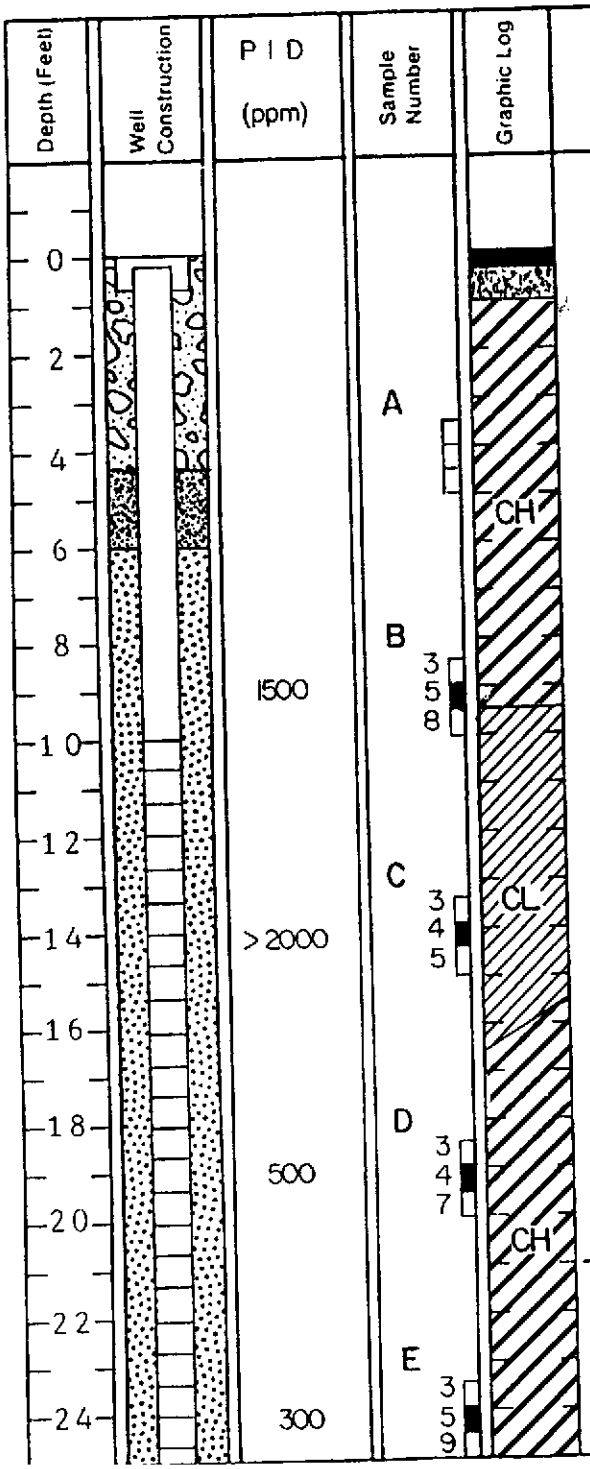
Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger

Driller Mel Isom Log by Eric Schniewind

Sketch Map

See Site Map

Notes



Description/Soil Classification

4 inch Asphalt over 8 inch base course

Black silty clay with trace gravel (stiff, slight moist, no product odor)

(no sample recovered due to obstruction by old concrete and wood fragments)

Green, fine sandy clay (stiff, slightly moist, [illegible] product odor)

Green-brown silty clay (stiff, moist [illegible] product odor)

▼ Encountered water 3/31/87 (1020 hours)

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 4

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Green brown silty clay (cont'd)
28				CH	
30					End of boring, installed monitor well
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 6

Drilling Log

Project Kayo San Leandro Owner Kayo Oil Co.
Location San Leandro, CA Project Number 20-8224
Date Drilled 3/31/87 Total Depth of Hole 30 ft. Diameter 7.5 in.
Surface Elevation Water Level, Initial 19 ft. 24-hrs.
Screen: Dia. 2 in. Length 20 ft. Slot Size .020 in.
Casing: Dia. 2 in. Length 10 ft. Type PVC
Drilling Company Sierra Pacific Drilling Method Hollow Stem Auger
Driller Mel Isom Log by Eric Schniewind

Sketch Map: See Site Map

Notes:

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification
0					4 inch Asphalt over 8 inch base course
2					Black silty clay (very stiff, slightly moist, no product odor)
4		700	A 5, 10, 13	CH	
6					Brown-green silty clay (stiff, slightly moist, no product odor)
8				CH	
10		700	B 3, 2, 6		Green clayey sand (loose, moist, no product odor)
12				SC	
14		>2000	C 2, 3, 4		Green-brown silty clay (stiff, moist, [redacted] product odor)
16					
18		500	D 2, 4, 7	CH	Encountered water 3/31/87 (1210 hours)
20					
22					
24		>2000	E 2, 3, 4		(slight product odor)

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GROUNDWATER TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Monitoring Well 5

Drilling Log

Depth (Feet)	Well Construction	PID (ppm)	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
26					Green-brown silty clay (cont'd)
28				CH	
30					End of boring, installed monitor well
32					
34					
36					
38					
40					
42					
44					
46					
48					
50					
52					
54					
56					
58					

GROUNDWATER TECHNOLOGY
STANDARD OPERATING PROCEDURE
CONCERNING GROUNDWATER MONITORING
SOP 8

Groundwater monitoring of wells at the site shall be conducted using an ORS Interface Probe and Surface Sampler. The Interface Probe is a hand held, battery operated device for measuring depth to petroleum product and depth to water as measured from an established datum (i.e., top of the well casing which has been surveyed). Product thickness is then calculated by subtracting the depth to product from the depth to water. In addition, water elevations are adjusted for the presence of fuel with the following calculation:

(Product Thickness)(.8)+(Water Elevation)
= Corrected Water Elevation

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

The Interface Probe consists of a dual sensing probe utilizing an optical liquid sensor and electrical conductivity to distinguish between water and petroleum products. A coated steel measuring tape transmits the sensor's signals to the reel assembly, where an audible alarm sounds a continuous tone when the sensor is immersed in petroleum product and an oscillating tone when immersed in water. The Interface Probe is accurate to 1/16-inch.

A Surface Sampler shall be used for visual inspection of the groundwater to note sheens (difficult to detect with the Interface Probe), odors, microbial action, etc.

The Surface Sampler used consists of a 12-inch long cast acrylic tube with a Delrin ball which closes onto a conical surface creating a seal as the sampler is pulled up. The sampler is calibrated in inches and centimeters for visual inspection of product thickness.

To reduce the potential for cross contamination between wells the monitorings shall take place in order from the least to most contaminated wells. Wells containing free product should be monitored last. Between each monitoring the equipment shall be washed with laboratory grade detergent and double rinsed with distilled water.

GROUNDWATER TECHNOLOGY
STANDARD OPERATING PROCEDURE
CONCERNING WATER SAMPLING METHODOLOGY
SOP 9

Prior to water sampling, each well shall be purged by pumping a minimum of four well volumes or until the discharge water indicates stabilization of temperature, conductivity,and pH. If the well is evacuated before four well volumes are removed or stabilization is achieved, the sample should be taken when the water level in the well recovers to 80% of its initial level.

Retrieval of the water sample, sample handling and sample preservation shall be conducted in accordance with Groundwater Technology Laboratory Standard Operating Procedure (GTL SOP 10) concerning Sampling For Volatiles in Water". The sampling equipment used shall consist of a teflon and/or stainless steel samplers, which meets EPA regulations. Glass vials with teflon lids should be used to store the collected samples.

To insure sample integrity, each vial shall be filled with the sampled water such that the water stands above the lip of the vial. The cap should then be quickly placed on the vial and tightened securely. The vial should then be checked to ensure that air bubbles are not present prior to labeling of the sample. Label information should include a sample identification number, job identification, date, time, type of analysis requested and the sampler's name. Chain-of-Custody forms shall be completed as per Groundwater Technology Laboratory Standard Operating Procedure (SOP 11) concerning Chain of Custody.

The vials should be immediately placed in high quality coolers for shipment to the laboratory. The coolers should be packed with sufficient ice or freezer packs to ensure that the samples are kept below 4C. Samples which are received at the Groundwater Technology Laboratory above 10 C. will be considered substandard. To minimize sample degradation the prescribed analysis shall take place within seven days of sample collection unless specially prepared acidified vials are used.

To minimize the potential for cross contamination between wells, all the well development and water sampling equipment which contacts the groundwater shall be cleaned between each well sampling. As a second precautionary measure, the wells shall be sampled in order of increasing contaminant concentrations as established by previous analysis.

GT ENVIRONMENTAL LABORATORY (GTEL)
STANDARD OPERATING PROCEDURE
CONCERNING SAMPLING FOR VOLATILES IN WATER (DISSOLVED GASOLINE, SOLVENTS, ETC.).
SOP 10

1. Use only vials properly washed and baked, available from GTEL or I-Chem.

2. Use clean sampling equipment. Scrub with Alconox or equivalent laboratory detergent and water followed by a thorough water rinse. Complete with a distilled water rinse.

   Sampling equipment which has come into contact with liquid hydrocarbons (free product) should be regarded with suspicion. Such equipment should have tubing and cables replaced and all resilient parts washed with laboratory detergent solution, as above. Visible deposits may have to be removed with hexane. Solvent washing should be followed be detergent washing as above.

   This procedure is valid for volatile organics analysis only. For extractable organics (for example, pesticides, or base neutrals for EPA method 625) a final rinse with pesticide grade isopropyl alcohol, followed by overnight or oven drying, will be necessary.

3. Take duplicate samples for GTEL. Mark on forms as a single sample with two containers to avoid duplication of analysis.

4. Take a site blank using distilled water or known uncontaminated source. This sample will be run at the discretion of the project manager.

5. Fill out labels and forms as much as possible ahead of time. Use an indelible marker.

6. Preservatives are required for some types of samples. Use specially prepared vials from GTEL, marked as indicated below, or use the appropriate field procedure (SOP 12 for acidification). Make note on forms that samples were preserved. Always have extra vials in case of problems. Samples for volatile analysis should be acidified below pH 2 with hydocloric acid. Use vials with care and keep them upright. Eye protection, foot protection, and disposable vinyl gloves are required for handling. Samples designated for expedited service and analyzed within seven (7) days of sampling will be acceptable without preservation.

   Acid causes burns. Glasses or goggles (not contact lenses) are necessary for protection of the eyes. Flush eyes with water for 15 minutes if contact occurs and seek medical attention. Rinse off hands frequently with water during handling.

   For sampling chlorinated drinking water supplies for chlorinated volatiles, samples shall be preserved with sodium thiosulfate. Use vials labeled "CONTAINS THIOSULFATE". No particular cautions are necessary.

7. Fill vial to overflowing with water, avoiding turbulence and bubbling as much as possible. Water should stand above lip of vial.

8. Carefully but quickly slip cap onto vial. Avoid dropping the teflon septum from cap by not inverting cap until in contact with vial. Disc should have teflon face toward the water. Also avoid touching white teflon face with dirty fingers.

9. Tighten cap securely, invert vial and tap against hand to see that there are no bubbles inside.

10. Label vial using indelible ink as follows:

    a) Sample I.D. No.
    b) Job I.D. No.
    c) Date and Time.
    d) Type of analysis requested.
    e) Your name.

11. Unless the fabric type label is used, place scotch tape over the label to preserve its integrity.

12. For Chain of Custody reasons, sample vial should be wrapped end-for-end with scotch tape or evidence tape and signed with indelible ink where the end of the tape seals on itself. The septum needs to be covered.

13. Chill samples immediately. Samples to be stored should be kept at 4°C (39°F). Samples received at the laboratory above 10°C (as measured at glass surface by a thermocouple probe), after overnight shipping will be considered substandard, so use a high quality cooler with sufficient ice or freezer packs. (Coolers are available from GTEL).

14. Fill out Chain of Custody and Analysis Request form. (See Chain of Custody Procedures SOP 11).

GT ENVIRONMENTAL LABORATORY (GTEL)
STANDARD OPERATING PROCEDURE
CONCERNING CHAIN OF CUSTODY
SOP 11

1. Samples must be maintained under custody until shipped or delivered to the laboratory. The laboratory will then maintain custody. A sample is under custody if:

    a) It is in your possession
    b) It is in your view after being in your possession
    c) You locked it up after being in your possession
    d) It is in a designated secure area

2. Custody of samples may be transferred from one person to the next. Each transferee and recipient must date, sign and note the time on the chain of custody form.

3. In shipping, the container must be sealed with tape, bearing the sender's signature across the area of bonding at the ends of the tape in order to prevent undetected tampering. Each sampling jar should be taped and signed as well. Scotch tape works well.

4. Write "sealed by" and sign in the Remarks box at the bottom of the form before sealing up the box. Place form in a plastic bag and seal inside the box.

5. The "REMARKS" section in the upper right part of the form is for documenting details such as:

    a) correlation of sample numbers if samples are split between labs.
    b) QC numbers when lab is logging in the samples.
    c) sample temperature and condition when received by lab.
    d) Preservation notation.
    e) pH of samples when opened for analysis (if acidified).
    f) Sampling observation or sampling problem

6. The chain of custody form should be included inside the shipping container. A copy should be sent to the project manager.

7. When the samples are received by the lab, the chain of custody form will be dated, signed, and a note of the time made by a laboratory representative. The form along with shipping bills and receipts will be retained in the laboratory files.

GT ENVIRONMENTAL LABORATORY (GTEL)
STANDARD OPERATING PROCEDURE
CONCERNING FIELD PRESERVATION OF BTX SAMPLES
BY ACIDIFICATION
SOP 12

If specially prepared acidified vials are not available, apply the following Field Procedures, using the field acidification kit. The kit contains:

a) 500 cc glass measuring cup or breaker.
b) dropping bottle of 50% hydrocloric acid or nitric acid.
c) narrow range pH paper, 1.0-2.5 pH range.
d) glass stirring rod.

1. Collect approximately 300cc of water in beaker. Try to minimize turbulence, bubbling, and time of exposure to the air.

2. For inorganic analysis: use 50% nitric acid
For volatile organic analysis: use 50% hydrocloric acid
Add 30 drops of 50% acid to measuring cup. Hold dropper completely vertically.

3. Gently mix with glass bar.

4. Remove bar and touch wetted tip to the pH paper and check color code to assure it is below pH 2. As more acid is added the pH goes lower. Discard used pH strip.

5. Add more acid if necessary. Too much acid is not a problem, just record how much was added (this will be helpful next time). Don't waste time trying to get it right - just add plenty of acid to get it below pH 2. Ideally, once you know how much acid needs to be added at one well, that amount will be sufficient for the rest. However, test the pH each time.

6. Pour the water into the vials prepared for that well and cap off with no bubbles inside. Again turbulence and bubbling are to be minimized. Also note that it is important that all of the vials for a given well be poured and sealed one right after another. Make sure the 300cc collected is enough to fill all of the vials with some to spare at the end. The volume collected can be increased but remember to proportionally increase the amount of acid added.

7. Acidification does not replace chilling. Always chill samples and ship via air for next day delivery.

GROUNDWATER TECHNOLOGY
STANDARD OPERATING PROCEDURE
CONCERNING MONITORING WELL INSTALLATION
SOP 13

The boreholes for the monitoring wells shall be drilled using a truck mounted hollow stem auger drill rig. The outside diameter (O.D.) of the auger should be a minimum of eight inches when installing 4-inch well screen. The hollow stem auger provides minimal interruption of drilling while permitting soil sampling at specific intervals.
Soil samples can be taken at desired depths by hammering a conventional split barrel sampler containing precleaned 2 inch brass sample tubes.

The construction details of the monitoring wells to be drilled at the site are graphically depicted in the attached figure titled "Typical Detail of Monitoring Well Construction" (See Figure 1). The wells should be constructed of 4 inch PVC, .020 inch machine slotted screen and blank casing. The screened portion of the well will extend 5 feet above and 10 feet below the present water table. An appropriate sand pack as determined by grain size analysis shall be placed in the annular space between the casing and drilled hole to inhibit silt buildup around the well. An annular seal installed above the sand pack should consist of bentonite pellets overlain by neat cement or cement grout to the surface. The wellhead shall be protected below grade within a traffic rated street box. Each well shall have a permanently attached identification plate containing the following information (1) Well Number, (2) Wellhead Elevation, (3) Depth of Well, (4) Screened Interval.

Subsequent to installation the wells shall be developed to remove silts and improve well performance. The well development shall be conducted by air lifting the water within the well until groundwater pumped from the wells is silt free.

To assure that cross contamination does not occur between the drilling and development of successive wells all equipment contacting subsurface soils or ground water shall be steam cleaned. The steam cleaned equipment should include but not limited to the following (1) Drilling Augers, (2) Split Barrel Sampler, (3) Groundwater Monitoring and Sampling Equipment, (4) Well Development Piping and Sparging Equipment.

GROUNDWATER TECHNOLOGY
STANDARD OPERATING PROCEDURE
CONCERNING SOIL SAMPLE COLLECTION AND
HANDLING WHEN SAMPLING FOR VOLATILE ORGANICS
SOP 15

1. Use a sampling means which maintains the physical integrity of the samples. The project sampling protocol will designate a preferred sampling tool. A split spoon sampler with liners or similar tube sampler which can be sealed is best.

2. At the discretion of the project manager, the samples should be either.

   A. sealed in liner with teflon plugs (The "California Sampler") or

   B. field prepped for sample analysis.

   Projects using method (A) will incur a separate sample preparation charge of $ 10.00 per sample in the laboratory. For method (B), prepared and pre-weighed vials, and sample coring syringes must be ordered at least 2 weeks ahead of time from the laboratory before sampling. (Vials are free if samples will be sent to Groundwater Technology Laboratory).

3. For sending whole-core samples (2A above):

   A. Seal ends of liner with teflon plugs leaving no free air space inside.

   B. Tape with duct tape.

   C. Cover with a non-contaminating sealant (paraffin).

   D. Place in plastic bag labeled with indelible marker. Use Well #, depth, date, and job #.

   E. Place inside a second bag and place a labelling tag inside outer bag.

   F. Enclose samples in a cooler with sufficient ice or dry ice to maintain samples at 4 degrees during shipment.

   G. Seal cooler with a lock or tape with samplers signature so tampering can be detected.

   H. Package cooler in a box with insulating material. Chain of custody forms can be placed in a plastic bag in this outer box.

I. If dry ice is used, a maximum of 5 pounds is allowed by Federal Express without special documents (documents are easy to obtain but just not necessary for under 5 pounds). Simply write "ORM-A dry ice," "_____ pounds, for research" on outside packaging and on regular airbill under classification. UPS does not accept dry ice.

J. Make yourself a supplies list necessary before going into the field.

K. Soil cores kept a 4 degrees C are only viable for up to 7 days when aromatic hydrocarbons are involved. The lab will prepare them in methanol as above once in the lab, but we will need a call ahead of time to schedule personnel.

4. For field-prepping (Step 2B above):

A. Obtain prepared sample containers from the laboratory. Order for # of samples intended and add 50%. This should be sufficient for QA requirements (below), breakage, and additional samples taken by discretion of sampler.

B. Organize containers consecutively - they are all numbered and pre-weighed. Make a necessary supplies list before going into the field.

C. For a 6" liner section retrieved from the spoon sampler, spread a 12" square piece of broiler (heavy) aluminum foil and slice it lengthwise with a clean stainless steel spatula.

D. Immediately sample with a coring syringe with plunger removed. Poke tube into mid-section of core (into undisturbed soil) to capture a 1/2 to 1 inch plug.

E. Immediately transfer to the sample vial with methanol by using plunger. Clean around lip of vial to remove soil with clean laboratory paper towelling

CAUTION: WORK ONLY IN WELL VENTILATED AREA. DO NOT BREATH METHANOL VAPOR. IT IS TOXIC. SEE MSDS ATTACHED.

and seal septum onto the vial with lid, teflon side (shiny) toward the sample. shake sample enough to break it up so that whole sample is immersed in methanol. The rapid progression of steps indicated here is necessary to prevent loss of volatiles from the soil. Do not leave vials unopened for any extended period - the methanol evaporates quickly. Grit left on threads of vial can cause vial to break.

F. * If required (see 5 below). Take a duplicate sample from the other half directly across from the first sample, or where ever undisturbed, yet representative soil occurs.

G. Label vial with legible information as follows:

1. Job name or number.

2. Date.

3. Time.

4. Depth and well number.

5. Samplers initials.

H. Tape vial across septum with scotch tape and around cap and sign on the tape with indelible ink to prevent tampering.

I. Wrap up a representative section of the core equivalent in volume to cube 3 cm on a side in the aluminum foil square, discarding the rest appropriately. Seal in saran wrap. This section is for dry weight determination. Close it in plastic bag with a tag or write on the bag with an indelible marker. These samples go into a separate cooler or box and not with the vials. The cooler for dry weight samples need not be iced, but overnight delivery is requested.

J. Discard plastic coring syringe, clean the spatula, and get clean equipment ready for next sample.

K. Ice the sample vials immediately and keep them iced through shipment.

L. Fill out chain of custody form. SOP 11 gives major details. Make sure sample requests is for proper analysis type.

M. Shipping of hazardous materials (methanol) requires special documents from Federal Express and UPS. Have this all arranged ahead of time (once set up with documents, the actual process will be little different than normal). Briefly you will need to add following to outside of package and on documents:

1. Flammable liquid label (some will come from lab with the vials).

2. "UN1230 methyl alcohol".

3. For UPS, a "Hazardous Material" label.

N. Ship overnight delivery to the lab. If dry ice is available, up to 5 pounds per package can be sent via Federal Express by simply writing "ORM-A dry ice", "_____ pounds, for research" on outside of package and on shipping document. UPS does not accept dry ice shipments.

5. Good sampling practice would include preparing 1 out of 5 samples to be prepared in duplicates for analysis. These 4 out of 20 samples will be for the following purposes.

A. One in every 20 samples should be analyzed as a field replicate to evaluate the precision of the sampling technique. A minimum of 1 sample per data set is suggested.

B. An additional 1 in 20 samples should be selected by sampler to be prepared in duplicate as alternative to Step (A). Choose a different soil type if available.

C. The lab does spiking with reference materials for internal QC so additionally a minimum of 2 in 20 samples need to be prepared in duplicate.

6. Other QC procedures can be specified at the project manager's discretion. See Table 3-2 (reference 2) attached.

7. Decontamination of equipment in the field requires a detergent wash, a water rinse, and spectrographic quality acetone rinse followed by distilled water.

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REFERENCES

1. Soil Sampling Quality Assurance Users Guide, U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-84-043, May 1984.

2. Preparation of Soil Sampling Protocol. Techniques and Strategies, U.S. EPA, Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-83-020, August 1983 (PB83-206979).

3. Test Methods for Evaluating Solid Waste, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, D.C., SW 846, July 1982.

GT Environmental Laboratories
A division of Groundwater Technology, Inc.

Western Region
4080-C Pike Ln., Concord, CA 94520
(415) 685-7852
(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*

04/09/87
PROJECT MGR: Joyce Miley
Groundwater Technology, Inc
4080 Pike Lane
Concord, CA. 94520
PROJECT #:20-8224-1
LOCATION: San Leandro, CA.
SAMPLED: 3/30-31/87 BY:E.Schniewind
RECEIVED: 04/02/87 BY: E.Foley
ANALYZED: 04/07/87 BY: J.Floro
MATRIX: Soil

TEST RESULTS (ppm)

COMPOUNDS	LAB # / I.D.#	1422 / MW1-C	1423 / MW2-C	1424 / MW3-C	1425 / MW4-C	1426 / MW5-C
Benzene		2.7	1.3	<1.0	16.8	7.9
Ethylbenzene		12.6	3.1	<1.0	80.7	40.9
Toluene		28.0	10.4	<1.0	179.1	91.6
Xylenes		74.2	18.8	<1.0	427.3	228.2
Total BTEX		117.5	33.6	<1.0	703.9	368.6
Chlorobenzene		--	--	--	--	--
1,2 DCB		--	--	--	--	--
1,3 DCB		--	--	--	--	--
1,4 DCB		--	--	--	--	--
MEK		--	--	--	--	--
MIBK		--	--	--	--	--
Misc.Aromatics		209.8	49.4	<1.0	1404	569.0
Total Hydrocarbons		327.3	83.0	<1.0	2108	937.6

-- = Not Requested. < = Method Detection Limit-Compound below this level would not be detected. MEK = Methyl Ethyl Ketone MIBK = Methyl Isobutyl Ketone

METHODS: Modified EPA Method 5030/8020/8015.
Total Hydrocarbons is the summation of Total BTEX and Miscellaneous Aromatics.
Sample #1426 was confirmed by GCMS.

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(800) 423-7143 *from outside California*

04/28/87
PROJECT MGR: Joyce Miley
Groundwater Technology, Inc.
1080 Pike Lane
Concord, CA, 94520
PROJECT #:20-8224-3
LOCATION: San Leandro, CA.
SAMPLED: 04/02/87 BY: J.Miley
RECEIVED: 01/21/87 BY: V.Adams
ANALYZED: 04/27/87 BY: C.Gurgui's
MATRIX: Soil

TEST RESULTS (ppm)

COMPOUNDS	LAB # / I.D. #	1422 MW-1C	1423 MW-2C	1424 MW-3C	1425 MW-4C	1426 MW-5C	
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Cobalt							
Copper							
Gallium							
Germanium							
Gold							
Iron							
Lead		1	4	6		5	
Lithium							
Magnesium							
Manganese							
Molybdenum							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Strontium							
Thallium							
Tin							
Tungsten							
Vanadium							
Zinc							
Zirconium							

N.R. = Not Requested. M.D.L. = Method Detection Limit - Compound below this level could not be detected.
Methods: EPA 3050, 7420.

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A division of Groundwater Technology, Inc.

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Joyce Miley
Groundwater Technology, Inc.
4080-D Pike Lane
Concord, CA. 94520
04/24/87
PROJECT # 20-8224-2
LOCATION: San Leandro, CA.
SAMPLED: 04/16/87
BY: E.Schniewind
RECEIVED: 04/17/87
BY: A.Adams
ANALYZED: 04/22/87
BY: J.Floro
MATRIX: Water

TEST RESULTS (ppb)

COMPOUNDS	LAB # I.D.#	1853 MW 1	1854 MW 4	1855 MW 5			
Benzene		2313	5896	2267			
Ethylbenzene		664.1	893.9	921.2			
Toluene		3770	3797	3277			
Xylenes		3331	4106	4536			
Total BTEX		10078	14693	11001			
Chlorobenzene		--	--	--			
1,2 DCB		--	--	--			
1,3 DCB		--	--	--			
1,4 DCB		--	--	--			
MEK		--	--	--			
MIBK		--	--	--			
Total Aliphatics		--	--	--			
Misc.Aromatics		7198	4616	6732			
Total Hydrocarbons		17276	19309	17733			

-- = Not Requested. < = Method Detection Limit-Compound below this level would not be detected. MEK = Methyl Ethyl Ketone MIBK = Methyl Isobutyl Ketone

METHODS: Modified EPA Method 602.
Total Hydrocarbons is the summation of Total BTEX and Miscellaneous Aromatics.

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A division of Groundwater Technology, Inc.

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(800) 544-3422 *from inside California*
(800) 423-7143 *from outside California*

05/01/87
PROJECT MGR: Joyce Miley
Groundwater Technology, Inc
4080 Pike Lane
Concord, CA. 94520
PROJECT #: 20-8224-4
LOCATION: San Leandro, CA.
SAMPLED: 04/28/87 BY: J.Deschene
RECEIVED: 04/28/87 BY: E.Foley
ANALYZED: 04/29/87 BY: J.Floro
MATRIX: Water

TEST RESULTS (ppb)

COMPOUNDS	LAB # / I.D.#	2147 MW 2	2148 MW 3				
Benzene		3131	1371				
Ethylbenzene		1067	472.3				
Toluene		4239	2438				
Xylenes		4608	2617				
Total BTEX		13045	6898				
Chlorobenzene		--	--				
1,2 DCB		--	--				
1,3 DCB		--	--				
1,4 DCB		--	--				
MEK		--	--				
MIBK		--	--				
Misc.Aromatics		4875	3069				
Total Hydrocarbons		17920	9967				

-- = Not Requested. < = Method Detection Limit-Compound below this level would not be detected. MEK = Methyl Ethyl Ketone MIBK = Methyl Isobutyl Ketone
METHODS: Modified EPA Method 602.
Total Hydrocarbons is the summation of total BTEX and Miscellaneous Aromatics.

MAY 8 1987

BROWN AND CALDWELL LABORATORIES

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

ANALYTICAL REPORT

LOG NO: E87-04-583

Received: 28 APR 87
Reported: 07 MAY 87

Ms. Joyce Miley
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

Project: 8224

REPORT OF ANALYTICAL RESULTS

Log Number : 87-04-583-1
Sample Description: Kayo.S.L. MW-1

General Mineral Analysis
Sampled Date 28 APR 87

Anions	mg/L	meq/L
Nitrate (as NO3)	<0.44	<0.0071
Chloride	40	1.1
Sulfate	57	1.2
Bicarbonate (as HCO3)	600	9.8
Carbonate (as CO3)	<0.6	<0.02
Total Milliequivalents per Liter		12.1

Cations	mg/L	meq/L
Sodium	53	2.3
Potassium	47	1.2
Calcium (EDTA Titration)	100	5
Magnesium	133	10.9
Total Milliequivalents per Liter		19.4

Determination	mg/L
Hydroxide Alk (as CaCO3)	<1.0
Carbonate Alk (as CaCO3)	<1.0
Bicarb Alk (as CaCO3)	490
Ca Hardness (as CaCO3)	250
Mg Hardness (as CaCO3)	547
Total Hardness (as CaCO3)	797
Iron	290
Manganese	5.3
Copper	0.37
Zinc	0.65
Surfactants	<0.05
Filterable Residue (TDS)	550
Sp. Conductance, umhos/cm	850
pH, units	6.8

* Conforms to Title 22, California Administrative Code

D. A. McLean, Laboratory Director

BROWN AND CALDWELL LABORATORIES

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

MICROSCOPIC EXAMINATION

Log No. E87-04-583-1

Date Sampled 04/28/87
Date Received 04/28/87
Date Reported 05/06/87

Report To:
Groundwater Technology
4080 Pike Lane, Suite D
Concord, California 94520

ATTN: Ms. Joyce Miley

cc:

Laboratory Director

Sample Description Kayo.S.L. MW-1

Concentration NA mL to NA mL; Survey NA Fields Total Count NA Fields Counted at NA x Magnification

Classification	Predominant Organism	Organisms Per mL	Classification	Predominant Organism	Organism Per mL
FILAMENTOUS IRON BACTERIA	None observed at 400x magn. and 1,000x magn.				
HETEROTROPHIC PLATE COUNT	77,000 colony-forming units per mL. All plates incubated 72 hours at 35°C.				
			ORGANISMS PER mL		

Comments:

NA: Not applicable