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Subject: Report

TO Mr. Dennis Byrne
A. C. D. H. S.
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Oakland, CA 94621

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REPORT
LIMITED SUBSURFACE ENVIRONMENTAL INVESTIGATION
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California

AGS Job No. 19014-1

Prepared for:

ARCO Products Company
2000 Alameda de Las Pulgas
San Mateo, California 94403

by

Applied GeoSystems

K. William Howell
Project Geologist

Walter H. Howe
R.G. 730

August 8, 1989

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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August 8, 1989

Mr. Kyle Christie
Environmental Manager
ARCO Products Company
2000 Alameda de Las Pulgas
San Mateo, California 94403

Subject: Executive Summary of Report No. 19014-1, Limited Subsurface Environmental Investigation of ARCO Service Station 276, 10600 MacArthur Boulevard, Oakland, California.

Mr. Christie:

At the request of ARCO Products Company (ARCO), Applied GeoSystems performed a limited subsurface environmental investigation to assess the presence of soil and ground-water contamination at the above-referenced location. Our investigation included drilling 5 soil borings, constructing three 2-inch-diameter and two 4-inch-diameter ground-water monitoring wells in the borings, collecting soil and water samples for laboratory analyses, surveying the wellheads with reference to mean sea level, collecting ground-water elevation data, and reviewing reports from previous environmental investigations at, and adjacent to, the site.

This report presents a description of the work performed, discusses and interprets the data collected, and includes our recommendations for additional onsite and offsite work.

The soil encountered during drilling was primarily sandy and silty clay underlain by silty sand with clay and gravel lenses. Evidence of a locally discontinuous gravelly deposit, possibly representing a buried stream channel, was suggested by the difference in the soil type encountered between 2 borings located about 10 feet from each other (B-2 and B-5).

The depth to first-encountered ground-water beneath the site is approximately 35 feet below the ground surface with the exception of a localized perched water-bearing zone at monitoring well MW-2. At well MW-2, water was encountered at approximately 17 feet below the ground surface in the gravel deposits believed to represent a former stream channel.

No laboratory evidence of hydrocarbon contamination was detected in soil samples collected from borings B-3 or B-4. Laboratory evidence of hydrocarbon contamination was detected in soil samples collected from borings B-1, B-2, and B-5 using the modified Environmental Protection Agency (EPA) Method 8015 and EPA Method 8020. Analyses of one soil sample from boring B-1 detected relatively low levels of xylene isomers (0.078 parts per million [ppm]). Soil contamination in boring B-2 included concentrations of total petroleum hydrocarbons as gasoline (TPHg) ranging from nondetectable to 690 ppm, and concentrations of the purgeable gasoline constituents benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) ranging from nondetectable to 62 ppm. Soil samples collected from boring B-5 detected TPHg concentrations ranging from nondetectable to 220 ppm, and BTEX concentrations ranging from nondetectable to 14 ppm. Laboratory analyses indicate the highest level of soil contamination at the site was found in boring B-2 at depths of between 16 and 20 feet below the ground surface.

No laboratory evidence of hydrocarbon contamination was detected in ground-water samples collected from monitoring well MW-1. Evidence of hydrocarbon contamination was detected in ground-water samples collected from monitoring wells MW-2 through MW-5 using the modified EPA Method 8015 and EPA Method 602. The levels of TPHg in the samples from wells MW-2 through MW-5 ranged from 0.13 ppm to 165 ppm. Concentrations of BTEX in wells MW-2 through MW-5 ranged from nondetectable to 21 ppm. Laboratory personnel reported that an unidentified peak was observed in the chromatograph of the water samples collected from wells MW-3 and MW-4 which could not be identified by the analytical method used and may be due to a volatile hydrocarbon compound. Laboratory analyses indicate the highest level of ground-water contamination at the site was found in well MW-2, the monitoring well constructed in boring B-2.

PCE ?

Monitoring well MW-4 was installed within the area of a former waste-oil tank pit. Replicate water samples were collected from well MW-4 and analyzed for volatile organic compounds using EPA Method 624 and for total oil and grease (TOG) compounds using the California Department of Health Services (Cal-DHS) Standard Method 503E. The results of these analyses detected the presence of benzene (0.78 ppm), xylene isomers (0.13 ppm), and tetrachloroethene (1.5 ppm). The EPA Method 624 analysis also identified the compounds 1-ethyl-2-methyl-benzene and 1,3,5-trimethyl-benzene, but at concentrations below the reporting limits of the EPA method. TOG was not found at or above the detection limits of the Cal-DHS method (5 ppm).

We recommend that copies of this report by sent to Mr. Don Dalke, California Regional Water Quality Control Board, 1111 Jackson Street- Room 6040, Oakland, California 94607; and to Mr. Dennis Byrne, Alameda County Department of Health Services, 80 Swan Way- Room 200, Oakland, California 94621. Please call if you have any questions regarding this report.

Sincerely,
Applied GeoSystems

K. William Howell
Project Geologist

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PRELIMINARY REPORT
LIMITED SUBSURFACE
ENVIRONMENTAL INVESTIGATION
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California

For ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), Applied GeoSystems conducted a limited subsurface environmental investigation to assess the presence of potential hydrocarbon compounds in the soil and ground water at the above-referenced location. The investigation involved drilling five soil borings, installing five ground-water monitoring wells, performing laboratory analyses on selected soil and water samples, surveying the wellheads and collecting ground-water gradient data, and reviewing information from previous environmental investigations conducted in the site vicinity. This report presents our findings, our interpretation of the data, and recommendations for additional work at the site.

SITE DESCRIPTION

ARCO Service Station 276 is located at the southeast corner of the intersection of MacArthur Boulevard and 106th Avenue in Oakland, California, as shown on the Site Vicinity and Well Location Map (Plate P-1). A Lucky food store and parking lot, part of a large shopping center complex known as Foothill Square, are located adjacent to the site to the southeast. Numerous commercial businesses are located across MacArthur Boulevard to the southwest. Residential housing lies adjacent to the site to the northeast and northwest. There is a USA-Olympic Gasoline Service Station approximately 1/4-mile to the southeast of the site within the Foothill Square shopping center property. Known traces of the Hayward Fault Zone are mapped approximately 3,500 feet from the site, in the hills to the east, as shown on Plate P-1, according to the State of California Special Studies Zone Map for the San Leandro Quadrangle (January 1982). In the site area, surface topography slopes downward toward the southwest. It is our understanding, on the basis of a site plan provided by ARCO, that four underground gasoline storage tanks are buried at the site including a 6,000 gallon supreme unleaded (T1), a 6,000 gallon regular unleaded (T2), and a 4,000 gallon regular unleaded (T3). The size and contents of the fourth tank (T4) are not known. A waste-oil tank was located in the rear of the station, but has been removed. Pertinent site features are shown on the Generalized Site Plan (Plate P-2).

SITE BACKGROUND

Kaldveer Associates (KA) of Oakland, California, conducted a preliminary environmental assessment of the Foothill Square shopping center property, and described the land-use history of the property. In their report dated October 3, 1988, KA states that the property was owned by Fageol Motors Company from about 1916 to 1960 and that tractors, trucks, and motor buses were manufactured there. During 1960, the current shopping center complex was constructed. Current businesses in the center include a dry cleaners and a USA-Olympic Service Station. The KA report stated there is no record of any unauthorized product release or any known soil or ground-water contamination near the USA Station. The KA report did identify four service stations located between 1/2 and 1-1/2 miles from the Foothill Square property that have reported fuel leaks to the California Regional Water Quality Control Board.

KA conducted a subsequent subsurface environmental investigation of the Foothill Square property that involved drilling 12 borings, ranging from 16.5 feet to 36.5 feet below the ground surface, collecting soil samples from each, and performing laboratory analyses of selected soil samples. In a report dated October 7, 1988, KA stated that ground-water was encountered during drilling of two of the shallow borings and that grab water samples were collected and analyzed. A copy of the site plan presented in the KA report showing the boring locations is included in Appendix A. One of the KA exploratory borings where

ground water was encountered (EB-1) is approximately 60 feet from the southeast corner of ARCO Station 276. The KA report states that gasoline-like odors and discolored soils were encountered during the drilling of EB-1 and that 80 percent of the grab water sample that was collected contained black floating gasoline product. Analyses of composited soil samples from KA boring EB-1 indicated the presence of total petroleum hydrocarbons as gasoline (TPHg), and the purgeable gasoline constituents benzene, ethylbenzene, and total xylene isomers (BEX). Toluene (T) was not detected. Analyses of the grab water sample from KA boring EB-1 indicated the presence of TPHg, BTEX, pesticides, PCBs, and semi-volatile compounds. Copies of the boring logs presented in the KA report are included in Appendix A.

The KA report concluded by recommending an additional soil and ground water investigation to determine the quality of the underlying groundwater and to assess the vertical and lateral extent of contamination. Specifically, KA recommended that 3 ground-water monitoring wells be installed in the northwest area of the Foothill Square property and approximately 8 soil borings be drilled and samples collected. KA suggested that the water samples analyzed for heavy metals, volatile and semi-volatile orgainic coumpounds, PCB's and petroleum hydrocarbons.

Western Geologic Resources, Inc., (WGR) in Sausalito, California, conducted a subsurface environmental investigation of the Foothill Square shopping center property during

December 1988. The WGR environmental investigation, described in a report dated January 17, 1989, involved drilling five borings, constructing five ground-water monitoring wells, and analyzing nine soil and five water samples. The WGR investigation found evidence of soil contamination at one boring location (WGR B-3). This boring is approximately 25 feet southeast of ARCO Station 276 and near the former location of Kaldveer boring EB-1. A copy of the site plan presented in the WGR report showing the boring and subsequent monitoring well locations is included in Appendix A. The WGR report noted the presence of hydrocarbon product odor in the soil cuttings of boring B-3 from 14 to 21 feet below the ground surface. Laboratory analysis of the soil sample collected from boring B-3 at 18 feet below the ground surface detected the presence of benzene at a concentration of 16 parts per billion (ppb). Monitoring well MW-3 was constructed in boring B-3 and a water sample was collected. Floating product was not observed in the water sample, but laboratory analyses detected the presence of TPHg at a concentration of 300 ppb, benzene at 0.2 ppb, total xylene isomers at 17 ppb, and Trichloroethane (TCA) at 0.2 ppb. Evidence of ground-water contamination also was detected in two other monitoring wells. Benzene and TCA compounds also were found in water samples collected from WGR well MW-2 at concentrations of 0.1 ppb. WGR well MW-2 is approximately 280 feet from the southeast corner of ARCO Station 276. Benzene was detected in another WGR well (MW-4) at a level of 0.2 ppb. WGR well MW-4 is on the shopping center property near the intersection of MacArthur Boulevard and 108th Avenue as shown on the WGR site plan included in Appendix A.

The WGR report included boring logs, well construction details, field and laboratory information, a potentiometric surface map, and recommendations for an additional investigation. The wells were surveyed to mean sea level and indicated a ground-water flow direction toward the south with a gradient of about 0.4 foot per foot. Copies of the boring logs, a summary of the analytical results, and the potentiometric surface map presented in the WGR report are included in Appendix A. Specific recommendations made by WGR included resampling and analyzing their wells for the presence of total petroleum hydrocarbons, aromatic hydrocarbons, purgeable priority pollutants, CAM metals, pesticides, and PCB's.

Between September 29, 1988, and December 6, 1988, Pacific Environmental Group, Inc. (PEG) removed a waste-oil tank from ARCO Station 276, excavated soil from the waste-oil tank pit, and collected soil samples for analyses. Applied GeoSystems did not receive a final tank removal report of the work performed by Pacific Environmental, but a preliminary report supplied by ARCO indicated that hydrocarbon soil contaminated soil contamination in was detected and delineated in the tank pit. The contaminated soil was excavated and removed in December 1988. When Applied GeoSystems became involved with the ARCO site on March 21, 1989, the area around the former waste-oil tank was covered with a concrete pad.

↑ WE HAVE THIS REPORT.

REGIONAL GEOLOGY AND HYDROGEOLOGY

ARCO Station 276 lies at an elevation of approximately 55 feet above mean sea level. The site is about 3/4-mile west of the Hayward Fault Zone, as shown on Plate P-1. The Alameda County Flood Control and Water Conservation District (ACFCWCD) issued a report on the hydrogeology and ground-water quality in the East Bay Plain Area of Alameda County, California, in June 1988. The ACFCWCD report describes the general geology in the site vicinity as older alluvium composed of a series of poorly consolidated to unconsolidated clay, silt, sand, and gravel layers that were deposited during the Pleistocene age. The sediments were derived mainly from the hills to the east, northeast, and southeast, and represent successive coalescing alluvial fans. The ACFCWCD report describes this alluvium as permeable, but of locally highly variable permeability.

A records check was conducted to identify the location and other characteristics of other ground-water wells within a 1/2-mile radius of the site. The results of this survey are summarized in Table 1. Locations of the identified wells are shown on Plate P-1.

As indicated in Table 1 and on Plate P-1, there are no known ground-water wells in the immediate vicinity of the site. The well survey information was obtained from Mr. Kelvin Hickenbottom from the Alameda County Flood Control and Water Conservation District. Additional details were not available.

TABLE 1
WATER WELL DATA
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

WELL ID.	DTW*	TOTAL DEPTH OF WELL	USE	YEAR DRILLED AND INSTALLED
$B1_1$	42	75	Domestic	1977
$B1_2$	35	102	Domestic	1971
E1	NR	50	Cathodic Protection	1977
E2	NR	120	Cathodic Protection	1976
J1	NR	120	Cathodic Protection	1976
K1	NR	120	Domestic	1974
M1	38	58	Irrigation	1977
N1	40	79	Irrigation	1977
R2	29	60	Destroyed	1977

Source: Alameda County Flood Control and Water Conservation District
Measurements are in feet
* = Believed to represent depth to static water when well was installed.
NR = Not Recorded
1 = Located in quadrant 23
2 = Located in quadrant 24

PREPARATIONS FOR SITE WORK

Before the start of the Applied GeoSystems environmental investigation, a permit for constructing five ground-water monitoring wells was obtained from the Alameda County Flood Control and Water Conservation District (Zone 7). A copy of the well construction permit is included in Appendix E. Underground Service Alert (USA) also was contacted

to request that they notify various public utility companies of our intention to drill in the subject area.

Field work performed at the site by Applied GeoSystems personnel was conducted in accordance with Applied GeoSystems' Site Safety Plan No. 19012-1S (dated March 6, 1989). The Plan describes the safety requirements for the subsurface environmental investigation and the drilling of soil borings at the site. The Site Safety Plan is applicable to personnel and subcontractors of Applied GeoSystems. Applied GeoSystems personnel and our subcontractors scheduled to work at the site were briefed on the contents of the Site Safety Plan before work began. A copy of the Plan was kept at the site and was available for reference by appropriate parties during the site work. The Staff Geologist of Applied GeoSystems was the Site Safety Officer.

DRILLING OF SOIL BORINGS

Kvilhaug Well Drilling and Pump Co, Inc. (Kvilhaug) of Concord, California drilled the boreholes using a Mobil B-61 drill rig. A geologist from Applied GeoSystems observed the drilling of the boreholes and collected soil samples from the borings on March 21, 22, 29, and 30, 1989. The locations of borings B-1 through B-5 are indicated on Plate P-2. Eight or ten-inch-diameter, continuous flight, hollow-stem augers were used to drill the boreholes. The augers were steam-cleaned prior to each use to reduce the possibility of cross-

contamination. Soil cuttings generated during drilling were placed on, and covered with, plastic pending laboratory analyses to assess the proper method of disposal.

The field geologist from Applied GeoSystems used standardized field procedures to collect soil samples, to describe the soil encountered, to evaluate the samples in the field for the presence of hydrocarbons, and to retain and transport the soil samples to a laboratory for analyses. Standardized field procedures were also used to construct ground-water monitoring wells in the boreholes, to develop the wells, to collect ground-water samples, and to transport the water samples to a State-certified laboratory for analyses. These standardized field procedures are described in Appendix B.

As described in Appendix B, an organic vapor meter (OVM) was used in the field to evaluate the relative organic vapor concentrations present in the soil samples. Chain of custody records were initiated by the field geologist for the soil samples collected, and copies of these records are included in Appendix D. The Unified Soil Classification System was used to identify the soil encountered in the boreholes. A copy of this classification system is shown on Plate P-3. Descriptions of the subsurface soil encountered in the borings are presented on the Logs of Borings, Plates P-4 through P-14. The OVM readings are shown on the Logs of Borings in the column labeled "P.I.D."

Borings B-1 and B-3 were drilled to approximately 40 feet below the ground surface. Borings B-4 and B-5 were drilled to about 50 feet below the ground surface. Ground water in these four borings was first encountered at approximately 35 feet below the ground surface. Ground-water in boring B-2 was first encountered at about 17 feet below the ground surface. Boring B-2 is located approximately 10 feet from B-5 which suggests that a localized and perched-water bearing zone may be present in the shallow subsurface. The silty gravel encountered in boring B-2 between approximately 17 feet below the surface was not observed in boring B-5, suggesting heterogenous conditions in the subsurface.

Evidence of hydrocarbon-contaminated soil was detected in boring B-2 by the OVM instrument. Boring B-2 was advanced to approximately 28 feet below the ground surface, then backfilled with bentonite and terminated in a clayey sand at about 26-1/2 feet below the ground surface. OVM readings also indicated the presence of hydrocarbon contamination in soil samples from boring B-5, and to a lesser extent, in boring B-4.

DESCRIPTION OF SUBSURFACE SOIL

The subsurface soil encountered during drilling was typically a sandy and silty clay in the upper subsurface, underlain by a silty sand with clay and gravel lenses. Two cross-sections were constructed from the boring logs to interpret the subsurface geology beneath the site.

These cross-sections are presented in Plates P-15 and P-16. Plate P-2 shows the location of the lines used in constructing the cross-sections.

CONSTRUCTION OF MONITORING WELLS

Five ground-water monitoring wells, designated MW-1 through MW-5, were installed in boreholes B-1 through B-5, respectively. Monitoring wells MW-1, MW-3, and MW-4 were completed with 2-inch-inside-diameter Schedule 40 polyvinyl chloride (PVC) casing. Monitoring wells MW-2 and MW-5 were completed with 4-inch-inside-diameter PVC casing. Twenty feet of screened casing with 0.020-inch-wide slots were set from the bottom of the boring in wells MW-1, MW-3, and MW-4. Ten and 15 feet of the same sized slotted casing were set from the bottom of the borings to construct monitoring wells MW-2 and MW-5, respectively. Appendix B describes the field procedures used in constructing each well.

GROUND-WATER WELL DEVELOPMENT AND SAMPLING

On April 17, 1989, a geologist from Applied GeoSystems visited the site to collect ground-water samples from each well for subjective analyses and to observe well development by personnel from Armour Petroleum Service and Equipment Corp. (Armour) of Vacaville, California.

Water samples were collected from each monitoring well for subjective analysis using the field procedures described in Appendix B. The results of the subjective analyses are summarized in Table 2 and indicate that a slight sheen was observed in well MW-2.

Armour personnel used a diaphragm pump to purge sediment and approximately 330 gallons of water from the five wells. The water purged from the wells during development was stored in 17E 55-gallon liquid-waste drums approved by the Department of Transportation for this use. As requested by ARCO, Armour personnel removed the purged water from the site and transported it to the California Medical Facility in Vacaville under a Bill of Lading. A copy of the Bill of Lading is included in Appendix C.

On April 24, 1989, a geologist from Applied GeoSystems returned to the site to purge the monitoring wells and collect water samples for laboratory analyses. Before purging each well, a water sample was collected for subjective analysis in accordance with the procedures described in Appendix B. The results of the subjective analyses are summarized in Table 2.

After the subjective analyses, the wells were purged of between 3 and 5 well volumes to collect ground-water samples representative of the water-bearing formation. The purged water was temporarily stored in Department of Transportation 17E 55-gallon liquid-drums approved for this use. As requested by ARCO, the purged water was removed by Armour

on May 8, 1989 under a Bill of Lading consigned to the Solano Community College. A copy of the Bill of Lading is included in Appendix C.

TABLE 2
RESULTS OF SUBJECTIVE ANALYSES
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California

Well	Date	Depth to Water	Floating Product	Sheen
MW-1	4/17/89	33.04	None	None
	4/24/89	33.84	None	None
MW-2	4/17/89	17.20	None	Slight
	4/24/89	17.83	None	Slight
MW-3	4/24/89	34.47	None	None
	4/24/89	34.32	None	None
MW-4	4/17/89	33.87	None	None
	4/24/89	33.76	None	None
MW-5	4/17/89	33.17	None	None
	4/24/89	33.06	None	None

Measurements are in feet below top of each well casing.

After each well was allowed to recover to at least 90 percent of its static level, as measured to the nearest 0.01 foot using a Solinst electronic water level indicator, water samples were collected for laboratory analyses. The procedures used to collect the ground-water samples are described in Appendix B of this report. A Chain of Custody Record was initiated by

the field geologist for the water samples collected. A copy of this record is presented in Appendix D.

RESULTS OF LABORATORY ANALYSES

Soil Samples

Soil samples from each boring were submitted to the Applied GeoSystems Laboratory in Fremont for analyses (California Department of Health Services Hazardous Waste Testing Laboratory Certificate No. 153). Samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg) using modified Environmental Protection Agency (EPA) Method 8015, and for the purgeable gasoline constituents benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) using EPA Method 8020. The analytical results are summarized in Table 3.

As indicated in Table 3, hydrocarbon contamination was not detected in the laboratory analyses of soil samples collected from borings B-3 or B-4. Some contamination (less than 1 part per million [ppm]) was detected in the samples analyzed from borings B-1. Hydrocarbon compounds at levels greater than 100 ppm were detected in soil samples analyzed from borings B-2 and B-5. Copies of the Analysis Reports are included in Appendix D.

TABLE 3
ANALYTICAL RESULTS OF SOIL SAMPLES
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
(March 1989)

Sample Number	TPHg	Benzene	Toluene	Ethyl-benzene	Total Xylenes
S-26-B1	<2	<0.05	<0.05	<0.05	<0.05
S-31-B1	<2	<0.05	<0.05	<0.05	0.078
S-5.5-B2	<2	<0.05	<0.05	<0.05	<0.05
S-11-B2	<2	<0.05	0.066	<0.05	0.079
S-16-B2	38	0.30	0.91	0.38	2.4
S-20-B2	690	7.4	36	10	62
S-24.5-B2	4.2	<0.05	0.10	<0.05	0.18
S-28-B2	<2	<0.05	<0.05	<0.05	<0.05
S-30.5-B3	<2	<0.05	<0.05	<0.05	<0.05
S-21-B4*	<5.0	<0.05	<0.05	<0.05	<0.05
S-31-B4	<5.0	<0.05	<0.05	<0.05	<0.05
S-11-B5	<5.0	0.13	<0.05	<0.05	<0.05
S-16-B5	220	0.83	3.4	2.2	14
S-18-B5	<5.0	0.23	0.11	<0.05	0.21
S-24-B5	<5.0	0.086	<0.05	<0.05	<0.05
S-31-B5	<5.0	<0.05	<0.05	<0.05	<0.05

Results are in parts per million (ppm)
TPHg = total petroleum hydrocarbons as gasoline
< = below the reporting limits of the analysis
* = Sample S-21-B4 also analyzed for TOG. (Not found)
Sample designation = S-31-B5
S — Soil sample
31 — Sample depth in feet
B5 — Boring number

One soil sample from the boring advanced within a former waste-oil tank pit (B-4), was transported to Anametrix Inc. (Anametrix) in San Jose, California, (California Department of Health Services Hazardous Waste Testing Laboratory Certificate No. 151) for analysis of total oil and grease (TOG) compounds by the California Department of Health Services (Cal-DHS) Standard Method 503E. TOG was not detected in the soil sample within the limits of the analytical method used.

Four soil samples were also collected from the soil cuttings and submitted to the Applied GeoSystems laboratory for composite labatory analyses to assess the level of total petroleum hydrocarbons compounds as gasoline (TPHg). The composite sample analyses was performed to assess the proper method of disposing the cuttings. The results of the analyses indicated the cuttings contained a TPHg concentration of 5 ppm and could be disposed at a certified Class III landfill. At ARCO's request, the cuttings were removed from the site and disposed at the Davis Street Transfer Station in San Leandro, California on June 1, 1989. A copy of the analytical report is included in Appendix D.

Ground-Water Samples

Ground-water samples collected from wells MW-1 through MW-5 were submitted to Applied GeoSystems Laboratory for analyses of TPHg by modified EPA Method 8015 and for BTEX by EPA Method 602. The analytical results are summarized in Table 4.

TABLE 4
ANALYTICAL RESULTS OF WATER SAMPLES
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
(April 24, 1989)

Sample Number	TPHg	Benzene	Toluene	Ethyl-benzene	Total Xylenes
W-35-MW1	<0.050	<0.00050	<0.00050	<0.00050	<0.00050
W-19-MW2	165	13	21	2.1	12.7
W-35-MW3	0.56	0.00054	0.00075	<0.00050	<0.00050
W-34-MW4	2.5	0.27	0.0014	<0.00050	0.085
W-34-MW5	0.13	0.00067	<0.00050	<0.00050	<0.00050

Results are in parts per million (ppm)
TPHg = total petroleum hydrocarbons as gasoline
< = below the reporting limits of the analysis
Sample designation = W-34-MW5
W = Water sample
34 = Sample depth in feet
MW5 = Well number

As Table 4 indicates, hydrocarbon compounds were not detected in the water samples collected from monitoring well MW-1. Hydro-carbon compounds were detected in the water samples collected from monitoring wells MW-2 through MW-5. In addition, laboratory personnel reported a peak was observed that in the chromatograph of the water sample collected from wells MW-3 and MW-4 that could not be identified by the analytical method used. Copies of the Analysis Reports are included in Appendix D.

A replicate water sample from well MW-4 was submitted to Anametrix for analyses of 41 volatile organic compounds (VOC) by EPA Method 624. Water samples were also collected from well MW-4, and submitted to Anametrix, for laboratory analysis of TOG by the Cal-DHS Standard Method 503E. The analytical results are summarized on Table 5.

TABLE 5
ANALYTICAL RESULTS OF ADDITIONAL WATER SAMPLES
COLLECTED FROM MONITORING WELL MW-4
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
(April 24, 1989)

Sample Number	Benzene	Total Xylenes	Tetra-chloro-ethene	Total Oil & Grease	1-ethyl-2-methyl-benzene	1,3,5-trimethyl-benzene
W-34-MW4	0.780	0.130	1.50	<5.0	**	**

Results are in parts per million (ppm)
< = below the reporting limits of the analysis
** = compound identified at concentrations below the reporting limits of the method used
Sample designation = W-34-MW4
W = Water sample
34 = Sample depth in feet
MW4 = Well number

As indicated in Table 5, benzene, total xylene isomers, and Tetrachloroethene (~~TCE~~ PCE) compounds were detected in the water samples. Oil and grease compounds were not

detected by the Cal-DHS method. In addition, two compounds (1-ethyl-2-methyl-benzene and 1,3,5-trimethyl-benzene) were identified in the water sample, but at concentrations below the reporting limits of the method used. Toluene and ethylbenzene compounds were not detected during analysis by EPA Method 624. Copies of the Analysis Reports are included in Appendix D.

EVALUATION OF GROUND-WATER FLOW DIRECTION

Ron Archer Civil Engineer, Inc., of Pleasanton, California, surveyed the locations and casing elevations of the five wells, and other site features, on April 26, 1989. A copy of their report summarizing the survey data is included in Appendix E. The surveyed wellhead elevations and depth to static water level measurements taken on May 8, 1989 were used to calculate the ground-water surface elevation summarized in Table 6.

The depth to static water was measured to the nearest 0.01 foot using a Solinst electronic water level indicator on May 8, 1989. Ground-water elevation data from Table 6 was used to construct a ground-water elevation map for the site (Plate P-17). Because of the shallow perched water bearing zone encountered in monitoring well MW-2, data from this well was not used in constructing the map. Plate P-15 and the May 8, 1989 data indicate that the direction of ground-water flow is toward the north and the ground-water gradient is approximately 0.003.

TABLE 6
GROUND-WATER SURFACE ELEVATION DATA
ARCO Products Station No. 276
10600 MacArthur Boulevard
Oakland, California
(data measured on May 8, 1989)

Well No.	Casing Elevation	Depth to Ground Water	Ground-water Elevation
MW-1	55.91	34.06	21.85
MW-2	55.35	17.00	38.35
MW-3	56.55	34.45	22.10
MW-4	55.94	33.88	22.06
MW-5	55.43	33.17	22.26

Measurements are in feet.
Elevation measurements are referenced to mean sea level.

DISCUSSION

The Background section of this report discussed an environmental investigation of the Foothill Square shopping center property performed by Western Geologic Resources. A review of the depth to ground-water in the WGR wells with respect to mean sea level suggests, with the exception of WGR well MW-4, that the ground water encountered by WGR may represent a localized perched water-bearing zones similar to that encountered by Applied GeoSystems during the drilling boring B-2. The surveyed wellhead and ground-water elevation data presented in the WGR report are included in Appendix A. This data

indicates, with the exception of WGR well MW-4, that ground-water was encountered between 10 and 25 feet below the ground surface, or between 38 and 56 feet above mean sea level. The depth to water of monitoring wells at the ARCO Station site is about 22 feet above mean sea level with the exception of the perched water-bearing zone at well MW-2 which lies at about 38 feet above sea level. The WGR report also mentions that WGR well MW-3 went dry after one well volume was purged. It appears, therefore, that the potentiometric surface map presented in the WGR report is based on localized perched water-bearing zones and may not reflect true regional aquifer ground-water elevations.

Boring logs and field observations from the Applied GeoSystems subsurface investigation of the ARCO site also suggest that the perched water-bearing zone encountered in well MW-2 at about 17 feet below the ground surface (or 38 feet above mean sea level), is locally discontinuous. The saturated silty gravel encountered in boring B-2 was not observed in boring B-5, approximately 10 feet to the northeast. The inconsistency suggests that channelized deposits may be present in the subsurface. Well MW-2 was temporarily dewatered after approximately 250 gallons of water were pumped from it before boring B-5 was drilled which also suggests a perched water-bearing zone may be present in the shallow subsurface in the vicinity of well MW-2.

WGR did not establish that the water-bearing zone as mapped by their wells is hydraulically connected and it appears unlikely that they are, given the horizontal distances between the

wells and the range in depth-to-water measurements reported in the five wells (up to 15 feet). The range in depth-to-water measurements led WGR to calculate a relatively steep ground-water gradient across the Foothill Square site of 0.4 foot per foot. Our data suggests that a gradient of 0.4 foot per foot at the site is unlikely.

The WGR well MW-3 is about 20 feet southeast of Applied GeoSystems' well MW-2 (see WGR Figure 3 in Appendix A). The depth to water in WGR well MW-3 was reported to be about 38 feet above mean sea level, which is similar to the depth-to-water measurement in Applied GeoSystems' well MW-2, and it is possible that they are hydraulically connected. A second WGR monitoring well (MW-2), is approximately 280 feet from the southeast corner of ARCO Station 276. The depth to water reported for WGR well MW-2 is about 38 feet above mean sea level. Since the reported depth to water in the two WGR wells is about the same, it is possible that their ground-water is also derived from the same perched zone. This water-bearing zone may represent a buried stream channel.

WGR used the depth to water from their five monitoring wells in constructing a potentiometric surface map which was in turn used to evaluate the ground-water flow direction and the hydraulic gradient presented in their report. Since the WGR monitoring wells MW-1, MW-4, and MW-5 have very different water level elevations (with respect to mean sea level) from the WGR wells MW-2 and MW-3, and since the ground-water encountered by WGR appears to contain perched water-bearing zones as well as deeper

water representative of a regional aquifer, the potentiometric surface map, ground-water flow direction, and ground-water gradient reported by WGR are questionable.

The ground-water flow direction evaluated by our depth-to-water measurements in the ARCO Station wells is to the north. The depth-to-water elevation reported in the WGR report for their well MW-4 from January 11, 1989 is 27.8 feet above mean sea level, which is about the same elevation calculated for ARCO wells, and when combined with our data, also indicates a ground-water flow direction to the north.

CONCLUSIONS

- No laboratory evidence of TPHg or BTEX was detected in the soil samples collected from borings B-3 or B-4. Relatively low readings of hydrocarbon compounds were detected by the OVM instrument in the subjective analyses of soil samples collected from boring B-4 as shown on Plates P-10 and P-11 in the column labeled P.I.D. Evidence of hydrocarbon contamination (TPHg and BTEX) was detected in the soil samples analyzed from borings B-2 and B-5. The laboratory results of soil samples collected from borings B-2 and B-5 suggest the vertical extent of soil contamination at these locations has been delineated. At these locations, soil contamination appears to extend from the ground surface to about 25 feet below the ground surface of each

borings, with the highest levels of soil contamination occurring between 16 and 20 feet below the ground surface. Xylene compounds were detected in a soil sample collected from boring B-1, but other associated hydrocarbon contaminants were not found.

- No laboratory evidence of TPHg or BTEX was detected in the water samples analyzed from monitoring well MW-1. Laboratory analyses of water samples from monitoring wells MW-3 through MW-5 indicated the presence of hydrocarbon contamination (BTEX) in these wells, but at levels well below the respective Maximum Contamination levels as defined by Title 22 (paragraph 64444.5) of the California Administrative Code and the recommended action levels for drinking water established by the California Department of Health Services. ~~TCE~~ PCE was detected in the replicate water sample collected from well MW-4 and analyzed by EPA Method 624. Total oil and grease compounds were not detected in the water sample collected from monitoring well MW-4. Elevated levels of the hydrocarbon compounds TPHg and BTEX were detected in the perched ground-water samples collected from well MW-2.

- Our interpretation of the ground-water flow direction, based of elevation data taken on two separate days, is toward the north with a gradient of 0.003. This

direction is different from the expected westerly direction as based on topography and the location of the site with respect to San Francisco Bay but is also supported by the depth to water of an offsite well near the ARCO Station that was reported by Western Geologic Resources (WGR MW-4).

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. This investigation was conducted solely as a tool in evaluating environmental conditions of the soil and ground water with respect to contamination at the site. No soil engineering or geotechnical recommendations are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

REFERENCES

United States Geological Survey. 1982. East Oakland-San Leandro Quadrangle. State of California Special Studies Zones, Revised Official 7.5-Minute Topographic Quadrangle Map.

Kaldveer Associates. October 3, 1988. Preliminary Environmental Assessment Proposed Foothill Square Oakland, California. Job No. KE812-3, 12056.

Kaldveer Associates. October 7, 1988. Preliminary Soil And Groundwater Quality Testing Program Foothill Square Oakland, California. Job No. KE812-3A, 12302.

Western Geologic Resources, Inc. Soil Sampling and Monitoring Well Installation Foothill Square Shopping Center Oakland, California. Job No. 8-088.01.

Pacific Environmental Group, Inc. February 6, 1989. Former Waste-Oil Tank Pit Analytical Results and Site Plan of ARCO Station No. 276. Copy of letter sent to Ms. Mary Meirs, Alameda County Environmental Health Department Hazardous Material Division.

Applied GeoSystems. March 6, 1989. Site Safety Plan for Job No. 19012-1.

Alameda County Flood Control and Water Conservation District. June 1988. Geohydrology and Groundwater - Quality Overview, East Bay Plain Area, Alameda County, California 205 (J) Report. pp. 22-65.

Source: U.S. Geological Survey
7.5-Minute Quadrangle
Oakland East/San Leandro, California
Photorevised 1980

R2● = Ground-water well

— — — = Approximate location of Hayward Fault Zone (dashed where inferred) Fault considered to be active during Holocene time

Source: State of California
Special Studies Zone (1-1-82)

N

Approximate Scale

2000 1000 0 2000 4000

feet

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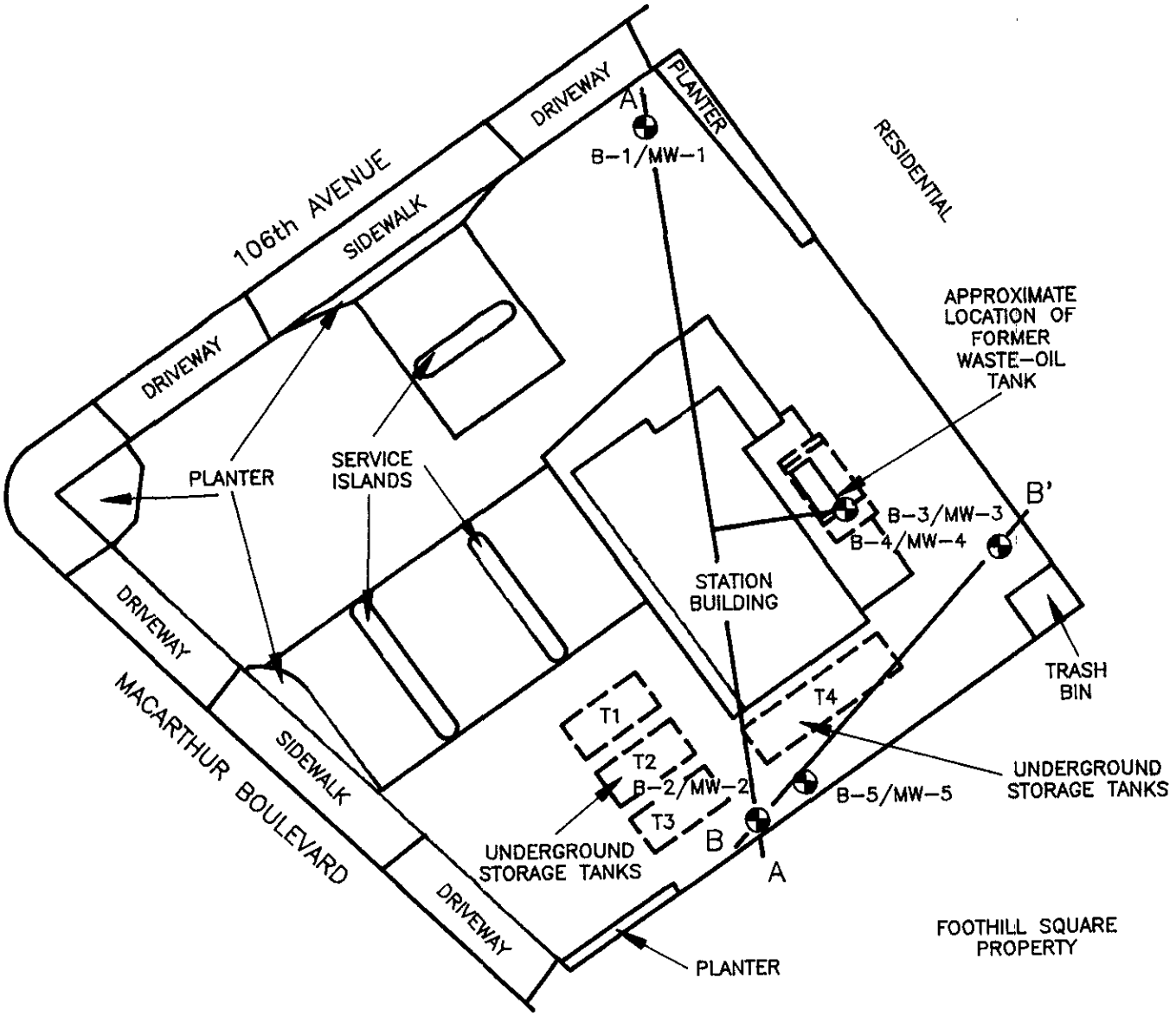
PROJECT NO. 19014-1

SITE VICINITY AND WELL LOCATION MAP
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE
P - 1



B — B' = Cross section location

B-5/MW-5 = Approximate location of boring/monitoring well

Source: Modified from plan supplied by ARCO and surveyed by Ron Archer Civil Engineer, Inc.

N

Approximate Scale

30 15 0 30 60

feet

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PROJECT NO. 19014-1

GENERALIZED SITE PLAN
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE
P - 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION
Coarse-grained soils	Gravel and gravelly soils	GW	Well-graded gravels of gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and sandy soils	SW	Well-graded sand of gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures

MAJOR DIVISIONS		LTR	DESCRIPTION
Fine-grained soils	Silts and clays LL<50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and clays LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils. Elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
Highly organic soils		PT	Peat and other highly organic soils

Depth through which sampler is driven

Relatively undisturbed sample

No sample recovered

Static water level observed in boring

Initial water level observed in boring

S-10 Sample number

Sand pack

Bentonite annular seal

Neat cement annular seal

Caved native soil

Blank PVC

Machine-slotted PVC

BLOWS REPRESENT THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH EACH 6 INCHES OF AN 18-INCH PENETRATION.

DASHED LINES SEPARATING UNITS ON THE LOG REPRESENT APPROXIMATE BOUNDARIES ONLY. ACTUAL BOUNDARIES MAY BE GRADUAL. LOGS REPRESENT SUBSURFACE CONDITIONS AT THE BORING LOCATION AT THE TIME OF DRILLING ONLY.

Applied GeoSystems

PROJECT NO. 19014-1

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE
P - 3

Total depth of boring: 40-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 3-21-89

Casing diameter: 2 inches **Length:** 39 feet **Slot size:** 0.020-inch

Screen diameter: 2 inches **Length:** 20 feet **Material type:** Sch 40 PVC

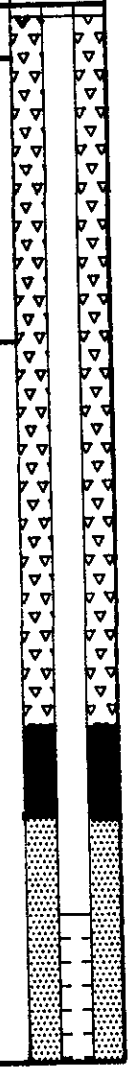
Drilling Company: Kvilhaug Drilling Co. **Driller:** Chris & Mike

Method Used: Hollow-Stem Auger **Field Geologist:** Jim Cline

Signature of Registered Professional: _____

Registration No.: _____ **State:** CA

DEPTH	SAMPLE NO.	BLOWS	P.I.D.	USCS CODE	DESCRIPTION	WELL CONST.
0					Asphalt (6 inches) over baserock (8 inches).	
2				CH	Silty clay with some sand, gray, moist, high plasticity, stiff.	
4						
6	S-5.5	16 38	0		With trace of gravel, grades gray-brown, damp, hard.	
8				CL	Silty clay with sand, brown, damp, medium plasticity, hard.	
10	S-10.5	12 28	0			
12						
14						
16	S-15.5	16 34	0			
18	S-18	17 40	0		Grades moist. Grades very stiff.	
20					(Section continues downward)	



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PROJECT NO. 19014-1

LOG OF BORING B-1/MW-1

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 4

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22	S-21	6 8 17	0	CL	Silty clay with sand, brown, damp, moist, medium plasticity, very stiff.	
24	S-23.5	8 9 11				
26	S-26	7 8 10	0			
28				ML	Clayey silt, brown, moist, low plasticity, very stiff.	
30		9 10				
32	S-31	11	0			
34						
36	S-36	8 10 14	0		Wet, with clay lenses.	
38				SM	Silty sand, fine grained, grades gray-brown.	
40	S-40	10 10 12	0			
42					Total Depth = 40-1/2 feet.	
44						
46						
48						
50						

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-1/MW-1

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 5

Total depth of boring: 28-1/2 feet **Diameter of boring:** 10 inches **Date drilled:** 3-22-89

Casing diameter: 4 inches **Length:** 25-1/2 feet **Slot size:** 0.020-inch

Screen diameter: 4 inches **Length:** 10 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Drilling Co. **Driller:** Chris & Mike

Method Used: Hollow-Stem Auger **Field Geologist:** Steve Johnston

Signature of Registered Professional: _____

Registration No.: _____ **State:** CA

DEPTH	SAMPLE NO.	BLOWS	P.I.D.	USCS CODE	DESCRIPTION	WELL CONST.
0					Asphalt (3 inches) over baserock (6 inches) over asphalt (3 inches) and baserock (6 inches).	
2				CH	Silty clay, dark gray, damp, high plasticity, very stiff.	
4				CL	Sandy clay, brown, damp, low plasticity, hard.	
6	S-5.5	30 38	1			
8						
10		6 6			Gray mottling, medium plasticity, grades very stiff.	
12	S-11	11	26			
14						
16	S-16	6 7 11	97	▽ ▼		
18	S-18	12 24	300	GM	Silty gravel, fine-to coarse-grained sand, brown-gray, wet, dense, noticeable odor.	
20	S-20	12 36	330		Grades more silty, fine-to medium-grained gravel, noticeable odor.	
					(Section continues downward)	

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-2/MW-2

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 6

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				GM	Silty gravel, fine–to coarse–grained sand, brown–gray, wet, dense, obvious odor.	
24	S–24.5	20 24	30	SC	Clayey sand, brown, moist, dense.	
26				SM	Silty sand with clay lenses, brown, moist, dense.	
28	S–28	20 22	50		Total Depth = 28–1/2 feet.	
30						
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-2/MW-2

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 7

Total depth of boring: 40-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 3-21-89

Casing diameter: 2 inches **Length:** 40 feet **Slot size:** 0.020-inch

Screen diameter: 2 inches **Length:** 20 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Drilling Co. **Driller:** Chris and Mike

Method Used: Hollow-Stem Auger **Field Geologist:** Steve Johnston

Signature of Registered Professional: _____

Registration No.: _____ **State:** CA

DEPTH	SAMPLE NO.	BLOWS	P.I.D.	USCS CODE	DESCRIPTION	WELL CONST.
0					Asphalt (2 inches) over baserock (8 inches).	
2				CL	Silty clay with some gravel, brown-gray, wet, medium plasticity, very stiff.	
4				CH	Silty clay with some sand, gray, damp, high plasticity, hard.	
6	S-5.5	12 20	0			
8						
10	S-10.5	12 22	0	SM	Silty sand, trace gravel, brown, damp, dense.	
12				CL	Silty clay, brown, damp, medium plasticity, hard.	
14						
16	S-15.5	12 30	0			
18	S-18.5	12 20	0		With fine-grained sand, grades moist.	
20					(Section continues downward)	

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-3/MW-3

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 8

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22	S-20.5	20 20	0	CL	Silty clay with fine-grained sand, brown, moist, medium plasticity, hard.	
		10 10			With trace gravel, grades to very stiff.	
24	S-23.5	10	0			
		5 7				
26	S-25.5	10	0			
28						
				SM	Silty sand with gravel, brown, moist, dense.	
30		15				
	S-30.5	20	0			
32						
				ML ▽	Clayey silt with trace gravel, brown, wet, slight plasticity, very stiff.	
34						
		10 10				
36	S-36	10	0			
38				SM	Silty sand with trace gravel, brown, wet, dense.	
		25				
40	S-40	25	0			
					Total Depth = 40-1/2 feet.	
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-3/MW-3

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 9

Total depth of boring: 53-1/2 feet **Diameter of boring:** 8 inches **Date drilled:** 3-29-89

Casing diameter: 2 inches **Length:** 50 feet **Slot size:** 0.020-inch

Screen diameter: 2 inches **Length:** 20 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Drilling Co. **Driller:** Chris & Mike

Method Used: Hollow-Stem Auger **Field Geologist:** Leigh Beem

Signature of Registered Professional: _____

Registration No.: _____ **State:** CA

DEPTH	SAMPLE NO.	BLOWS	P.I.D.	USCS CODE	DESCRIPTION	WELL CONST.
0					Concrete (6 inches) over backfill.	
2					Large gravel (backfill material).	
4						
6	S-6	4 6 7	2.3			
8						
10				SW	Sand with gravel, brown-gray, wet, loose.	
12	S-11	10 5 4	2	CL	Sandy clay with trace gravel, and some fine-to medium-grained sand, brown, damp, medium plasticity, hard.	
14						
16	S-16	12 25 50	1.1			
18						
20					Grades to silty clay, with some very fine-grained sand. (Section continues downward)	

Applied GeoSystems

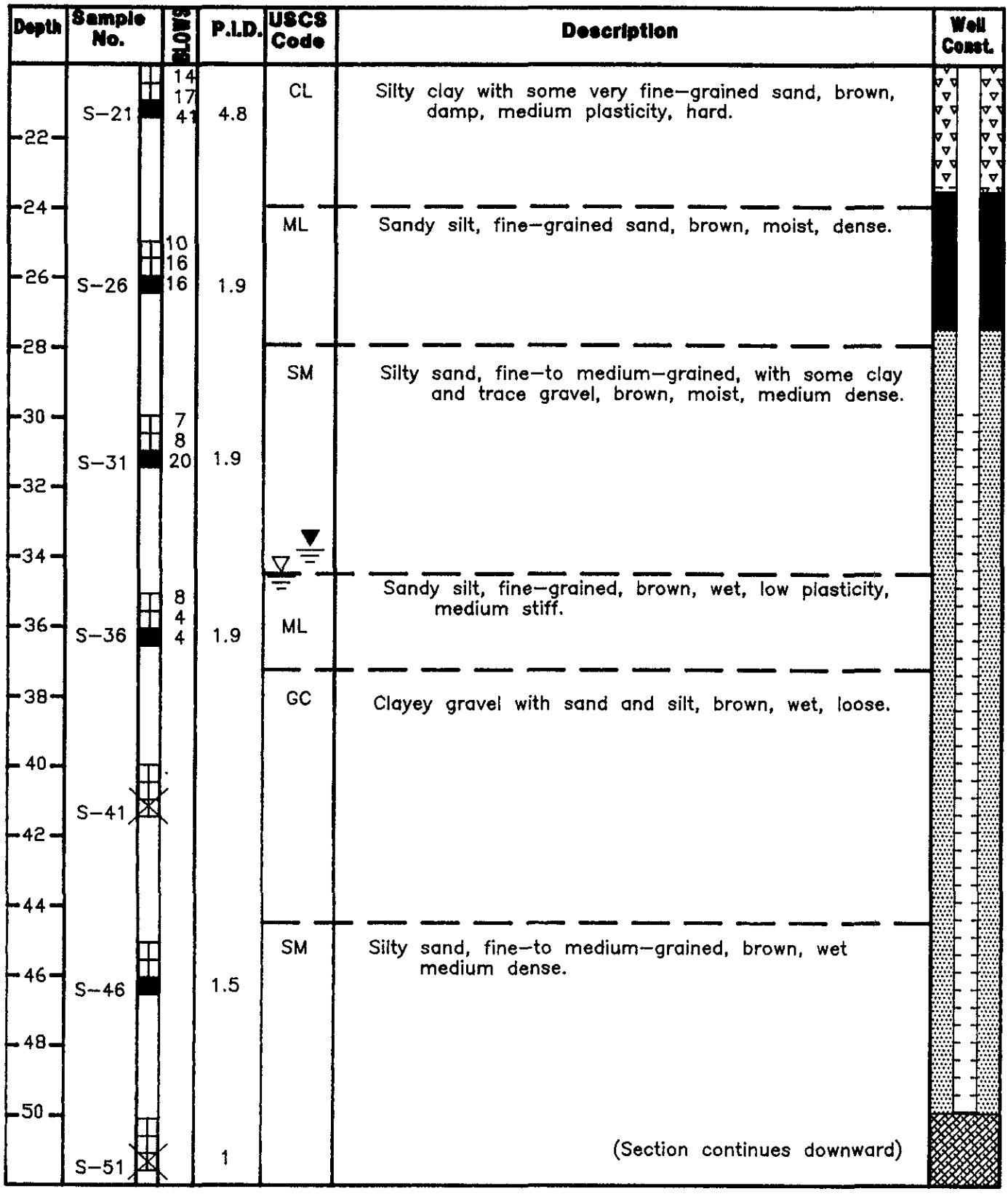
PROJECT NO. 19014-1

LOG OF BORING B-4/MW-4

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 10



Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-4/MW-4

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 11

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				SM	Silty sand, fine–to medium–grained, brown, wet, medium dense.	
52	S–53		1	CH	Gravelly clay with minor fine–to medium–grained sand, red–brown, moist, medium–high plasticity, stiff.	
54					Total Depth = 53–1/2 feet.	
56						
58						
60						
62						
64						
66						
68						
70						
72						
74						
76						
78						
80						

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-4/MW-4

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 12

Total depth of boring: 49 feet **Diameter of boring:** 10 inches **Date drilled:** 4-6-89

Casing diameter: 4 inches **Length:** 47-1/2 feet **Slot size:** 0.020-inch

Screen diameter: 4 inches **Length:** 15 feet **Material type:** Sch 40 PVC

Drilling Company: Kvilhaug Drilling Co. **Driller:** Chris & Mike

Method Used: Hollow-Stem Auger **Field Geologist:** Leigh Beem

Signature of Registered Professional: _____

Registration No.: _____ **State:** CA

DEPTH	SAMPLE NO.	BLOWS	P.I.D.	USCS CODE	DESCRIPTION	WELL CONST.
0						
					Asphalt (2 inches) over backfill (6 inches) over asphalt (2 inches).	
2				CH	Silty clay, dark brown, damp, high plasticity, very stiff.	
4						
6	S-6			CL	Sandy clay with minor gravel, brown-gray mottling, damp, medium plasticity, very stiff.	
8						
10		6 7				
	S-11	11	18		Silty clay with minor fine-grained sand, green-brown mottling.	
12						
14						
		12		GC	Clayey gravel with fine-to coarse-grained sand, gray, very moist, dense, noticeable odor.	
16	S-16	12 18	111			
		10				
		10				
18	S-18	16	44	CL	Gravelly clay with fine-to coarse-grained sand, brown, damp, low-medium plasticity, very stiff.	
		20				
		25			Silty clay with minor fine-grained sand, hard.	
20	S-20		80		(Section continues downward)	

Applied GeoSystems

PROJECT NO. 19014-1

LOG OF BORING B-5/MW-5

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 13

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
22		10		CL	Silty clay with minor fine–grained sand, brown, damp, low–medium plasticity, hard.	
		10				
	S–23	10	75	ML	Sandy silt with fine–grained sand, brown, damp, low plasticity, very stiff, noticeable odor.	
24						
		10		SM	Silty sand, fine–to medium–grained, brown, damp, dense, noticeable odor.	
26		10				
	S–26	20	116			
28						
30		10				
		15		CL	Silty clay lenses, damp, medium plasticity, stiff.	
	S–31	17	200	SM	Silty sand, fine–to medium–grained, brown, damp, dense, noticeable odor.	
32						
34					Sandy clay lenses.	
		20				
		25			Well graded sand with some interbedded clay and gravel, wet, dense.	
36	S–36	30	12.5			
38		2		CL	Silty clay with minor gravel, brown, damp, soft.	
		2				
	S–38.5	2	33	SM	Silty sand, brown, moist, medium dense, noticeable odor.	
40		4				
		6				
	S–41	13	104			
42						
		4		CL	Clay lenses with minor gravel, brown, damp, medium plasticity, stiff.	
		6				
44	S–43.5	10	124	SM	Silty sand, brown, moist, medium dense, noticeable odor.	
		6		CL	Silty gray with gravel, brown, damp, low to medium plasticity, very stiff.	
		10				
46	S–46	15	225	SM	Silty sand, brown, moist, medium dense, noticeable odor.	
		8		GC	Clayey gravel with sand, fine–to coarse–grained, brown–gray, moist, very dense, noticeable odor.	
48		16				
	S–48.5	50	200			
					Total Depth = 49 feet.	
50						

Applied GeoSystems

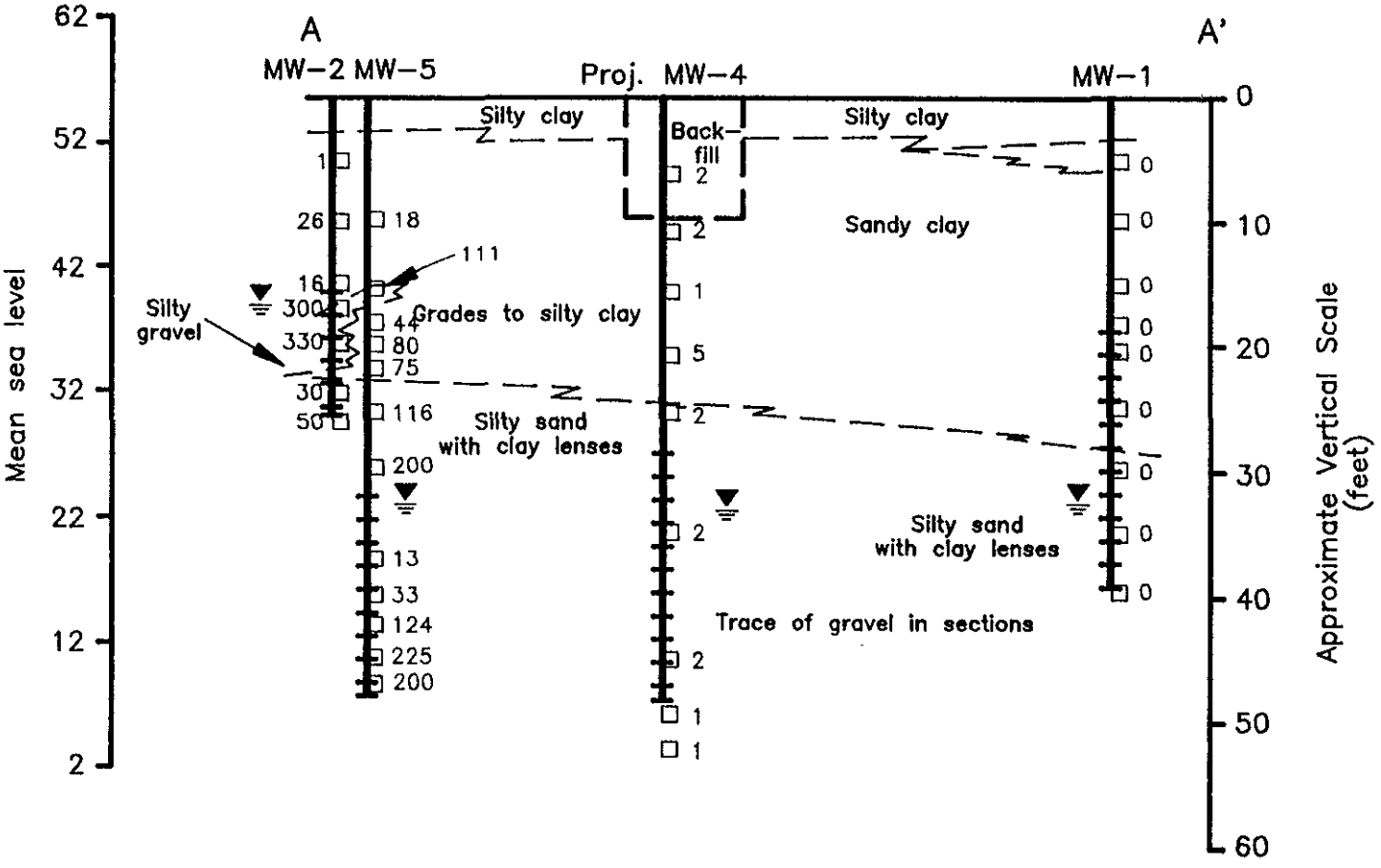
PROJECT NO. 19014-1

LOG OF BORING B-5/MW-5

Arco Service Station No. 276
10600 McArthur Blvd.
Oakland, California

PLATE

P - 14



EXPLANATION

- = OVM reading in ppm
- = Well casing
- = Well screen
- = Static water level measured on May 3, 1989
- = Interpreted contact

Approximate Horizontal Scale

30 0 30 60

feet

Approximate Vertical Scale

15 0 15 30

feet

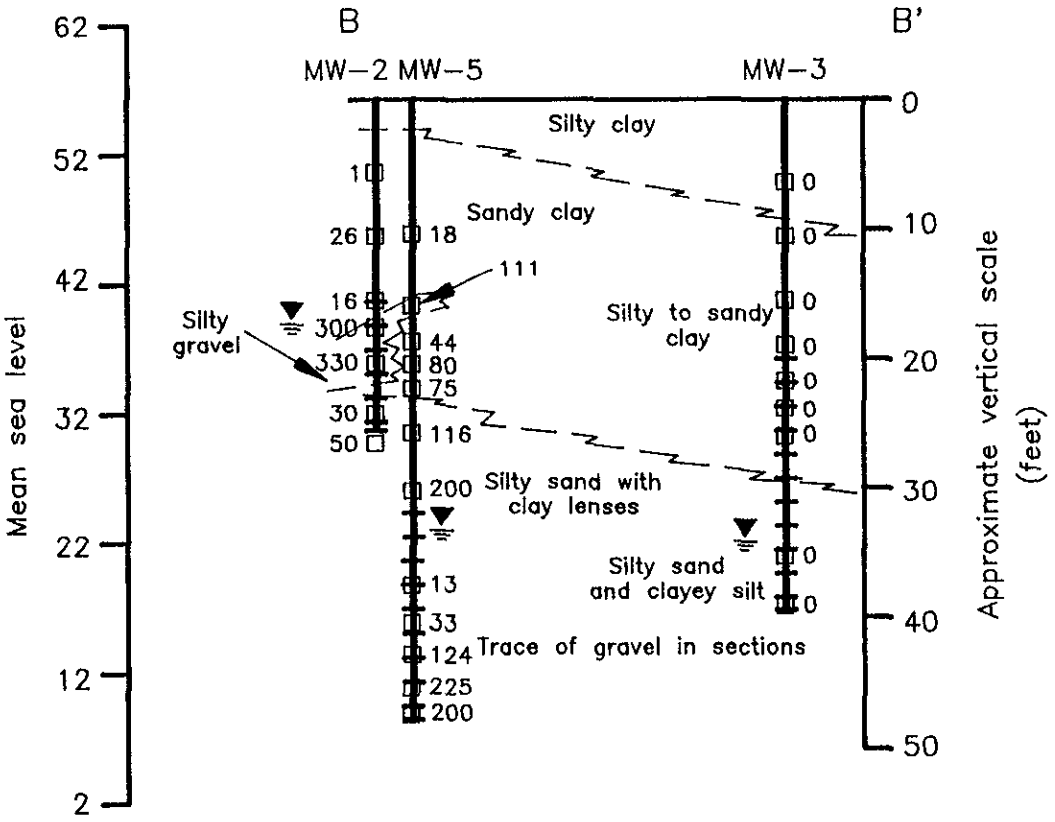
Applied GeoSystems

PROJECT NO. 19014-1

CROSS SECTION A - A'
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE

P - 15



EXPLANATION

- = OVM reading in ppm
- = Well casing
- = Well screen
- = Static water level measured on May 3, 1989
- = Interpreted contact

Approximate Horizontal Scale

30 0 30 60

feet

Approximate Vertical Scale

15 0 15 30

feet

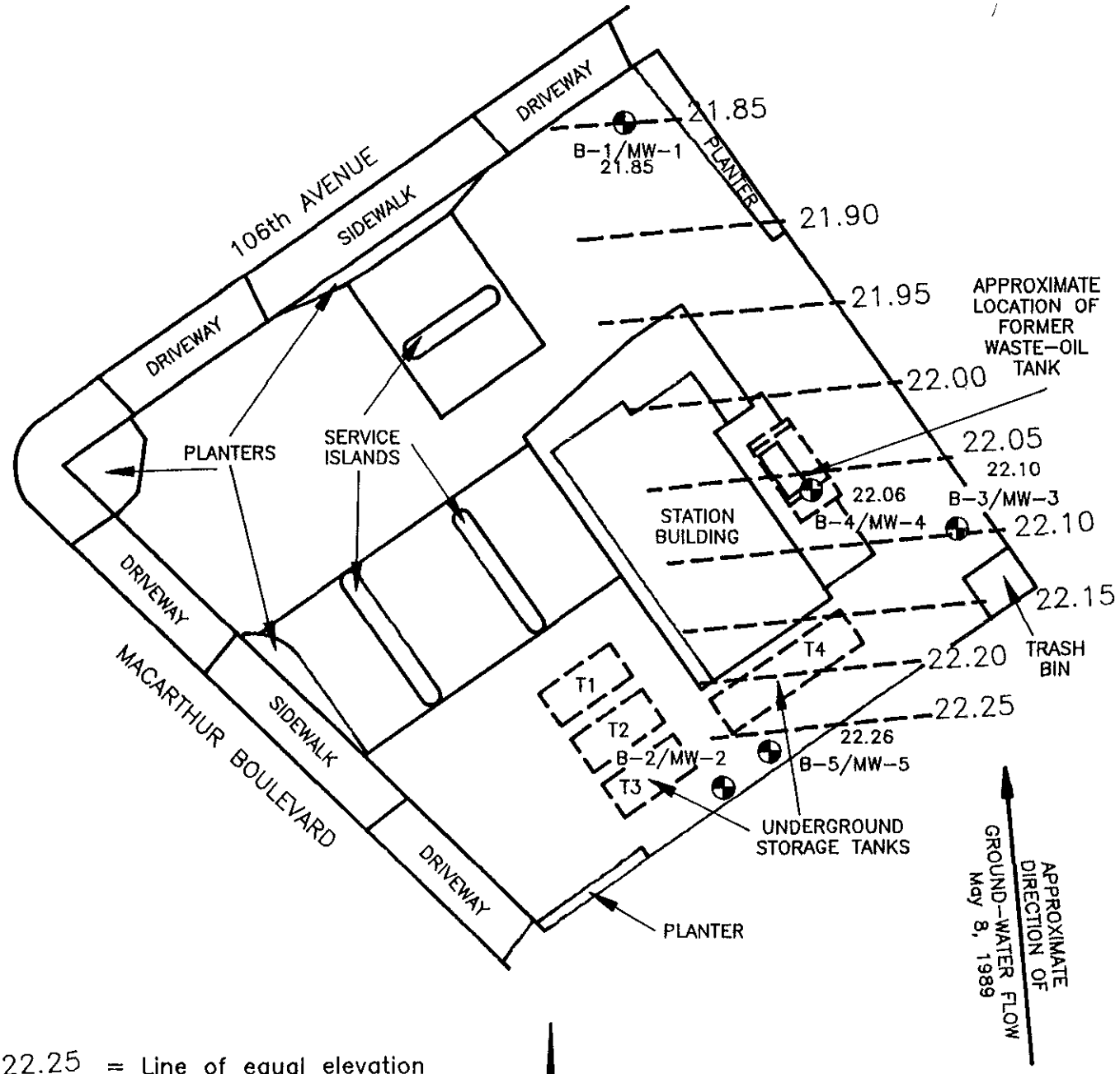
Applied GeoSystems

PROJECT NO. 19014-1

CROSS SECTION B - B'
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE

P - 16



---22.25 = Line of equal elevation to ground water

B-5/MW-5 ◓ = Approximate location of boring/monitoring well

Source: Modified from plan supplied by ARCO and surveyed by Ron Archer Civil Engineer, Inc.

N

Approximate Scale

30 15 0 30 60

feet

Applied GeoSystems

PROJECT NO. 19014-1

GROUND-WATER ELEVATION MAP
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE
P - 17

APPENDIX A

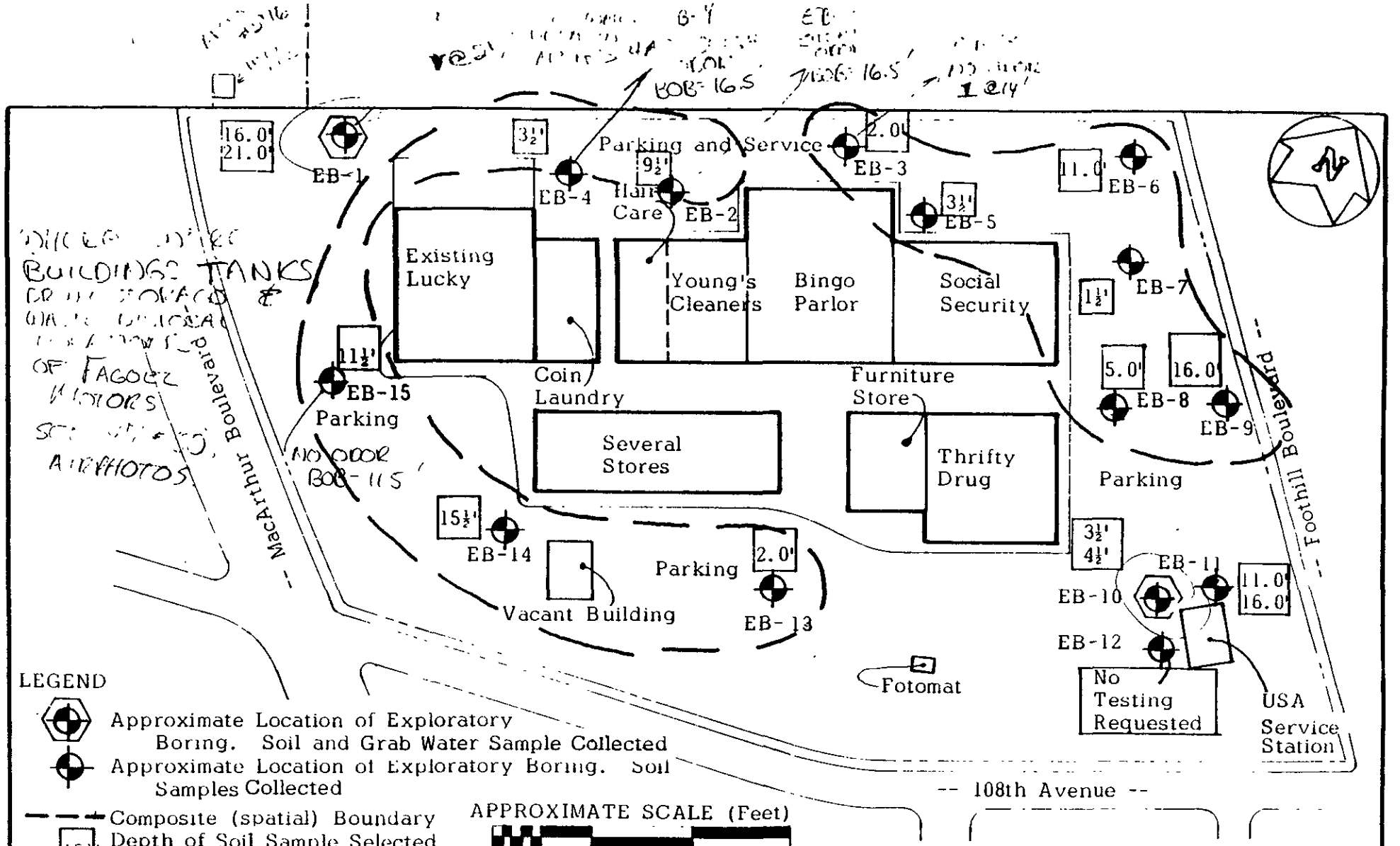
SELECTED PAGES FROM KALDVEER ASSOCIATES REPORT:

PRELIMINARY SOIL AND GROUNDWATER QUALITY TESTING PROGRAM

FOOTHILL SQUARE OAKLAND, CALIFORNIA

DATED OCTOBER 7, 1988

KE812-3A, 12302



Base: Foothill Square "Drake Builders", Welton Becket & Associates, undated

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SITE PLAN

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	Figure
KE812-3A	October 1988	2

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels gravel-sand-silt mixtures non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands gravelly sands little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures non-plastic fines
			SC	Clayey sands, sand-clay mixtures plastic fines
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays lean clays
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

DEFINITION OF TERMS

	U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			
	200	40	10	4	3/4"	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

GRAIN SIZES

SANDS AND GRAVELS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS AND CLAYS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation

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KEY TO EXPLORATORY BORING LOGS
Unified Soil Classification System (ASTM D-2487)

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	Figure
KE812-3A	October 1988	A-1

DRILL RIG	Continucus Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	27 Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
1" asphalt over 8" baserock CLAY, silty with gravels, no odor, dry	brown	very stiff	CL	1					
				2		23			
(grading to no gravels)				3					
				4		28			
				5		41			
		hard		6					
				7					
(grading to some white specks)				8					
				9					
				10					
(grading to no white specks)				11		24			
		very stiff		12					
(grading with some gravels)				13					
(grading with slight odor)				14					
				15					
				16		26			
				17					
				18					
CLAY, gravelly, very moist	brown-green	very stiff	CL	19					
(strong odor)				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER 27 Feet	BORING DIAMETER 6 inches	DATE DRILLED 8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAY, gravelly, very moist, strong odor	brown-green	very stiff	CL	21					
				22		30			
				23					
				24					
				25					
				26					
				27		34	▽		
				28					
				29					
(saturated)				30					
				31		21			
Bottom of Boring = 31½ Feet				32					
				33					
				34					
				35					
				36					
				37					
				38					
				39					
				40					

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.
3. Groundwater level was measured at 27 feet at time of drilling.

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" asphalt over 5" baserock				1					
CLAY, silty, few gravels, slight odor, dry	black	very stiff	CL	2		32			
		stiff		3					
				4		16			
(grading to slightly moist)				5					
				6					
				7					
CLAY, silty, no gravels, slight odor, dry	light-brown	hard	CL	8					
				9					
				10		64			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				11					
				12					
				13					
				14					
				15					
				16					
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	2

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	14 Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" Asphalt 6" baserock									
CLAY, silty with few gravels, dry, no odor	brown	very stiff	CL			36			
		hard				52			
(grading to no gravels)									
(grading to slightly moist)						26			
(grading to very moist)						34			
Bottom of Boring = 16½ Feet									

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.
3. Groundwater level was measured at 14 feet at time of drilling.

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	3

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER Not Encountered	BORING DIAMETER 6 inches	DATE DRILLED

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
1" asphalt over 6½" abserock									
CLAY, silty, dry, slight odor	black-brown	very stiff	CL	1					
				2	▨	35			
		stiff		3					
				4	▨	19			
				5					
(grades to light brown)	light-brown			6					
				7					
				8					
		hard		9					
				10	▨	55			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				11					
				12					
				13					
				14					
				15					
				16	▨	45			
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	4

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
1" asphalt over 7½" baserock				1					
CLAY, silty, some gravels, slight odor, dry	brown	very stiff	CL	2		21			
				3					
(grading to no gravels)				4		22			
				5					
				6		64			
(grading to slightly moist)				7					
				8					
				9					
				10					
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				11					
				12					
				13					
				14					
				15					
				16					
Bottom of **Boring = 16½ Feet**				17					
				18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	5

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	14 Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" asphalt over 5" baserock									
CLAY, silty, some gravels -roots(small) -dry -no odor	brown	firm	CL	1 2		9			
		very stiff		3 4		36			
(grading to no gravels) (grading to no roots)		hard		5		45			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A. 3. Groundwater level was measured at 14 feet at time of drilling.				6 7 8 9					
GRAVEL, sand(fine-coarse grained), some clay, no odor, grades with less clay, moderately moist	grey	medium-dense	GP	10 11		27			
(grades to saturated)				12 13 14			▽		
				15 16		27			
Bottom of Boring = 16½ Feet				17 18 19 20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	6

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER Not Encountered	BORING DIAMETER 6 inches	DATE DRILLED 8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSF)
2" asphalt over 6" baserock				1					
CLAY, silty, no gravels, dry, no odor	brown	hard	CL	2		50			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.		very stiff		3 4 5		44 34			
GRAVEL, sandy(fine-coarse grained), some clay, no odor, moderately moist (grades with less clay)	grey	medium-dense	GP	6 7 8 9 10 11		34			
(grades to very moist)				12 13 14 15					
		dense		16		42			
Bottom of Boring = 16½ Feet				17 18 19 20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	7

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	R.B
DEPTH TO GROUNDWATER	13 Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSF)
2" asphalt over 5" baserock				1					
CLAY, sand(fine-coarse grained), few gravels, dry, no odor	brown	very stiff	CL	2		40			
				3					
SAND(fine-coarse grained), silty, no gravels, dry, no odor	brown	dense	SM	4		38			
				5		20			
(grading to coarse sand with some gravels)				6					
				7					
(grading to moderately moist)				8					
				9					
				10					
GRAVEL, sandy(fine-coarse grained), very moist, no odor	brown	medium-dense	GP	11		25			
				12					
				13			▽		
				14					
				15					
				16		30			
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.
3. Groundwater level was measured at 13 feet at time of drilling.

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	8

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	13½ Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/29/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" asphalt over 5" baserock									
CLAY, silty, few gravels, dry, no odor	brown	hard	CL	1					
				2		49			
				3					
(grading to no gravels)				4		46			
				5					
				6		45			
				7					
(grading to slightly moist)				8					
				9					
				10					
(grading to very moist)				11					
		very stiff		12		24			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A. 3. Groundwater level was measured at 13½ feet at time of drilling.				13					
				14					
				15					
		firm		16		10			
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	9

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	29½ Feet	BORING DIAMETER	6 inches	DATE DRILLED	8/30/881

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" asphalt over 5" baserock									
CLAY, silty, few gravels, dry, no odor	brown	very stiff	CL	1					
				2	▨	33			
				3					
CLAY, sandy (fine-coarse grained) with gravels, slightly moist, slight odor, mottled color	brown-olive-green white	hard	CL	4	▨	60			
				5	▨	26			
CLAY, silty, no gravels, slightly moist, no odor	brown	very stiff	CL	6					
				7					
				8					
				9					
				10					
				11	▨	41			
		hard		12					
				13					
				14					
				15					
				16	▨	50			
				17					
(grading to mottled color), no odor	brown-olive-green orange			18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	10

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER 29½ Feet	BORING DIAMETER 6 inches	DATE DRILLED 8/30/88

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAY, silty, no gravels, slightly moist, no odor	brown	hard	CL	21					
						57			
(grading with some gravels)				22					
				23					
				24					
(grading to moderately moist)				25					
				26		75			
(grading with many gravels)				27					
				28					
				29			▽		
				30					
				31		50			
Notes. 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A. 3. Groundwater level was measured at 29½ feet at time of drilling.				32					
GRAVEL, sandy(fine-coarse grained), with clay, saturated, no odor	grey	very dense	GP	33					
				34					
				35					
				36					
Bottom of Boring = 36½ Feet				37					
				38					
				39					
				40					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO.
KE812-3A	October 1988	10

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/28/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
1" asphalt over 4" baserock				1					
CLAY, silty with few gravels, dry no odor	brown	very stiff	CL	2		36			
				3		32			
(grading with less gravels)				4					
				5		36			
				6					
				7					
				8					
				9					
				10					
				11		35			
				12					
				13					
				14					
				15					
		hard		16		49			
				17					
				18					
				19					
				20					

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	11

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER Not Encountered	BORING DIAMETER 6 inches	DATE DRILLED 8/30/88

DESCRIPTION AND CLASSIFICATION				DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE						
CLAY, silty with few gravels	brown	hard	CL	21		60			
Bottom of Boring = 21½ Feet				22					
				23					
				24					
				25					
				26					
				27					
				28					
				29					
				30					
				31					
				32					
				33					
				34					
				35					
				36					
				37					
				38					
				39					
				40					

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.

Kaldveer Associates
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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	11

DRILL RIG Continuous Flight Auger	SURFACE ELEVATION -	LOGGED BY RB
DEPTH TO GROUNDWATER Not Encountered	BORING DIAMETER 6 inches	DATE DRILLED 8/30/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAY, silty with gravels, dry, no odor	brown	very stiff	CL	1					
				2		43			
(grading with less gravels)				3					
				4		30			
				5		34			
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				6					
				7					
				8					
				9					
				10					
				11		36			
				12					
(grading to mottled)	brown-red-yellow			13					
				14					
				15					
		hard		16		64			
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

Kaldveer Associates
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A California Corporation

EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO	DATE	BORING NO
KE812-3A	October 1988	12

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/30/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
1½" asphalt over 5½" baserock				1					
CLAY, silty, few gravels, slight odor, dry	black	stiff	CL	2		15			
				3					
				4		17			
				5					
				6		18			
(grades to brown)				7					
(grades to slightly moist)				8					
				9					
				10					
		very stiff		11		36			
				12					
(grades to slightly moist)				13					
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				14					
				15					
				16		16			
Bottom of Boring = 16½ Feet				17					
				18					
				19					
				20					

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A California Corporation

EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	13

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/30/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAY, silty, few gravels, no odor, dry	brown	very stiff	CL	1–2		28			
CLAY, silty with many gravels, no odor, dry	black	very stiff	CL	3–4		35			
(grading with less gravels)				5		27			
(grades to brown)				6–10					
Notes: 1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual. 2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.				11		26			
				12–15					
		hard		16		41			
Bottom of Boring = 16½ Feet				17–20					

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Geoscience Consultants
A California Corporation

EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO.
KE812-3A	October 1988	4

DRILL RIG	Continuous Flight Auger	SURFACE ELEVATION	-	LOGGED BY	RB
DEPTH TO GROUNDWATER	Not Encountered	BORING DIAMETER	6 inches	DATE DRILLED	8/30/88

DESCRIPTION AND REMARKS	COLOR	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
2" asphalt over 5" baserock				1					
CLAY, silty with gravels, dry, no odor, mottled	brown-orange-green	very stiff	CL	2		30			
(grading to brown)				3					
(grading with less gravels)	brown			4		22			
				5		20			
				6					
				7					
				8					
				9					
				10					
				11		22			
Bottom of Boring = 11½ Feet				12					
				13					
				14					
				15					
				16					
				17					
				18					
				19					
				20					

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. These samplers were driven with a fully manual hammer and the penetration resistance values should be converted as explained in Appendix A.

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EXPLORATORY BORING LOG

FOOTHILL SQUARE
Oakland, California

PROJECT NO.	DATE	BORING NO
KE812-3A	October 1988	15

SELECTED PAGES FROM WESTERN GEOLOGIC RESOURCES, INC. REPORT:

SOIL SAMPLING AND MONITORING WELL INSTALLATION

FOOTHILL SQUARE SHOPPING CENTER

OAKLAND, CALIFORNIA

DATED JANUARY 17, 1989

WGR JOB NO. 8-088.01

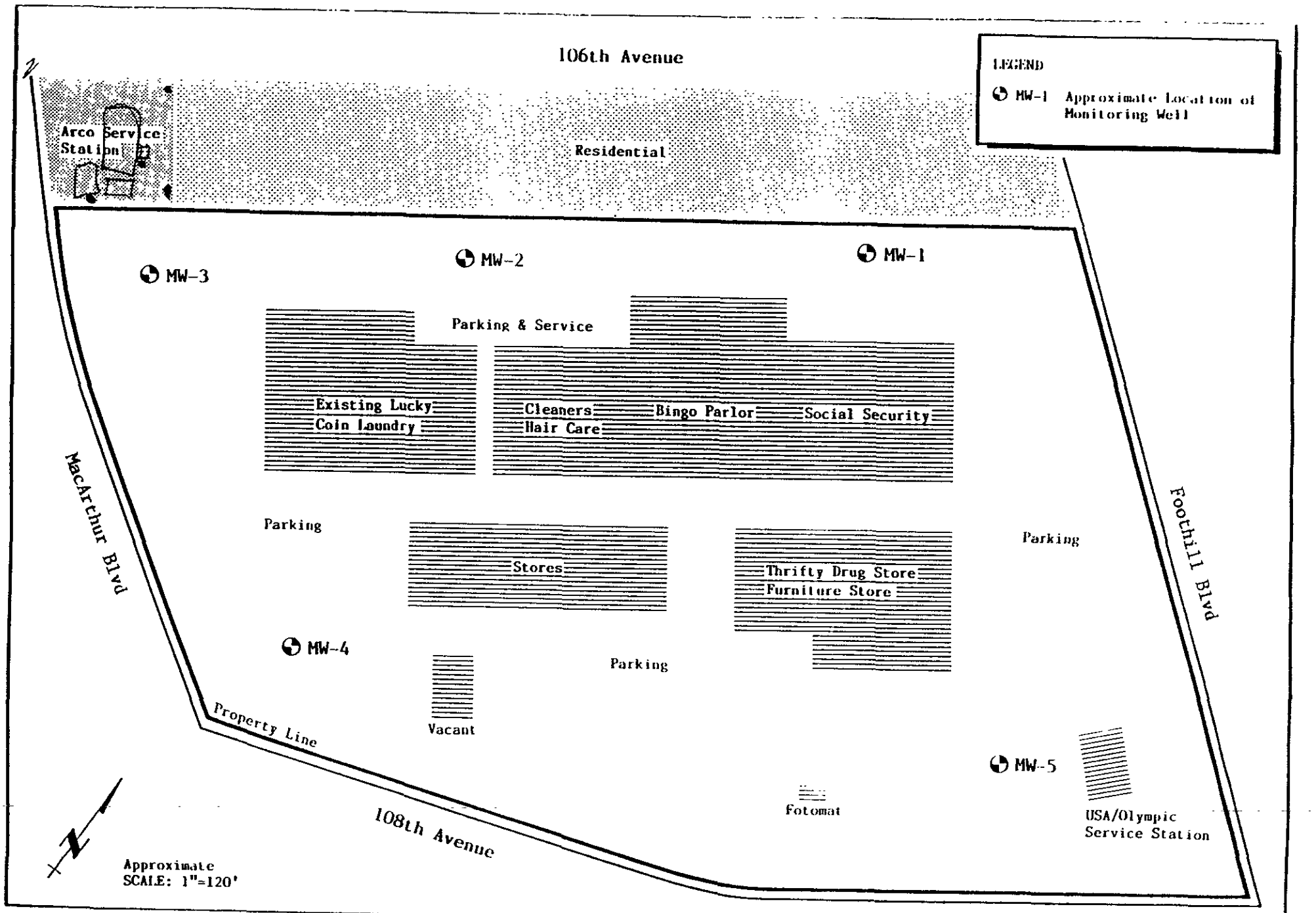


Figure 2. Site Plan, Foothill Square, Oakland, California.

Reference: Kaldveer Associates

WGR

TABLE 1. - ANALYTIC RESULTS FOR SOIL AND GROUNDWATER SAMPLES
Foothill Square, Oakland, California

ID	DATE	DEPTH (ft)	TYPE	BENZENE	TOLUENE	XYLENES	E-BENZENE	TPPH	PPP
				<----------PPB---------->					
B-1	5 Dec 88	20	SOIL	<5	5	<10	<5	<500	ND
B-1	5 Dec 88	31.5	SOIL	<1	<1	<2	<1	<100	ND
B-2	5 Dec 88	20	SOIL	<1	<1	<2	<1	<100	ND
B-2	5 Dec 88	40.5	SOIL	<1	<1	<2	<1	<100	ND
B-3	6 Dec 88	18	SOIL	16	<1	<2	<1	<100	ND
B-3	6 Dec 88	38.5	SOIL	<2	<2	<4	<2	<200	ND
B-4	7 Dec 88	14.5	SOIL	1	1	2	1	100	ND
B-4	7 Dec 88	49	SOIL	<1	<1	<2	<1	<100	ND
B-5	8 Dec 88	14.5	SOIL	<5	<5	<10	<5	<500	ND
				<----------PPB---------->					
MW-1	13 Dec 88	NA	WATER	<0.1	<1	<1	<1	<100	ND
MW-2	13 Dec 88	NA	WATER	0.1	<1	<1	<1	<100	*
MW-3	13 Dec 88	NA	WATER	0.2	<1	17	<1	300	*
MW-4	13 Dec 88	NA	WATER	0.2	<1	<1	<1	<100	ND
MW-5	13 Dec 88	NA	WATER	0.1	1	<1	<1	<100	ND
TRAVEL BLANK	13 Dec 88	NA	WATER	<0.1	<1	<1	<1	<100	ND

NOTES

Analyses by Central Coast Analytical Services, Inc.
All samples by EPA Method 524.2

PPP = Purgeable Priority Pollutants
TPPH= Total Purgeable Petroleum Hydrocarbons (Gasoline)
ND = Not present at limits of detection which vary for individual compounds
PPB = Parts per billion
PPM = Parts per million
* = MW-2: 0.1 ppb 1,1,1-Trichloroethane (TCA)
MW-3: 0.2 ppb 1,1,1-Trichloroethane (TCA)

Table 2. Top-of-Casing and Groundwater Elevations
Foothill Square, Oakland, California

TOC - DTW = Elev.-w

Monitor Well	DATE	TOC	GE	DTW	Elev.-W (msl)	REF. PT
MW-1	11 JAN 89	65.95	66.52	10.18	55.77	v-notch
MW-2	11 JAN 89	63.06	63.54	25.32	37.71	v-notch
MW-3	11 JAN 89	57.92	58.42	20.19	37.73	v-notch
MW-4	11 JAN 89	59.68	59.96	31.88	27.80	black mark
MW-5	11 JAN 89	68.94	69.14	19.00	49.94	black mark

TOC= Top-of-Casing Elevation, Liscensed surveyor
GE= Ground Surface Elevation
DTW= Depth-to-Water in feet
Elev.-W= Elevation of Static Water
REF. PT.= Reference Point for TOC elevation

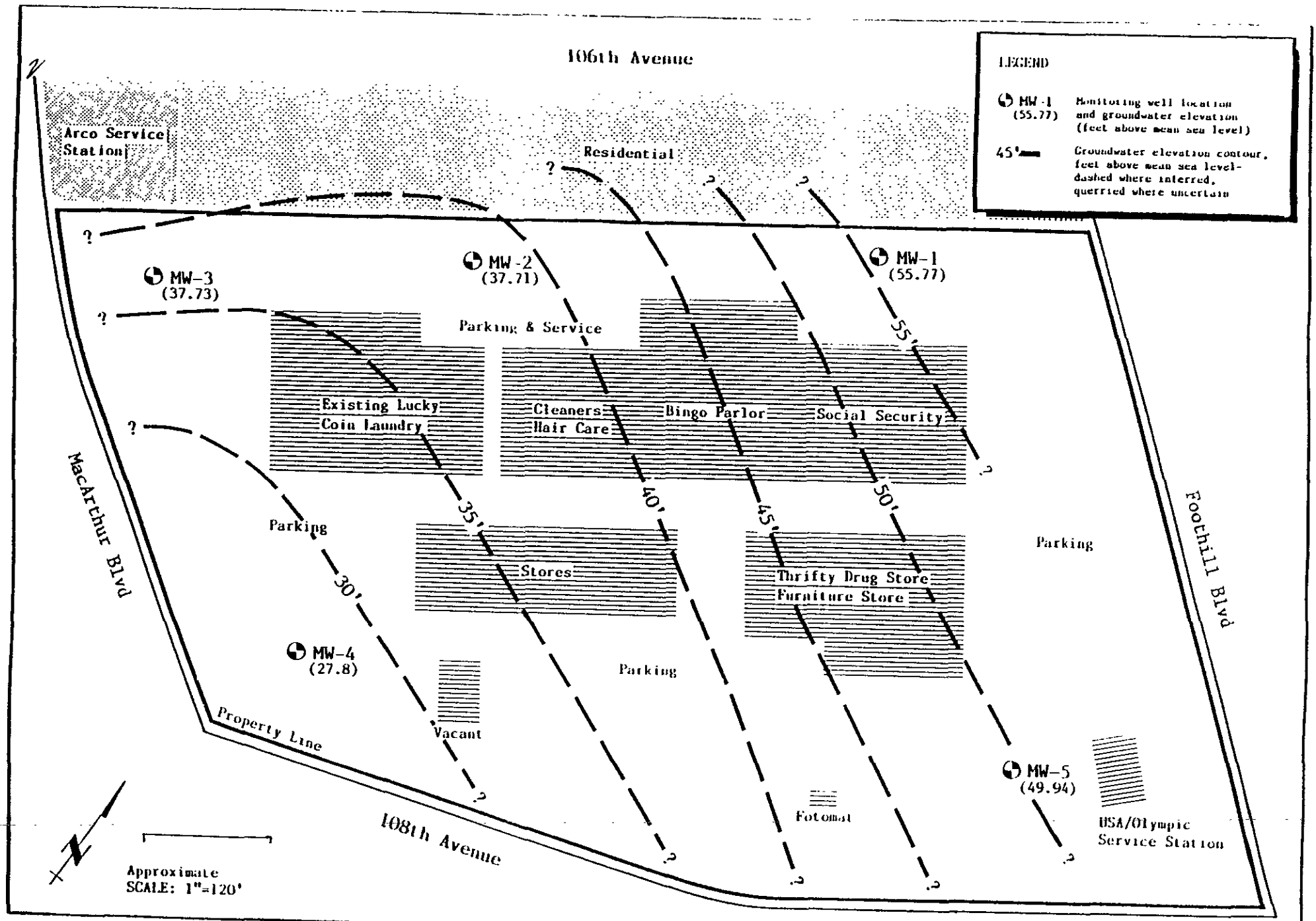
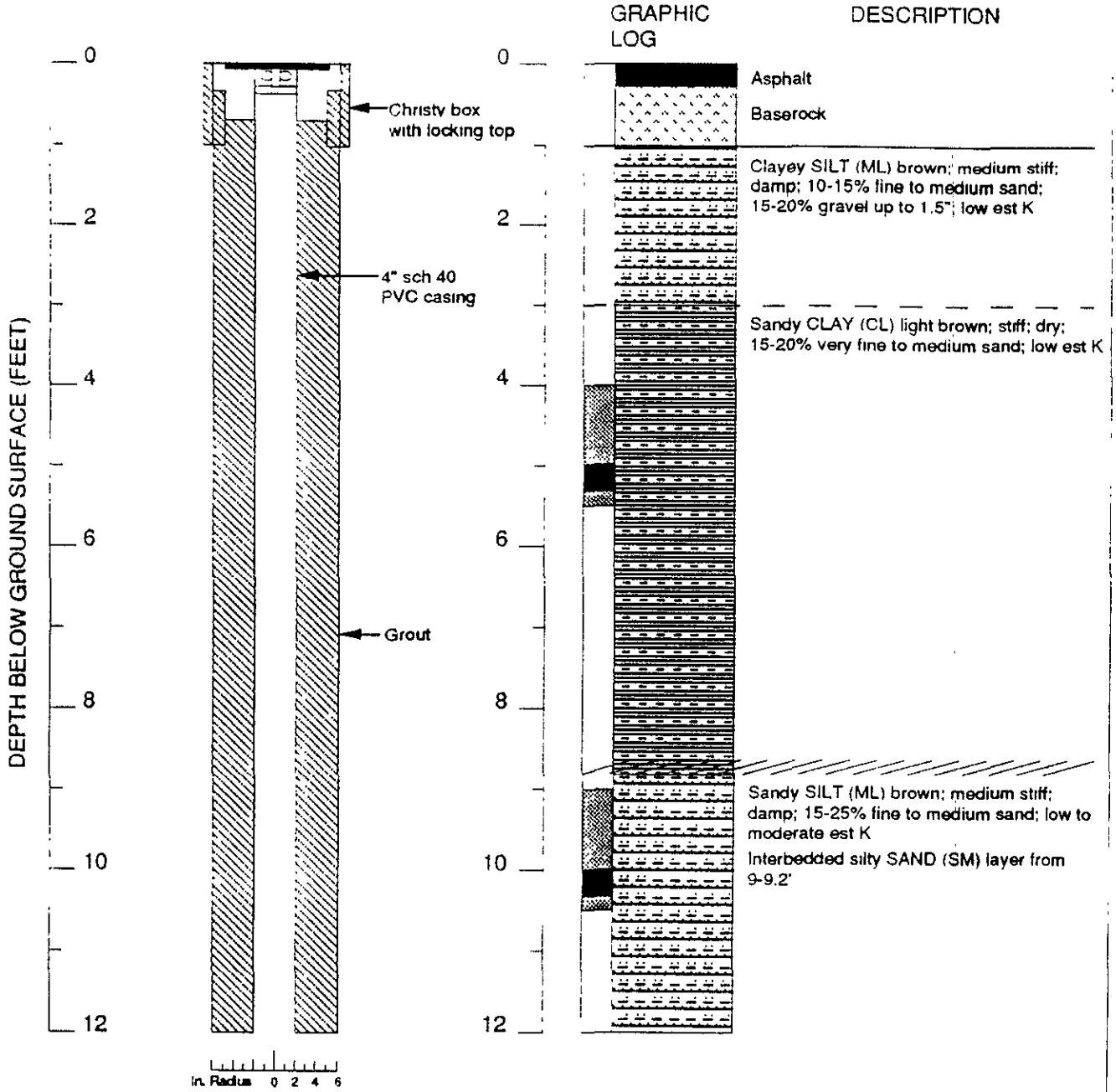


Figure 3. Potentiometric Surface of Shallow Water-Bearing Zone 11 January, 1989. Foothill Square, Oakland, California

Reference: Kaldveer Associates

WGR

MONITOR WELL MW-1



Continues

EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Gradational (hachured), uncertain (dashed) contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Grab sample

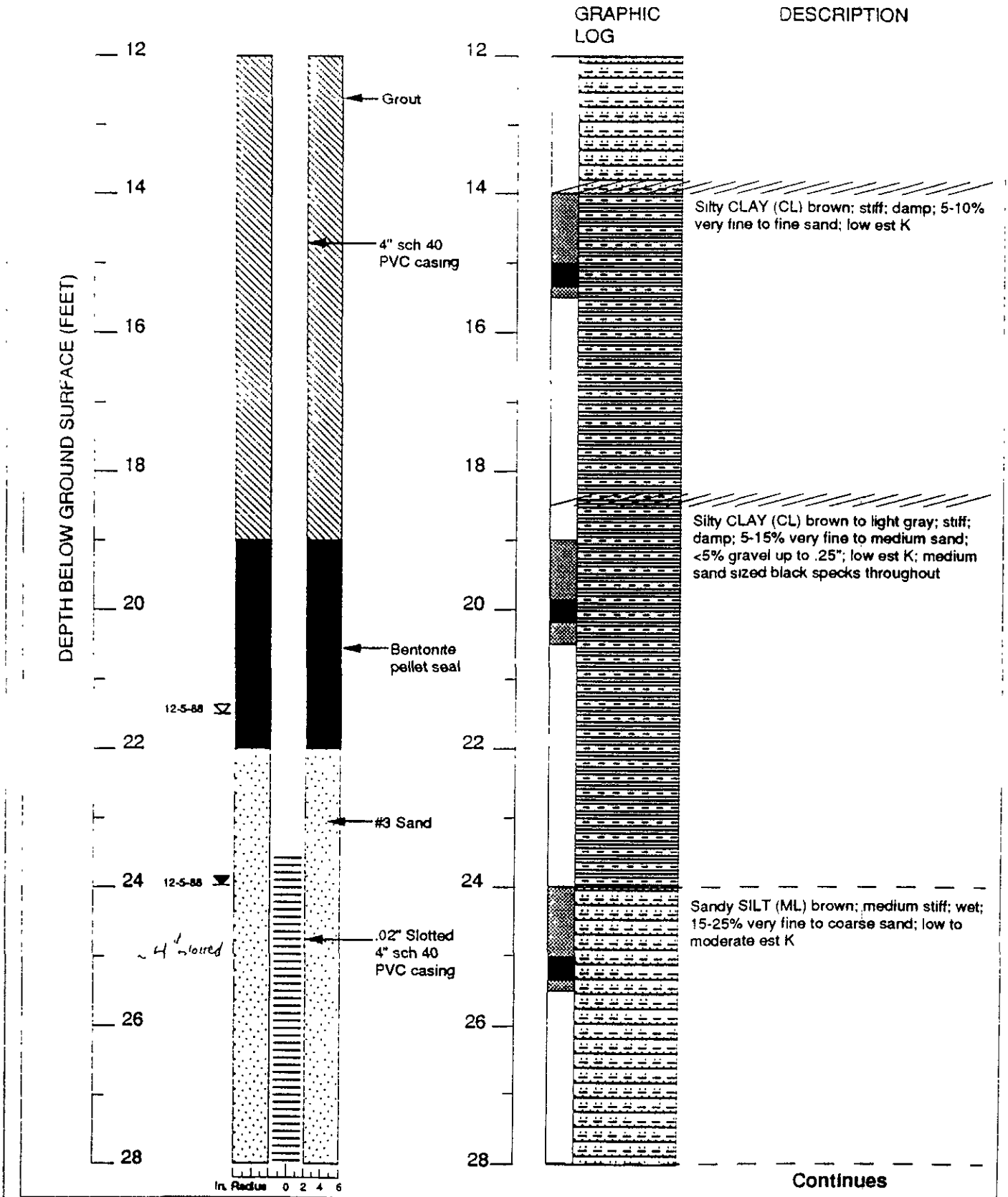
est K = Estimated permeability (hydraulic conductivity)

Logged by: Mike Edmonson
Supervisor: Todd Daniels
Drilling Company: Exploration Geoservices, Inc.
Driller: Dave Yeager
Drilling Method: Hollow stem auger
Dates Drilled: 12/5/88
Well Head Completion: Christy box & locking cap
Type of Sampler: 2" split barrel
TD: Drill depth = 33.5'

Boring Log and Well Completion Details MW-1
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

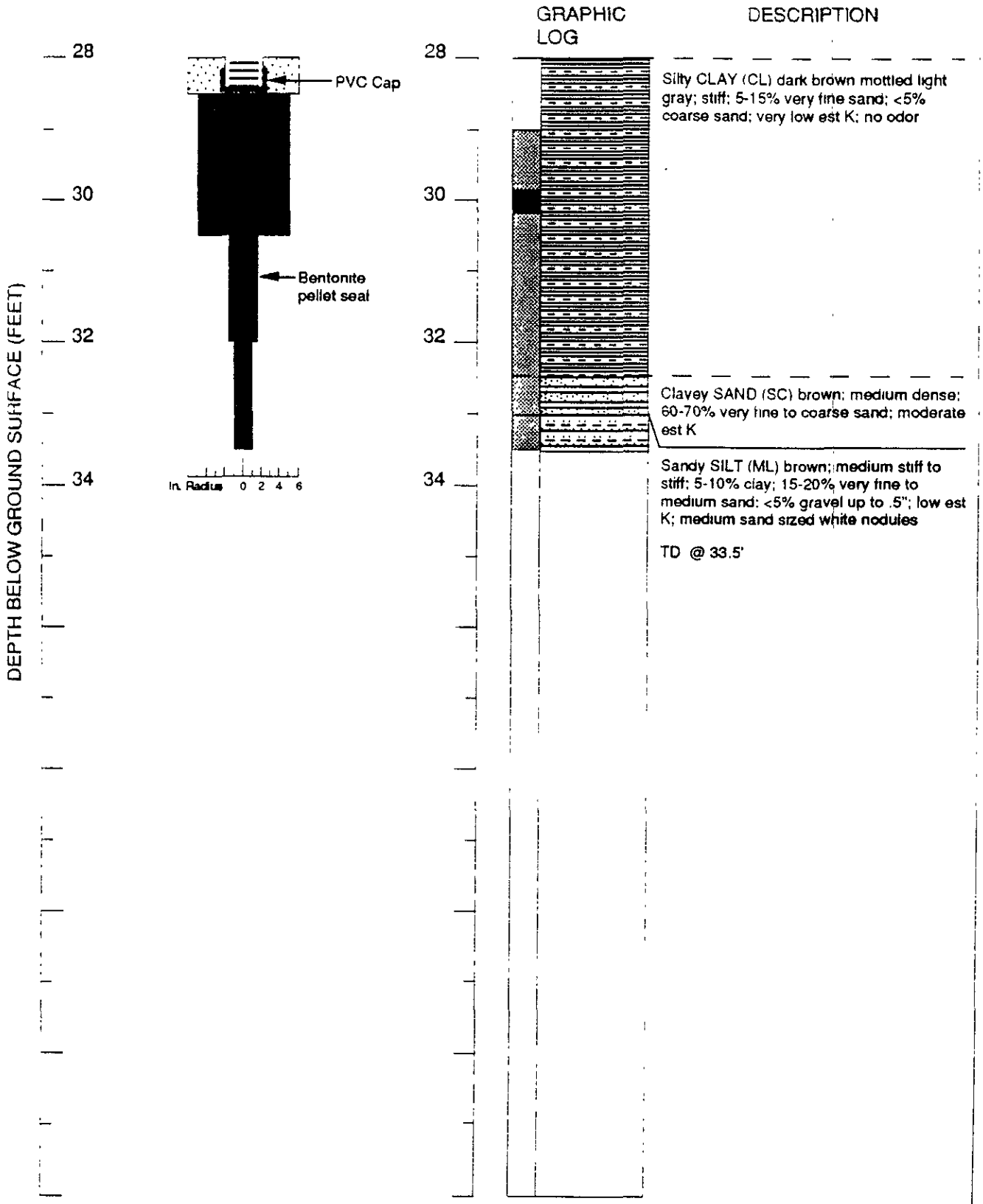
MONITOR WELL MW-1 (cont.)



Boring Log and Well Completion Details MW-1 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

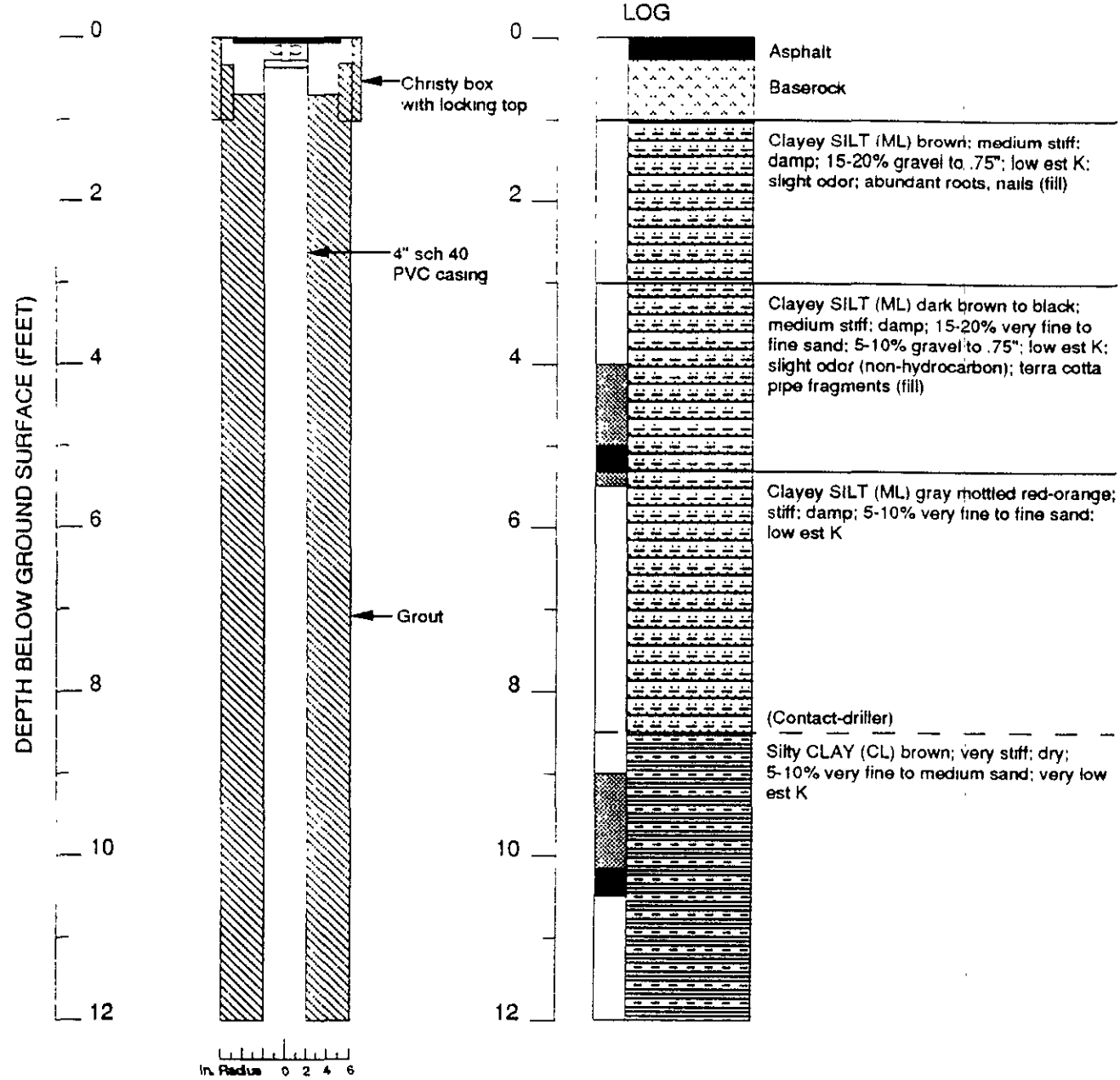
MONITOR WELL MW-1 (cont.)



Boring Log and Well Completion Details MW-1 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-2



Continues

EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Gradational (hachured), uncertain (dashed) contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Grab sample

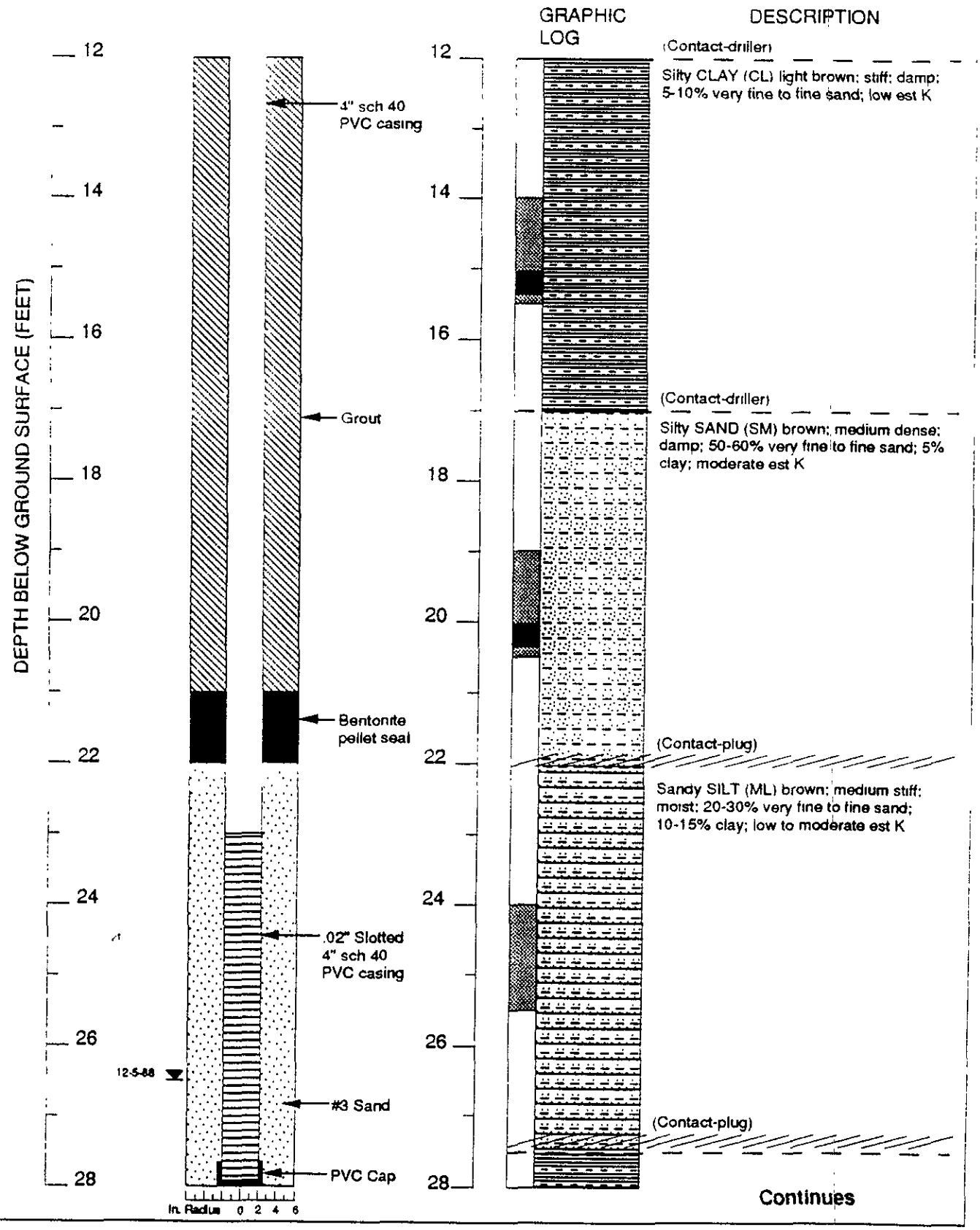
est K = Estimated permeability (hydraulic conductivity)

Logged by: Mike Edmonson
Supervisor: Todd Daniels
Drilling Company: Exploration Geoservices, Inc.
Driller: Dave Yeager
Drilling Method: Hollow stem auger
Dates Drilled: 12/5/88-12/6/88
Well Head Completion: Christy box & locking cap
Type of Sampler: 2" split barrel
TD: Drill depth= 40.5 ft

Boring Log and Well Completion Details MW-2
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

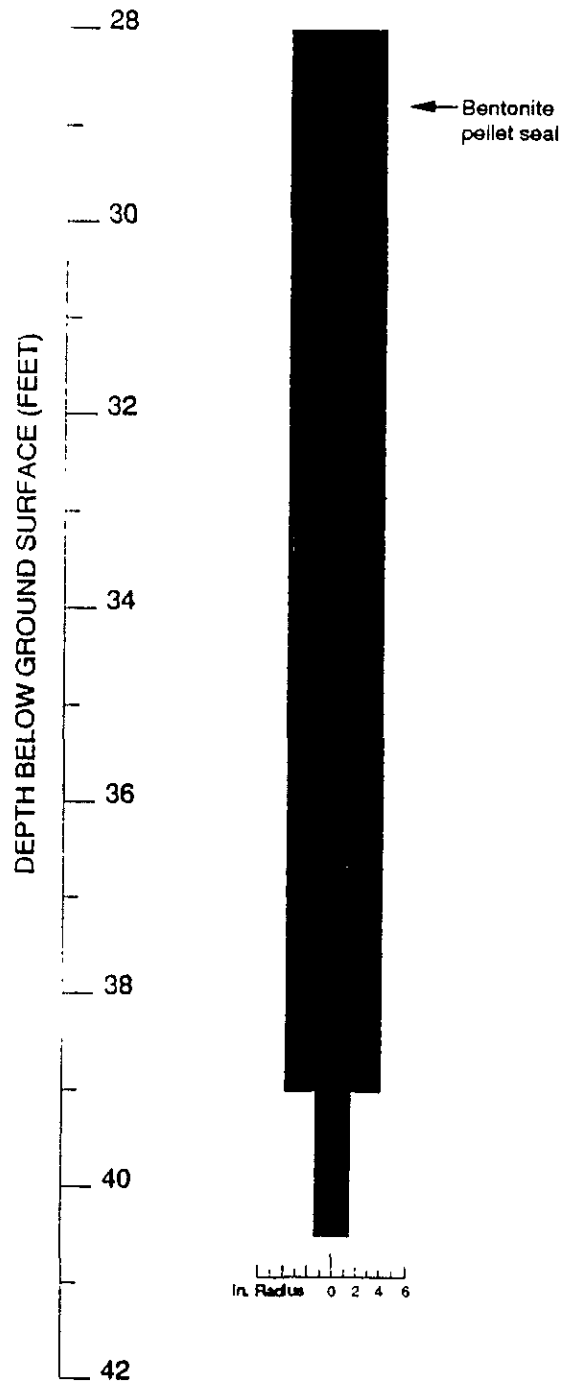
MONITOR WELL MW-2 (cont.)

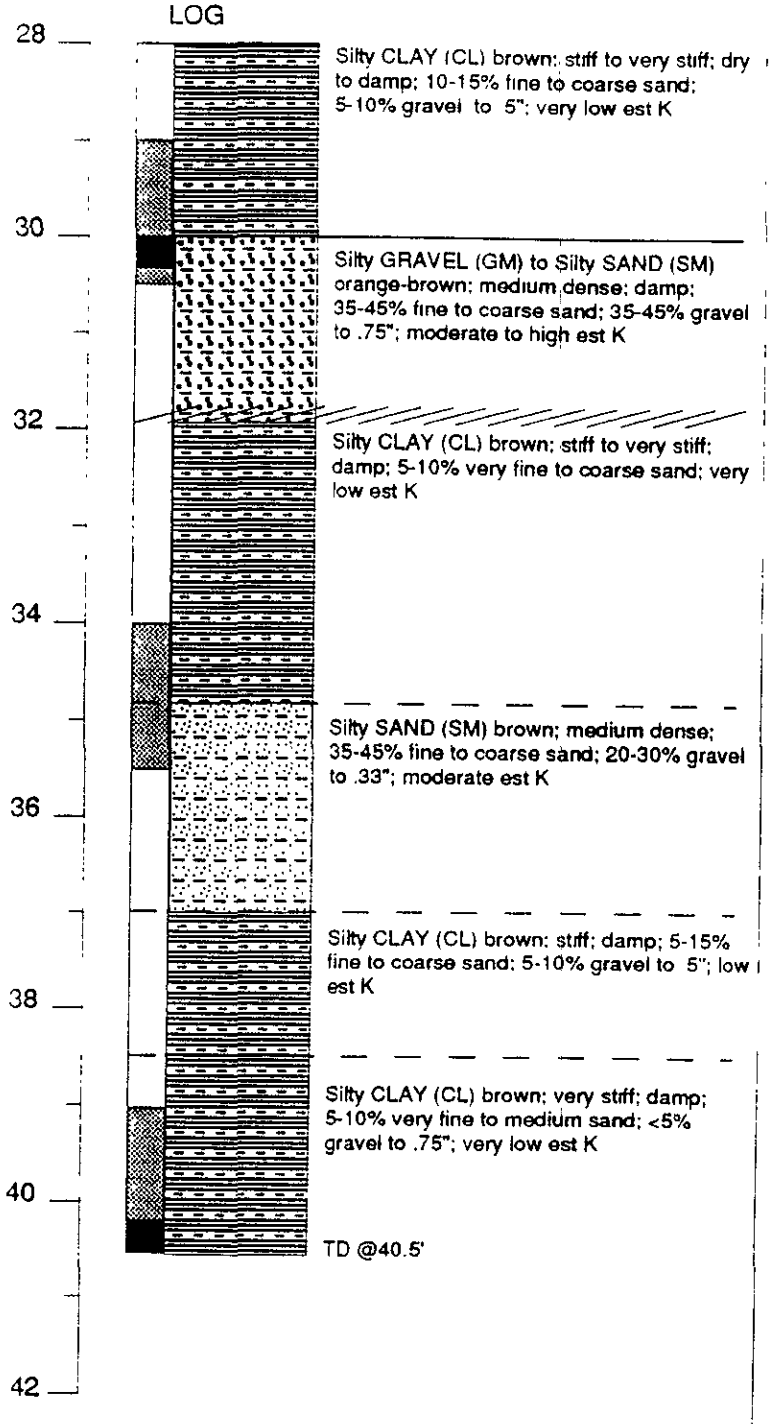


Boring Log and Well Completion Details MW-2 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-2 (cont.)

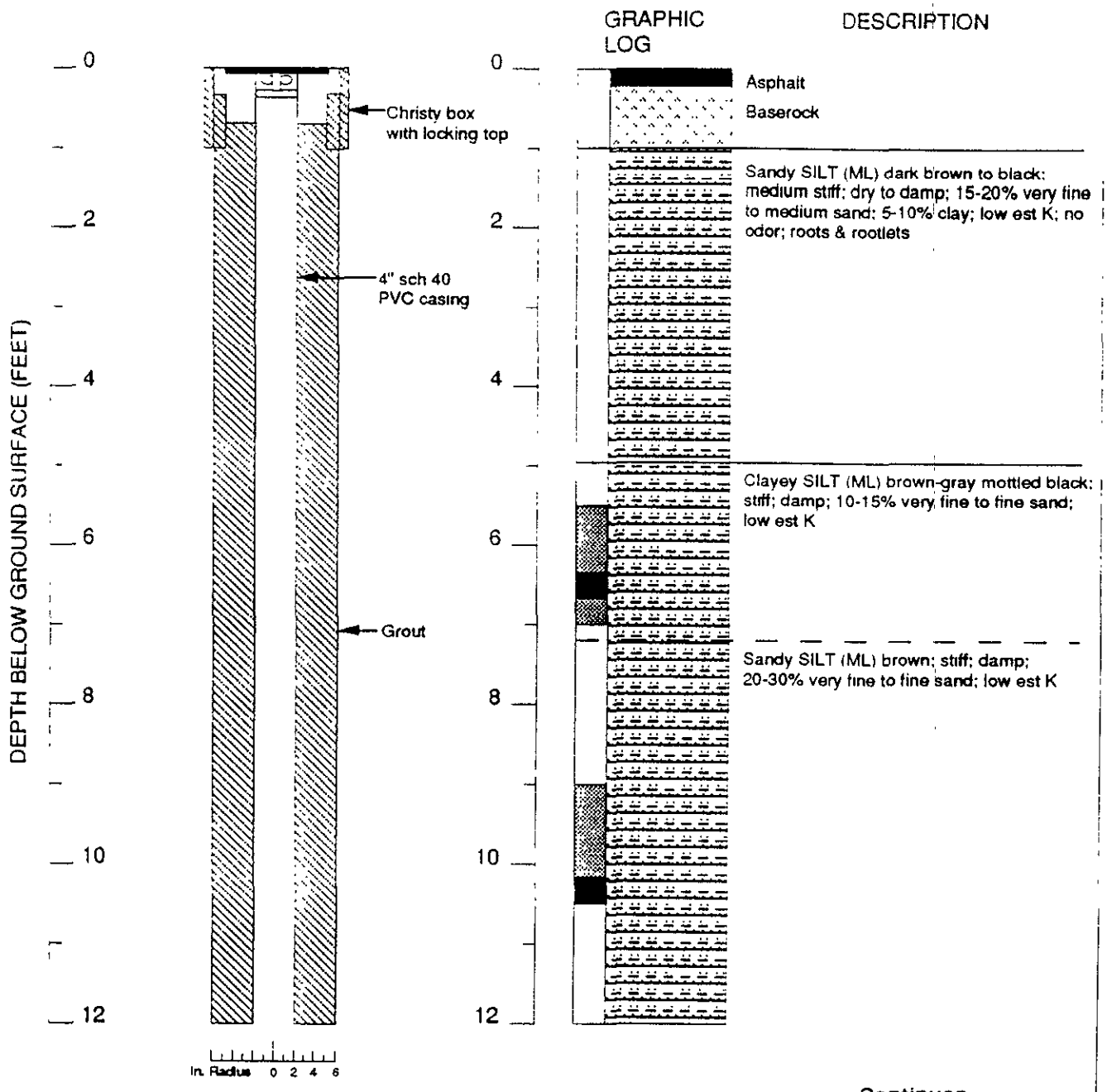




Boring Log and Well Completion Details MW-2 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-3



Continues

EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Gradational (hachured), uncertain (dashed) contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Grab sample

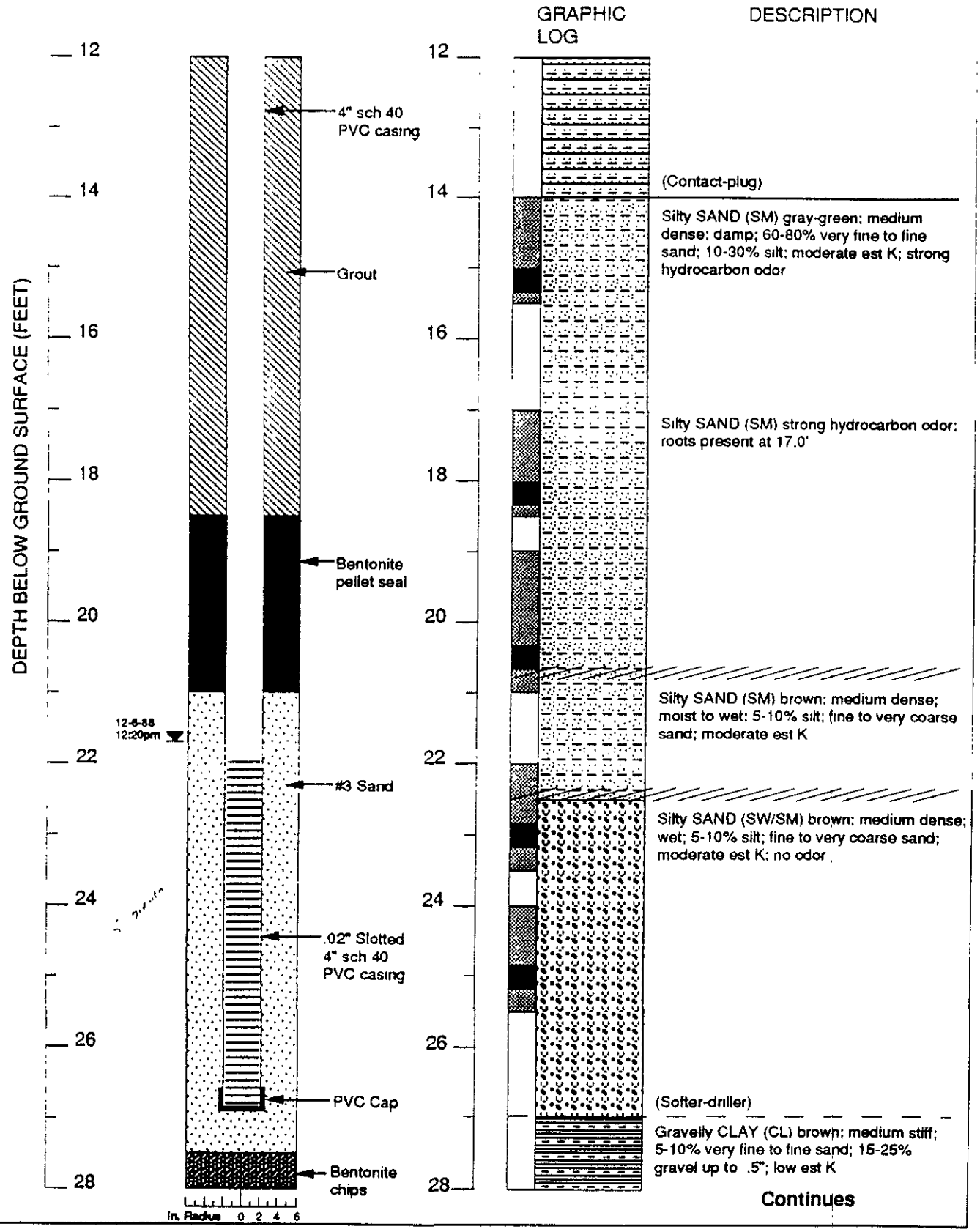
est K = Estimated permeability (hydraulic conductivity)

Logged by: Mike Edmonson
Supervisor: Todd Daniels
Drilling Company: Exploration Geoservices, Inc.
Driller: Dave Yeager
Drilling Method: Hollow stem auger
Dates Drilled: 12/6/88-12/7/88
Well Head Completion: Christy box & locking cap
Type of Sampler: 2" split barrel
TD: Drill depth= 42.0 ft

Boring Log and Well Completion Details MW-3
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-3 (cont.)



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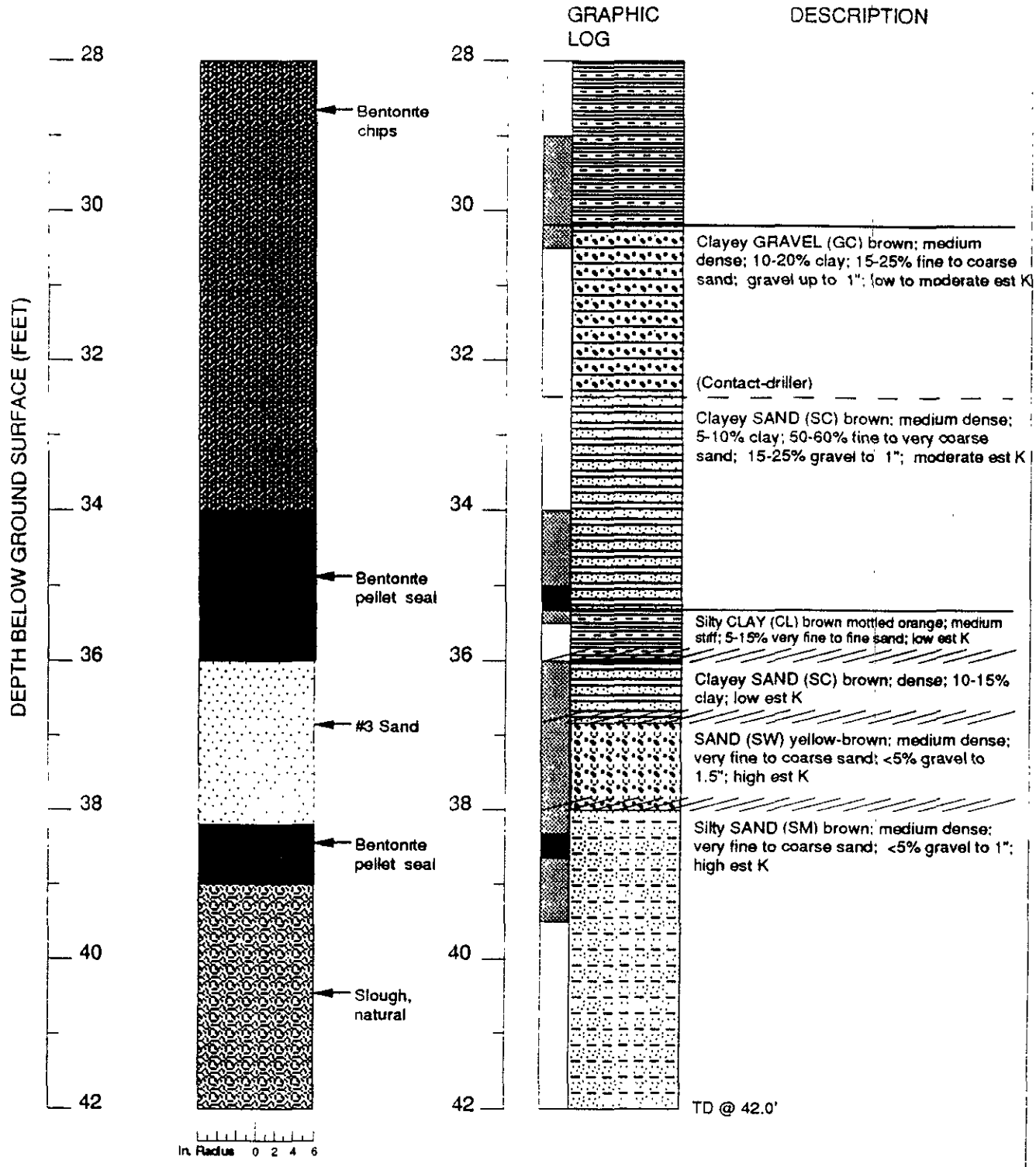
Boring Log and Well Completion Details MW-3 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

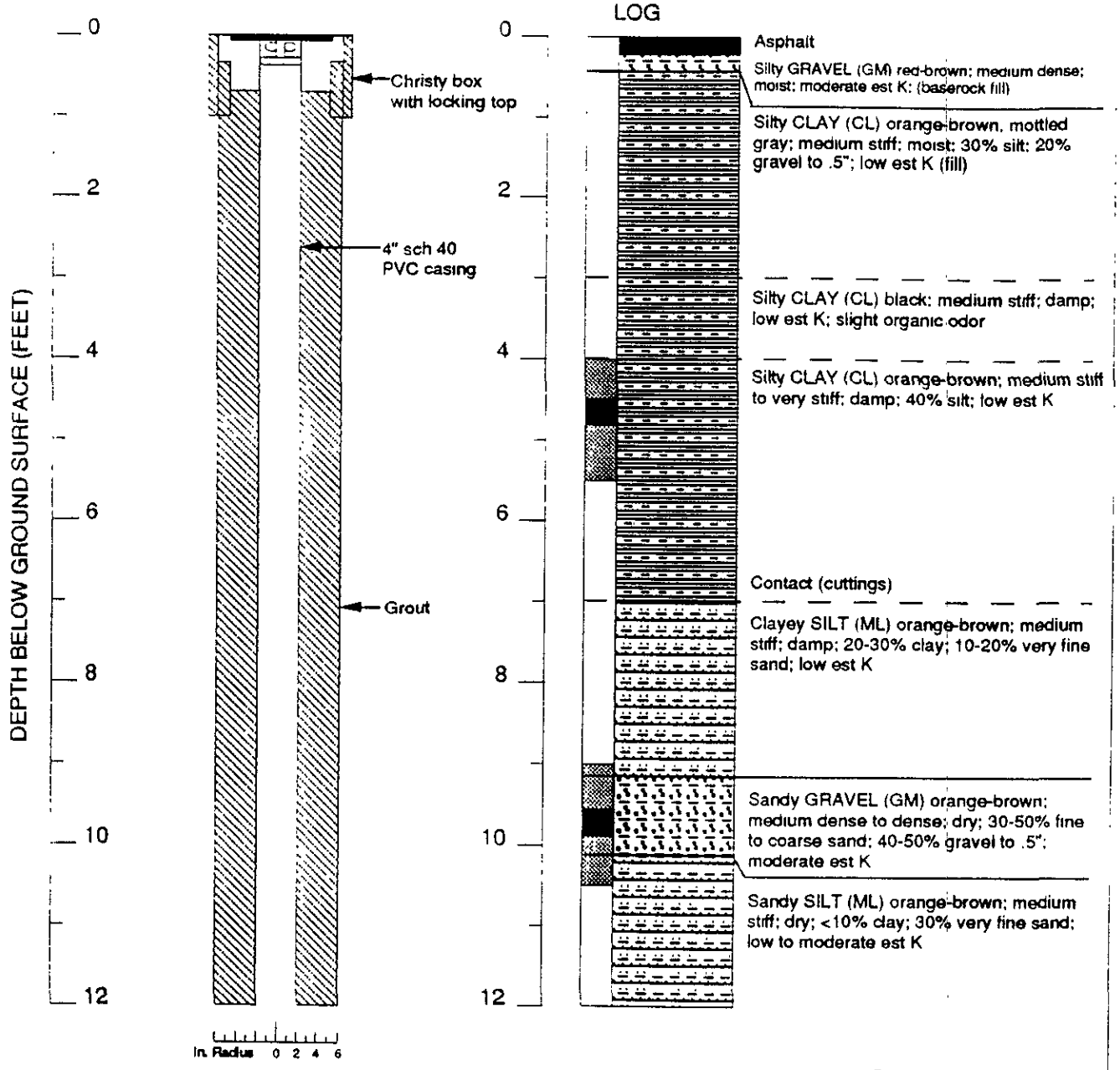
MONITOR WELL MW-3 (cont.)



Boring Log and Well Completion Details MW-3 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-4



Continues

EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Gradational (hachured), uncertain (dashed) contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Grab sample

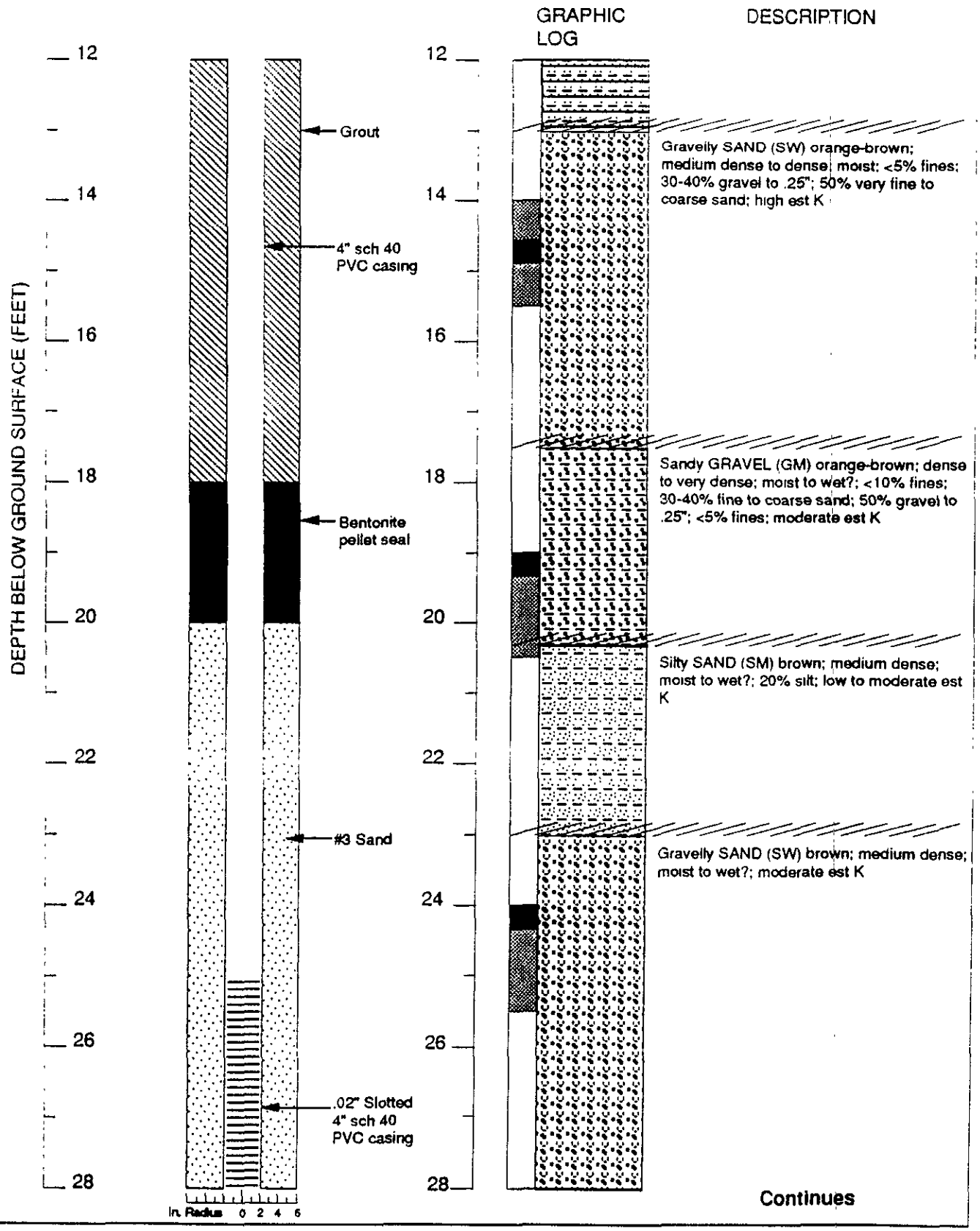
est K = Estimated permeability (hydraulic conductivity)

Logged by: Todd Daniels
Supervisor: Todd Daniels
Drilling Company: Exploration Geoservices, Inc.
Driller: Dave Yeager/Troy
Drilling Method: Hollow stem auger
Dates Drilled: 12/7/88
Well Head Completion: Christy box & locking cap
Type of Sampler: 2" split barrel
TD: Drill depth= 50.5 ft

Boring Log and Well Completion Details MW-4
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-4 (cont.)



Boring Log and Well Completion Details MW-4 (cont.)
WGR Project No.: 8-088.01

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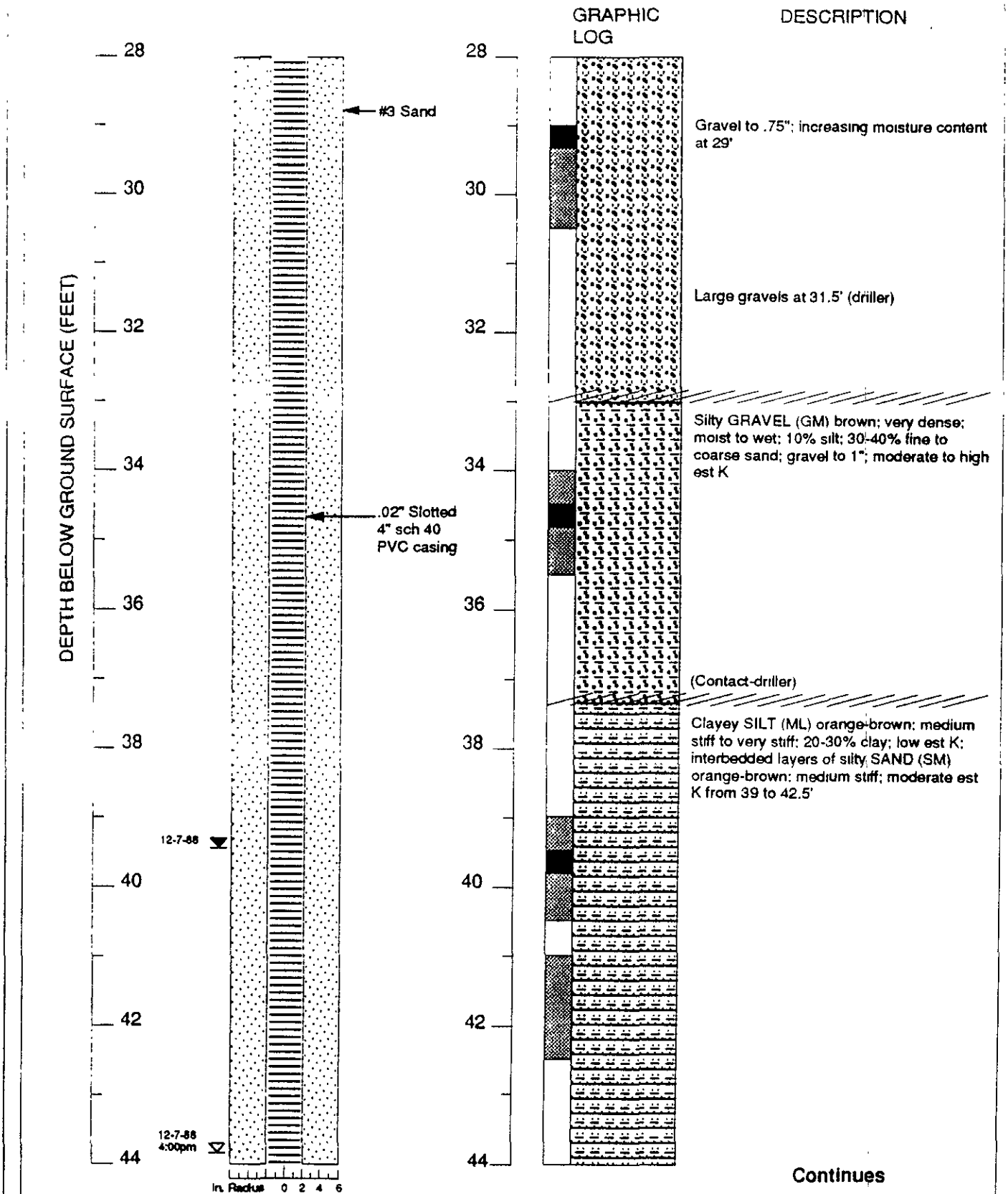
Oakland, CA

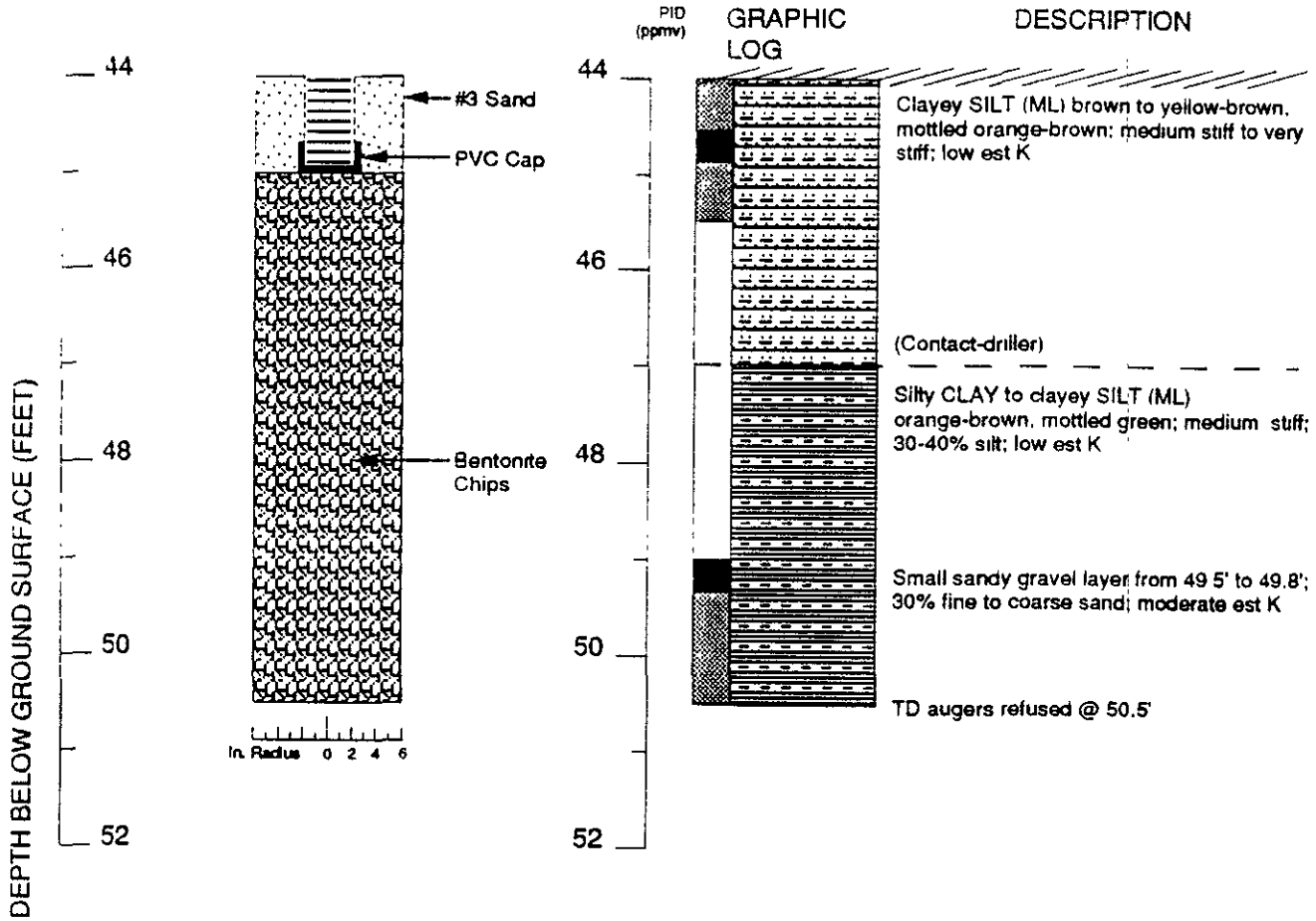
MONITOR WELL MW-4 (cont.)



Boring Log and Well Completion Details MW-4 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-4 (cont.)

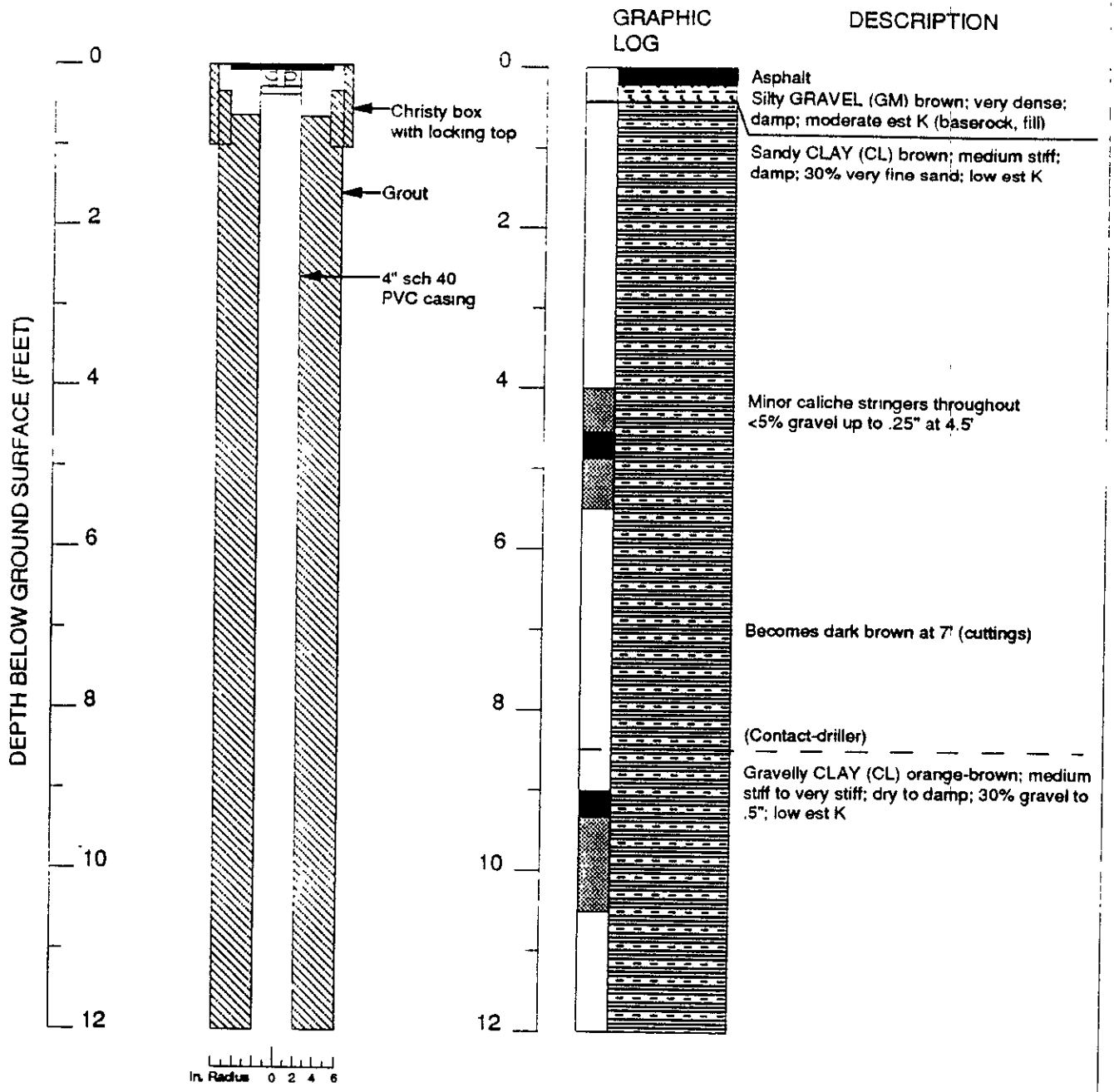


Boring Log and Well Completion Details MW-4 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

WGR

MONITOR WELL MW-5



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EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Gradational (hachured), uncertain (dashed) contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Grab sample

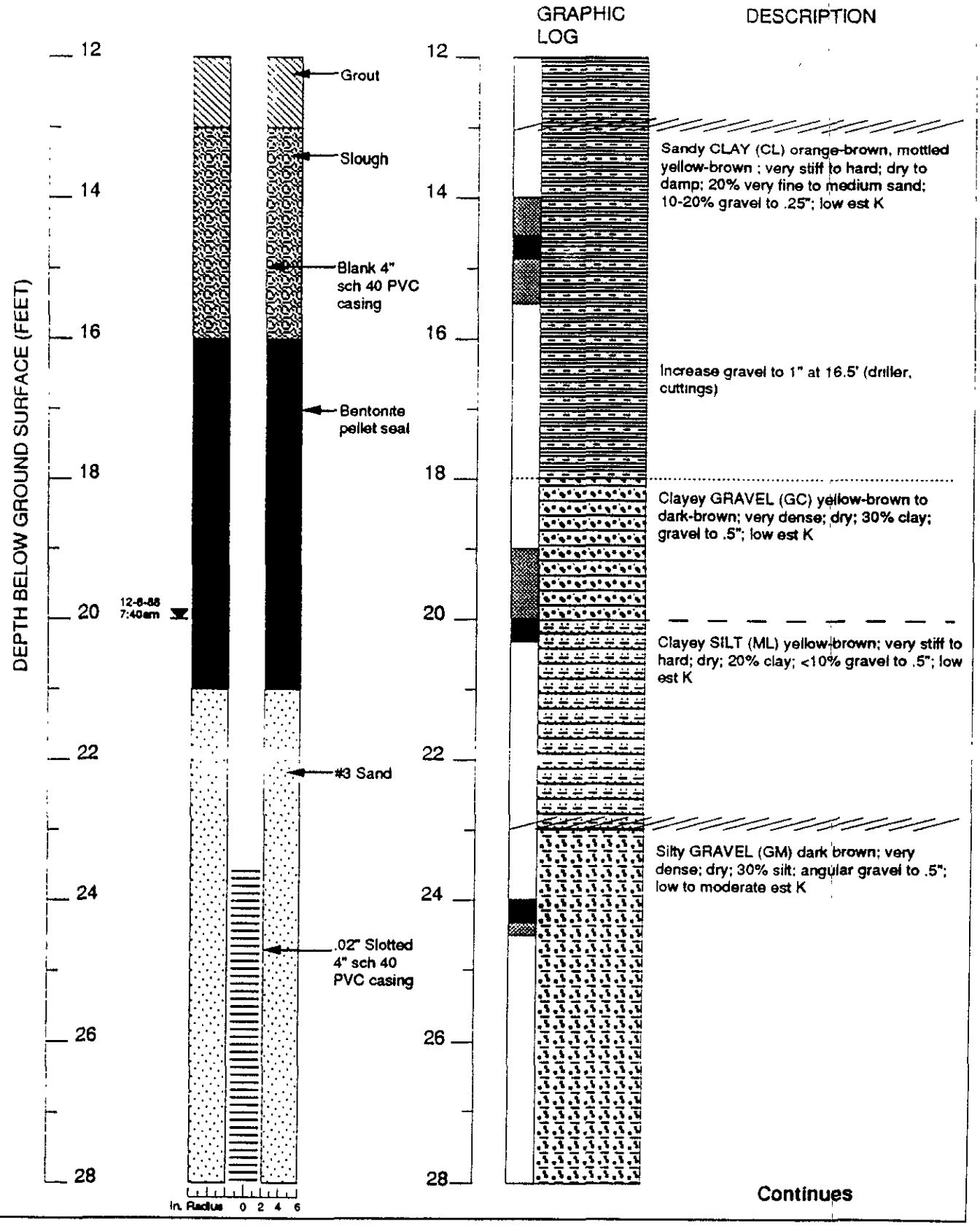
est K = Estimated permeability (hydraulic conductivity)

Logged by: Todd Daniels
Supervisor: Todd Daniels
Drilling Company: Exploration Geoservices, Inc.
Driller: Dave Yeager
Drilling Method: Hollow stem auger
Dates Drilled: 12/7/88-12/8/88
Well Head Completion: Christy box & locking cap
Type of Sampler: 2" split barrel
TD: Drill depth= 31.5 ft

Boring Log and Well Completion Details MW-5
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

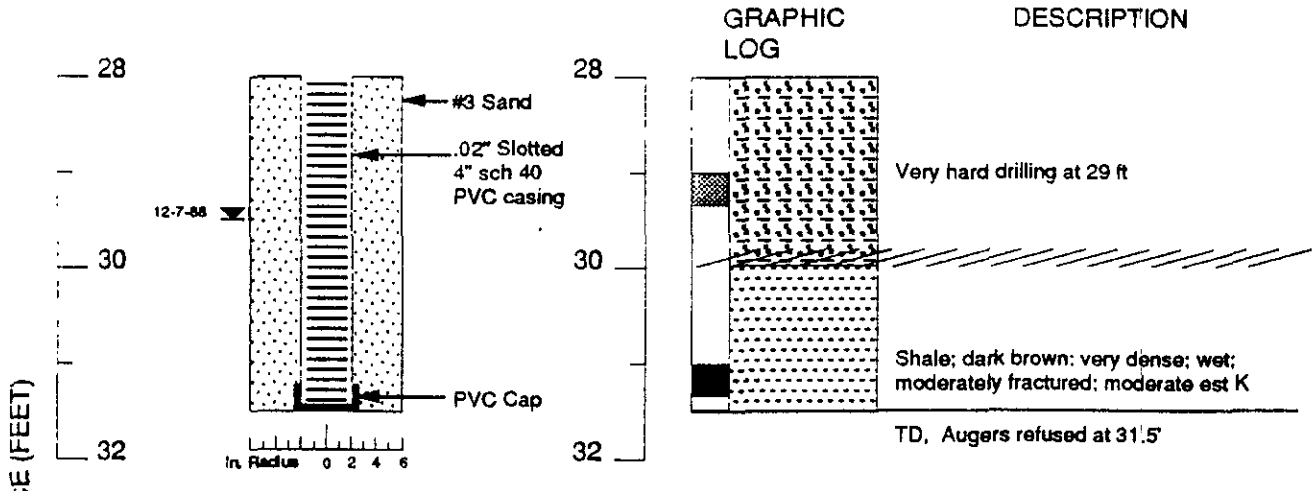
MONITOR WELL MW-5 (cont.)



Boring Log and Well Completion Details MW-5 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

MONITOR WELL MW-5 (cont.)



Boring Log and Well Completion Details MW-5 (cont.)
WGR Project No.: 8-088.01

Foothill Plaza
Oakland, CA

APPENDIX B

APPENDIX C

FIELD INVESTIGATION PROCEDURES OF APPLIED GEOSYSTEMS

Soil Sample Collection, Subjective Analysis, and Classification

Soil samples were collected from each of the borings at intervals of 5 feet or less in depth from the ground surface to the total depth of the boring. The samples were collected using a California-modified, split-spoon sampler containing three 6-inch-long brass sleeves. Samples were collected by advancing the boring to a point immediately above the sampling depth and then driving the sampler through the hollow center of the auger and into the soil. The sampler was driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows needed to drive the sampler each 6-inch increment was counted and recorded to evaluate the relative consistency of the soil.

After recovering the sampler, the soil samples were removed and one sample was promptly sealed in its brass sleeve with aluminum foil, plastic caps, and tape. It was then labeled and placed in iced storage pending transport to a laboratory certified by the State of California to perform the required testing. A Chain of Custody Record for each sample was initiated by the field geologist and is included in Appendix D. A second sleeve was used to analyze the soil sample from each sample interval for the subjective presence of hydrocarbons. Any product discoloration was noted on the Boring Log by the field geologist. An organic vapor meter (OVM) was used to evaluate the organic vapor concentrations present in the soil samples. Readings were collected by placing the rubber cup skirting the intake probe flush against the end of the soil sample immediately after the sleeve was removed from the sampler. Measurements from instruments such as the OVM can be used to indicate relative organic vapor concentrations in soil but cannot be used to measure the level of hydrocarbon compounds with the confidence of laboratory analytical methods.

The Unified Soil Classification System was used to identify the soil encountered in the boreholes. A copy of this classification system is shown on Plate P-3. Descriptions of the soil encountered in the boring are presented on the Logs of Borings. The OVM readings are shown on the Logs of Borings in the column labeled "P.I.D."

Soil cuttings generated during drilling were stockpiled at the rear of the station building, and placed on and covered with plastic sheeting pending laboratory analyses. Soil samples were collected from the stockpiled soil and submitted for laboratory analyses to assess the concentration of hydrocarbon compounds, and thereby enable us to evaluate the proper method of disposal.

Well Construction, Development, and Purging

Borings B-1 through B-5 were converted into ground-water monitoring wells MW-1 through MW-5, respectively. Monitoring wells MW-1, MW-3, and MW-4 were constructed using 2-inch inside-diameter Schedule 40 polyvinyl chloride (PVC) casing. Monitoring wells MW-2 and MW-5 were constructed using 4-inch inside-diameter Schedule 40 PVC casing. A 20-foot length of screened casing, perforated by the manufacturer with 0.020-inch-wide slots, was installed in each of the wells MW-1, MW-3, and MW-4. A 10-foot length of the same sized slotted casing was installed in well MW-2, and a 15-foot length of this slotted casing was installed in well MW-5. For each of the wells, the perforated casing was set from the bottom of the borehole. Non-perforated PVC casing was set from the top of the screened casing to within a few inches of the ground surface. All casing joints in the wells were flush-threaded, and no glues, chemical cements, or solvents were used in the construction of the wells. The top of each casing is covered with a locking compression cap and the bottom has a threaded end-plug.

The annular space of each well was backfilled with No. 3 sorted sand from the total well depth to between 2 and 3 feet above the screened casing. A bentonite plug, between 2 and 3 feet thick, was placed above the sand as a seal against cement entering the sand pack. The remaining annulus was backfilled to within a few inches of grade with a slurry of neat cement and approximately 5 percent bentonite. Graphic representation of each well construction is shown in the right column of the corresponding Log of Boring.

An aluminum utility box with a PVC apron was placed over each of the wellheads and set with concrete placed slightly above the ground surface. Each utility box has a watertight seal to protect the ground-water well against surface-water infiltration. A special wrench is necessary to open the utility boxes. This discourages vandalism and reduces the possibility of accidental disturbance of the wells.

After well construction was complete, the depth to static water level in each well was measured to the nearest 0.01-foot using a Solinst electronic water-level indicator. After this data was recorded, a subjective analysis was performed on each well by gently lowering a clean Teflon bailer approximately half its length past the air-water interface. Samples were retrieved and inspected for floating product and sheen.

After subjective analysis of a water sample, each monitoring well was developed by surging to remove accumulated sediment from the bottom, and purged of between 3 and 5 well volumes of ground-water. The purged water was stored in 17E 55-gallon waste-liquid drums, approved for this use by the Department of Transportation and removed from the site by Armour Petroleum Service and Equipment Corporation of Vacaville, California. Ground-water samples were collected after time had elapsed for each well to recover to approximately its static water level as measured by a Solinst electronic water-level indicator.

The ground-water samples were collected by using a Teflon bailer thoroughly cleaned with Alconox and water. The bailer was gently lowered past the air-water interface to collect the ground-water sample. The sample was quickly transferred to laboratory-cleaned, 40-milliliter sample vials. Hydrochloric acid was added to the samples as a preservative. The vials were then sealed with Teflon-lined caps, labeled, and placed in iced storage for transport for analytical testing to the Applied GeoSystems Laboratory in Fremont, California, California Hazardous Waste Testing Lab Certificate No. 153, and to Anametrix, Inc., in San Jose, California, California Hazardous Waste Testing Lab Certificate No. 151. Chain of Custody Records were initiated by the field geologist for water samples collected and are included in Appendix D.

This Memorandum is an acknowledgment that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

Armour Petroleum Shipper's No.

Carrier Equipment Recovery **Carrier's No** CA10759

RECEIVED, subject to the classifications and tariffs in effect on the date of the receipt by the carrier of the property described in the Original Bill of Lading.

at April 17TH **19**89 **from** Arco #276 10600 MacArthur Oakland CA

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Consigned to California Medical Facility

(Mail or street address of consignee - For purposes of notification only.)

Destination Vacaville State California County Solano

Delivery Address ★ 1600 California Drive

(★ To be filled in only when shipper desires and governing tariffs provide for delivery thereat.)

Route Via Direct - Major Hiways

Delivering Carrier Walter Santelle Car or Vehicle Initials No. 1257391 CA

No. Packages	HAZ. MAT.	Kind of Package, Description of Articles, Special Marks, and Exceptions	*Weight (Sub. to Corr.)	Class or Rate	Check Column
6	Yes	DOT #17 Drums	330 Gallons	1993	
		(99% Water 1% Fuel)			
	Yes	**PLACARDS PROVIDED FOR THIS LOAD**			

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $ ____ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per ____

(The signature here acknowledges only the amount prepaid.)

Charges Advanced

$

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and in proper condition for transportation according to the applicable regulations of the Department of Transportation.

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

NOTE-Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

per

†"The fibre boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Consolidated Freight Classification."

†Shipper's imprint in lieu of stamp, not a part of bill of lading approved by the Interstate Commerce Commission.

A.G.S. Shipper, Per Bill Howell Agent, Per Arco 3

Permanent post-office address of shipper, Fremont California

6S695 REDIFORM

Poly Pak (50 sets) 6P695

This Memorandum is an acknowledgment that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

Shipper's No.

Carrier Carrier's No. C/1 10754

RECEIVED, subject to the classifications and tariffs in effect on the date of the receipt by the carrier of the property described in the Original Bill of Lading.

at _____ 19 84 from

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked consigned and destined as indicated below which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail water shipment or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Consigned to Solano Community College (Mail or street address of consignee - For purposes of notification only.)

Destination _____ State CALIFORNIA County SOLANO

Delivery Address ★ _____

(★ To be filled in only when shipper desires and governing tariffs provide for delivery thereat.)

Route _____

Delivering Carrier _____ Car or Vehicle Initials _____ No. 64554G G.I.F.

No. Packages	HAZ. MAT.	Kind of Package, Description of Articles, Special Marks, and Exceptions	*Weight (Sub. to Corr.)	Class or Rate	Check Column
5	YES	DOT #17 DRUMS	265 GALLONS	1193	
		(19 GASOLINE 992 WATER)			
	YES	**PLACARDS PROVIDED FOR THIS LOAD**			

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and in proper condition for transportation according to the applicable regulations of the Department of Transportation

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

NOTE-Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

per

†"The fibre boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of Consolidated Freight Classification."

†Shipper's imprint in lieu of stamp; not a part of bill of lading approved by the Interstate Commerce Commission.

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges

(Signature of Consignor)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $ _____ to apply in prepayment of the charges on the property described hereon

Agent or Cashier

Per _____

(The signature here acknowledges only the amount prepaid.)

Charges Advanced

$

ACS Shipper, Per _____ Agent, Per _____

Permanent post-office address of shipper, FREMONT CALIFORNIA

6S695 REDIFORM

Poly Pak (50 sets) 6P695

APPENDIX D

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont CA 94539 415/651-1906

SAMPLER (signature): James R. Clive
Phone: 651-1906

LABORATORY:
Applied GeoSystems Lab
43255 Mission Blvd
Fremont, CA
TURNAROUND TIME: 2 week
Project Leader: Bill Howell
Phone No. 651-1906

SHIPPING INFORMATION:
Shipper
Address
Date Shipped
Service Used
Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell		3/23/89	9:30
	Received for laboratory by:	3-23-89	1100

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-31-B1	19014-1	3/27/89	TPH(gas) + BTEX	frozen
S-26-B1	19014-1	3/27/89	TPH(gas) + BTEX	frozen
S-5½-B2	19014-1	3/21/89	TPHg + BTEX	frozen
S-11-B2				
S-28-B2				

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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90345S01
Project: 19014-1
Sample: S-26-B1
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-26-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-26-89	
Toluene	ND		0.05		03-26-89	
Ethylbenzene	ND		0.05		03-26-89	
Total Xylenes	ND		0.05		03-26-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90345S02
Project: 19014-1
Sample: S-31-B1
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-26-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-26-89	
Toluene	ND		0.05		03-26-89	
Ethylbenzene	ND		0.05		03-26-89	
Total Xylenes	0.078		0.05		03-26-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90345S03
Project: 19014-1
Sample: S-5.5-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-26-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-26-89	
Toluene	ND		0.05		03-26-89	
Ethylbenzene	ND		0.05		03-26-89	
Total Xylenes	ND		0.05		03-26-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

APPLIED GEOSYSTEMS IS CERTIFIED BY THE STATE OF CALIFORNIA DEPARTMENT OF HEALTH SERVICES AS A HAZARDOUS WASTE TESTING LABORATORY

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90345S04
Project: 19014-1
Sample: S-11-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-26-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-26-89	
Toluene	0.066		0.05		03-26-89	
Ethylbenzene	ND		0.05		03-26-89	
Total Xylenes	0.079		0.05		03-26-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90345S05
Project: 19014-1
Sample: S-28-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-26-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-26-89	
Toluene	ND		0.05		03-26-89	
Ethylbenzene	ND		0.05		03-26-89	
Total Xylenes	ND		0.05		03-26-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

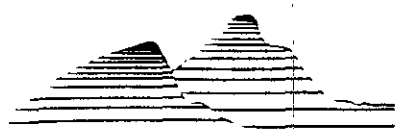
TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

CHAIN OF CUSTODY RECORD



Applied GeoSystems

43255 Mission Blvd Suite B Fremont CA 94539 415/651-1906

SAMPLER (signature): [signature]

Phone: 651-1906

LABORATORY:
Applied Geo System Lab.
43255 Mission Blvd
Fremont CA

TURNAROUND TIME: 1 week

Project Leader: Bill Howell

Phone No. 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell		3/23/89	9:30
	Received for laboratory by: [signature]	3-23-89	1100

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
~~S-16-B2~~	1	3/22/89	TPH gas + BTEX	Flower
S-16-B2	14			
S-20-B2	19			
S-24½-B2				

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90344S01
Project: 19014-1
Sample: S-16-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	38		2		03-25-89	
TEH as Diesel						NR
Benzene	0.30		0.05		03-25-89	
Toluene	0.91		0.05		03-25-89	
Ethylbenzene	0.38		0.05		03-25-89	
Total Xylenes	2.4		0.05		03-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90344S02
Project: 19014-1
Sample: S-20-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	690		20		03-25-89	
TEH as Diesel						NR
Benzene	7.4		0.5		03-25-89	
Toluene	36		0.5		03-25-89	
Ethylbenzene	10		0.5		03-25-89	
Total Xylenes	62		0.5		03-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard Fremont CA 94539 (415) 651-1906
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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90344S03
Project: 19014-1
Sample: S-24.5-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	4.2		2		03-25-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-25-89	
Toluene	0.10		0.05		03-25-89	
Ethylbenzene	ND		0.05		03-25-89	
Total Xylenes	0.18		0.05		03-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont CA 94539 415/651-1906

SAMPLER (signature): [signature]

Phone. 651-1906

LABORATORY:
Applied Geo Systems Lab
43255 Mission Blvd
Fremont CA

TURNAROUND TIME: 2 week

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell			
	Received for laboratory by: [signature]	3-23-89	1100

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-30½-B3	19014-1	3/21/89	TPH gas + BTEX	frozen

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 03-23-89
Laboratory Number: 90346S01
Project: 19014-1
Sample: S-30.5-B3
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2		03-25-89	
TEH as Diesel						NR
Benzene	ND		0.05		03-25-89	
Toluene	ND		0.05		03-25-89	
Ethylbenzene	ND		0.05		03-25-89	
Total Xylenes	ND		0.05		03-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

03-29-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems

41255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): P. Beam

Phone. 651-1906

LABORATORY: Applied Geosystems

TURNAROUND TIME: 2 week

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell			
	Received for laboratory by:	4-3-89	0930

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-21-B4	TPO'4-1	3/29/89	TPH9 + BTEX	Frozen
S-31-B4				
S-53-B4				

Applied GeoSystems 43255 Mission Boulevard Fremont CA 94538 (415) 657-2666
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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: K. William Howell

Date Received: 04-03-89
Laboratory Number: 90367S01
Subject: 19014-1
Sample: S-21-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-04-89	
TEH as Diesel						NR
Benzene	ND		0.050		04-04-89	
Toluene	ND		0.050		04-04-89	
Ethylbenzene	ND		0.050		04-04-89	
Total Xylenes	ND		0.050		04-04-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-06-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard Fremont C[illegible] [illegible] 415 651-1906
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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: K. William Howell

Date Received: 04-03-89
Laboratory Number: 90367S02
Subject: 19014-1
Sample: S-31-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-04-89	
TEH as Diesel						NR
Benzene	ND		0.050		04-04-89	
Toluene	ND		0.050		04-04-89	
Ethylbenzene	ND		0.050		04-04-89	
Total Xylenes	ND		0.050		04-04-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-06-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): Leigh Bean BH

Phone:

LABORATORY: Anametrix

TURNAROUND TIME: 2-week

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell			
	Received for laboratory by: [signature]	4/26/89	10:1[illegible]

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-21-B4	19014-1	3/24/89	TO6 / 503E	frozen

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-1 S-21-B4	Anametrix I.D.	: 8904160-01
Matrix	: SOIL	Analyst	: KD
Date sampled	: 03/29/89	Supervisor	: SR
Date anl.TPHg	: N/A	Date released	: 05/01/89
Date ext.TPHd	: N/A	Date ext. TOG	: 04/28/89
Date anl.TPHd	: N/A	Date anl. TOG	: 04/28/89

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	Total Oil & Grease	30000	ND

ND - Not detected at or above the practical quantitation limit for the method.
TOG - Total Oil & Grease is determined by Standard Method 503E.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

CHAIN OF CUSTODY RECORD

SAMPLER (signature): [signature]

Phone: 651-1906

LABORATORY: Applied Geo Systems

TURNAROUND TIME: 1 week.

Project Leader: Bill Howell

Phone No. 19014-1

Applied GeoSystems
43255 Mission Blvd Suite B Fremont CA 94539 415/651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell			
	Received for laboratory by:	10 30	4-12

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-11-B5	1	4/5/89	BTEX	
S-16-B5	1			
S-18-B5	1			
S-24-B5	1		TPH gas	
S-31-B5	1			

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-12-89
Laboratory Number: 90416S01
Project #: 19014-1
Sample #: S-11-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-14-89	
TEH as Diesel						
Benzene	0.13		0.050		04-14-89	
Toluene	ND		0.050		04-14-89	
Ethylbenzene	ND		0.050		04-14-89	
Total Xylenes	ND		0.050		04-14-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-20-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-12-89
Laboratory Number: 90416S02
Project #: 19014-1
Sample #: S-16-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	220		5.0		04-14-89	
TEH as Diesel						
Benzene	0.83		0.050		04-14-89	
Toluene	3.4		0.050		04-14-89	
Ethylbenzene	2.2		0.050		04-14-89	
Total Xylenes	14		0.050		04-14-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-20-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-12-89
Laboratory Number: 90416S03
Project #: 19014-1
Sample #: S-18-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-14-89	
TEH as Diesel						
Benzene	0.23		0.050		04-14-89	
Toluene	0.11		0.050		04-14-89	
Ethylbenzene	ND		0.050		04-14-89	
Total Xylenes	0.21		0.050		04-14-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-20-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-12-89
Laboratory Number: 90416S04
Project #: 19014-1
Sample #: S-24-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-14-89	
TEH as Diesel						
Benzene	0.086		0.050		04-14-89	
Toluene	ND		0.050		04-14-89	
Ethylbenzene	ND		0.050		04-14-89	
Total Xylenes	ND		0.050		04-14-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-20-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont CA 94539 (415) 651-1906

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-12-89
Laboratory Number: 90416S05
Project #: 19014-1
Sample #: S-31-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		5.0		04-14-89	
TEH as Diesel						
Benzene	ND		0.050		04-14-89	
Toluene	ND		0.050		04-14-89	
Ethylbenzene	ND		0.050		04-14-89	
Total Xylenes	ND		0.050		04-14-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-20-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd Suite B Fremont CA 94539 415/651-1906

SAMPLER (signature): Dan Kirkman
Phone: 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 48 hr
Project Leader: Bill Howell
Phone No. 651-1906

SHIPPING INFORMATION:
Shipper
Address
Date Shipped
Service Used
Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Dan Kirkman			
	Received for laboratory by:	4-25-89	0945

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-35-MW1	1814-1	4-24-89	TPH + BETX	Iced
W-18-MW2	DK	DK	DK	DK
W-35-MW3				
W-34-MW4				
W-34-MW5	DK	DK	DK	DK

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-25-89
Laboratory Number: 90438W01
Project #: 19014-1
Sample #: W-35-MW1
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		ND		0.050	04-25-89	
TEH as Diesel						NR
Benzene		ND		0.00050	04-25-89	
Toluene		ND		0.00050	04-25-89	
Ethylbenzene		ND		0.00050	04-25-89	
Total Xylenes		ND		0.00050	04-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-26-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-25-89
Laboratory Number: 90438W02
Project #: 19014-1
Sample #: W-19-MW2
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		165		10	04-25-89	
TEH as Diesel						NR
Benzene		13		0.050	04-25-89	
Toluene		21		0.050	04-25-89	
Ethylbenzene		2.1		0.050	04-25-89	
Total Xylenes		12.7		0.050	04-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-26-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-25-89
Laboratory Number: 90438W03
Project #: 19014-1
Sample #: W-35-MW3
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		0.56		0.050	04-25-89	
TEH as Diesel						NR
Benzene		0.00054		0.00050	04-25-89	
Toluene		0.00075		0.00050	04-25-89	
Ethylbenzene		ND		0.00050	04-25-89	
Total Xylenes		ND		0.00050	04-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-26-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-25-89
Laboratory Number: 90438W04
Project #: 19014-1
Sample #: W-34-MW4
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		2.5		0.10	04-25-89	
TEH as Diesel						NR
Benzene		0.27		0.00050	04-25-89	
Toluene		0.0014		0.00050	04-25-89	
Ethylbenzene		ND		0.00050	04-25-89	
Total Xylenes		0.085		0.00050	04-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-26-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 04-25-89
Laboratory Number: 90438W05
Project #: 19014-1
Sample #: W-34-MW5
Matrix: Water

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline		0.13		0.050	04-25-89	
TEH as Diesel						NR
Benzene		0.00067		0.00050	04-25-89	
Toluene		ND		0.00050	04-25-89	
Ethylbenzene		ND		0.00050	04-25-89	
Total Xylenes		ND		0.00050	04-25-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

04-26-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): [signature]

Phone: 651-1906

LABORATORY: Anametrix

TURNAROUND TIME: 48 hour

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Bill Howell			
	Received for laboratory by: Tahi Memarzadeh	4/25/89	10:48

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
W-34-MW-4	19014-1	4/24	TOG	cooled
W-34-MW-4	19014-1	4/24	EPA 624	

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-1 W-34-MW-4	Anametrix I.D.	: 8904145-01
Matrix	: WATER	Analyst	: KD
Date sampled	: 04/24/89	Supervisor	:
Date anl.TPHg	: N/A	Date released	: 04/26/89
Date ext.TPHd	: N/A	Date ext. TOG	: 04/25/89
Date anl.TPHd	: N/A	Date anl. TOG	: 04/26/89

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
	Total Oil & Grease	5000	ND

ND - Not detected at or above the practical quantitation limit for the method.
TOG - Total Oil & Grease is determined by Standard Method 503E.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-1 W-34-MW-4
Matrix : WATER
Date sampled : 04/24/89
Date analyzed: 04/26/89
Dilut. factor: 10

Anametrix I.D.: 8904145-01
Analyst : LM
Supervisor : PG
Date released : 04/26/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
74-87-3	* Chloromethane	100	ND
75-01-4	* Vinyl Chloride	100	ND
74-83-9	* Bromomethane	100	ND
75-00-3	* Chloroethane	100	ND
75-69-4	* Trichlorofluoromethane	50	ND
75-35-4	* 1,1-Dichloroethene	50	ND
76-13-1	# Trichlorotrifluoroethane	50	ND
67-64-1	**Acetone	200	ND
75-15-0	**Carbondisulfide	50	ND
75-09-2	* Methylene Chloride	50	ND
156-60-5	* Trans-1,2-Dichloroethene	50	ND
75-34-3	* 1,1-Dichloroethane	50	ND
78-93-3	**2-Butanone	200	ND
156-59-2	* Cis-1,2-Dichloroethene	50	ND
67-66-3	* Chloroform	50	ND
71-55-6	* 1,1,1-Trichloroethane	50	ND
56-23-5	* Carbon Tetrachloride	50	ND
71-43-2	* Benzene	50	780
107-06-2	* 1,2-Dichloroethane	50	ND
79-01-6	* Trichloroethene	50	ND
78-87-5	* 1,2-Dichloropropane	50	ND
75-27-4	* Bromodichloromethane	50	ND
110-75-8	* 2-Chloroethylvinylether	50	ND
108-05-4	**Vinyl Acetate	100	ND
10061-02-6	* Trans-1,3-Dichloropropene	50	ND
108-10-1	**4-Methyl-2-Pentanone	100	ND
108-88-3	* Toluene	50	ND
10061-01-5	* cis-1,3-Dichloropropene	50	ND
79-00-5	* 1,1,2-Trichloroethane	50	ND
127-18-4	* Tetrachloroethene	50	1500
591-78-6	**2-Hexanone	100	ND
124-48-1	* Dibromochloromethane	50	ND
108-90-7	* Chlorobenzene	50	ND
100-41-4	* Ethylbenzene	50	ND
1330-20-7	**Total Xylenes	50	130
100-42-5	**Styrene	50	ND
75-25-2	* Bromoform	50	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	50	ND
541-73-1	* 1,3-Dichlorobenzene	50	ND
106-46-7	* 1,4-Dichlorobenzene	50	ND
95-50-1	* 1,2-Dichlorobenzene	50	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-113%	103%
2037-26-5	Toluene-d8	83-110%	101%
460-00-4	p-Bromofluorobenzene	82-114%	104%

ORGANICS ANALYSIS DATA SHEET - 624/8240 TENTATIVELY IDENTIFIED COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

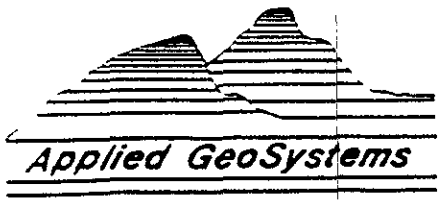
Sample I.D. : 19014-1 W-34-MW-4
Matrix : WATER
Date Sampled : 04/24/89
Analyzed VOA : 04/26/89
Dilution VOA : 1:10

Anametrix I.D. : 8904145-01
Analyst : M
Supervisor : PG
Date Released : 04/26/89

	CAS #	Scan#	Volatile Fraction Compound Name	Det. Limit ppb	Amt. Found ppb
1	611-14-3	985	1-ethyl-2-methylbenzene	50	<50
2	108-67-8	1066	1,3,5-trimethylbenzene	50	<50
3				50	
4				50	
5				50	
6				50	
7				50	
8				50	
9				50	
10				50	
11				50	
12				50	
13				50	
14				50	
15				50	

Tentatively identified compounds are significant chromatographic peaks (TICs) other than priority pollutants. TIC spectra are compared with entries in the National Bureau of Standards mass spectral library. Identification is made by following US EPA guidelines and acceptance criteria. TICs are quantitated by using the area of the nearest internal standard and assuming a response factor of one (1). Values calculated are ESTIMATES ONLY.

CHAIN OF CUSTODY RECORD



43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): [signature]

Phone: (415) 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 2 weeks

Project Leader: Bill Howell

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
[signature]			
	Received for laboratory by: [signature]	5-8-89	1510

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-0508-1a (Composite)	1	5-8-89	TPH Gasoline	Cool
S-0508-1b	1			
S-0508-1c	1			
S-0508-1d	1			

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: William K. Howell

Date Received: 05-08-89
Laboratory Number: 90519S01
Project #: 19014-1
Sample #: S-0508-1(ABCD)
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	5.0		2.0		05-08-89	
TEH as Diesel						NR
Benzene						NR
Toluene						NR
Ethylbenzene						NR
Total Xylenes						NR

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

05-10-89
Date Reported

APPENDIX E

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

(1) LOCATION OF PROJECT ARCO Station 276, Mc Arthur Boulevard and 106th Avenue Oakland, California

(2) CLIENT
Name ARCO Products Company
Address P.O. Box 5811 Phone (415) 571 2494
City San Mateo CA Zip 94402

(3) APPLICANT
Name Applied GeoSystems
43255 Mission Boulevard, Suite B
Address Fremont Phone (415) 651-1906
City California Zip 94539

(4) DESCRIPTION OF PROJECT
Water Well Construction ✓ Geotechnical ___
Cathodic Protection ___ Well Destruction ___

(5) PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring ✓ Other ___

(6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger ✓
Cable ___ Other ___

△ to 5 wells vertically interconnected on 4/18 Zone 7

WELL PROJECTS
Drill Hole Diameter 8 in. Depth(s) 40 ft.
Casing Diameter 2 in. Number
Surface Seal Depth 20 ft. of Wells 4
Driller's License No. C 57 482390

GEOTECHNICAL PROJECTS
Number ___
Diameter ___ in. ~~Maximum~~ Depth ___ ft.

(7) ESTIMATED STARTING DATE 21 Mar 89
ESTIMATED COMPLETION DATE 24 Mar 89

(8) I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] Date 16 Mar 1989
John T. Lambert

FOR OFFICE USE

PERMIT NUMBER 89148
LOCATION NUMBER ___

Approved [signature] Date 16 Mar 89
Todd N. Wendler

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Notify this office (484-2600) at least one day prior to starting work on permitted work and before placing well seals.
3. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or bore hole logs and location sketch for geotechnical projects. Permitted work is completed when the last surface seal is placed or the last boring is completed.
4. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie, or equivalent.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic, irrigation, and monitoring wells unless a lesser depth is specially approved.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie, or equivalent.

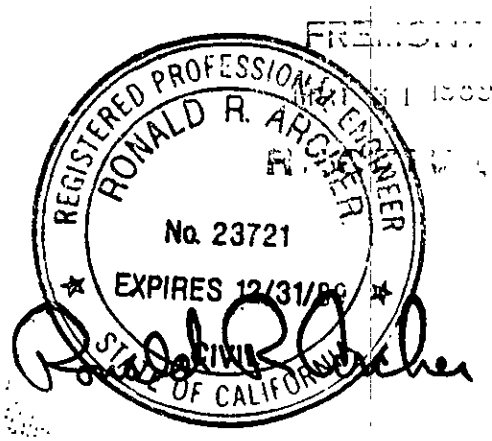
E. WELL DESTRUCTION. See attached.

91987

RON ARCHER
CIVIL ENGINEER, INC.

CONSULTING • PLANNING • DESIGN • SURVEYING

4133 Mohr Ave., Suite E • Pleasanton, CA 94566
(415) 462-9372



FRE...

MAY 11, 1989 JOB NO. 1549

ELEVATIONS OF EXISTING MONITOR WELLS LOCATED AT THE ARCO STATION, 10600 MAC ARTHUR BOULEVARD AT 106TH STREET, CITY OF OAKLAND, ALAMEDA COUNTY, CALIFORNIA.

FOR APPLIED GEOSYSTEMS
PROJECT NO. 19014-1

BENCHMARK: #14/B
TOP OF DISC SET IN A STANDARD CITY OF OAKLAND MONUMENT CASING IN MIDDLE OF CONCRETE SIDEWALK ON THE MOST S'LY CORNER OF 106TH AND MAC ARTHUR BOULEVARD.
ELEVATION TAKEN AS 52.811 M.S.L. CITY OF OAKLAND DATUM

MONITOR WELL DATA TABLE

WELL DESIGNATION	ELEVATION	DESCRIPTION
MW1	55.91	TOP OF CASING
	56.29	TOP OF BOX
MW2	55.35	TOP OF CASING
	55.75	TOP OF BOX
MW3	56.55	TOP OF CASING
	56.86	TOP OF BOX
MW4	55.94	TOP OF CASING
	56.54	TOP OF BOX
MW5	55.43	TOP OF CASING
	55.97	TOP OF BOX