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

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August 30, 1988

REPORT
SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
UNOCAL Service Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

AGS Job No. 18061-1

Report prepared for

UNOCAL Corporation
2175 North California Boulevard
Suite 650
Walnut Creek, California 94596

by

Burton E. Gilpin
Staff Geologist

Gillian S. Holmes
Gillian S. Holmes
G.E. 2023

August 30, 1988

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August 30, 1988
AGS 18061-1

Mr. Tim Ross
UNOCAL Corporation
2175 North California Boulevard
Suite 650
Walnut Creek, California 94596

Subject: Executive summary of Report No. 18061-1 regarding the subsurface environmental investigation at UNOCAL Service Station No. 5484, 18950 Lake Chabot Road, Castro Valley, California.

Mr. Ross:

This report presents the results of our limited subsurface environmental investigation at the above-referenced site. The investigation included drilling of three boreholes and constructing of three 2-inch-diameter ground-water monitoring wells. In addition, a ground-water gradient survey and a well-search were conducted. This work was conducted subsequent to leaks being detected in the fiberglass adapter and the sub-pump swing joint of the underground unleaded product tank during precision tank testing.

Contamination by petroleum constituents was detected in soil samples from each of the three soil borings and in the ground water collected from monitoring wells installed in these borings.

A survey of the monitoring well locations was conducted and the depths to water were measured after monitoring well installation. The results show the ground-water gradient to be 14 feet per 100 feet and the flow direction to be approximately south 33 degrees west.

The levels of hydrocarbon contaminants detected at this site vary from relatively low to moderate concentrations. Benzene concentrations in ground water collected from each of the wells were above the California Department of Health Services' (DHS) recommended maximum concentrations for benzene in drinking water. Ground water collected from well MW-3, located adjacent to and downgradient of the tank pit, showed the highest benzene level detected (0.380 part per million [ppm]). The total xylenes

concentration measured in water from well MW-3 was significantly higher than the DHS standard (2.2580 ppm). Contamination of ground water by benzene, ethylbenzene, toluene, total xylenes, and total petroleum hydrocarbons appears to decrease significantly with distance from the underground fuel storage tanks. Concentrations of toluene, ethylbenzene, and total xylene isomers in ground water from well MW-1 (upgradient of the tanks) are below DHS maxima. These data suggest that contamination by these compounds is limited areally and greatest near the downgradient portion of the tank pit.

A privately owned test well and one domestic well are known to exist approximately 1/2-mile downgradient of the site. As a precautionary measure, we recommend that the domestic well be sampled and analyzed for hydrocarbon contamination and a search for possible contaminant sources between the domestic well and the subject site be conducted. Such information would be helpful in evaluating the need, if any, for further work at the site. We recommend that the monitoring wells at UNOCAL Service Station No. 5484 be sampled and analyzed quarterly to evaluate and establish trends in the levels of the contaminants detected during this investigation.

We recommend that UNOCAL submit a copy of this report to Mr. Larry Seto, Hazardous Materials Specialist, Alameda County Health Care Services, 470 27th Street, Third Floor, Oakland, California 94612 and Ms. Lisa McCann, California Water Quality Control Board, San Francisco Bay Region, 1111 Jackson Street, Room 6040, Oakland, California 94607.

Please do not hesitate to contact us if you have any questions regarding the content of this report.

Sincerely,
Applied GeoSystems

Burton E. Gilpin
Staff Geologist

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

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REPORT
SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
UNOCAL Service Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

For UNOCAL Corporation

INTRODUCTION

At the request of UNOCAL Corporation and the Alameda County Department of Health Care Services, Applied GeoSystems conducted a subsurface environmental investigation to evaluate ground water for hydrocarbon contamination at UNOCAL Service Station No. 5484 in Castro Valley, California. The work was requested after leaks were detected in the fiberglass adapter and the sub-pump swing joint of the underground unleaded product tank during precision tank testing. The work included drilling three soil borings and installing three 2-inch-diameter ground-water monitoring wells in the borings. One of these wells is located immediately adjacent to the locations of the suspected leaks, and two are located near the boundary of the property in the inferred downgradient direction from the tanks. These wells have provided data on the type and distribution of soil underlying the site, as well as ground-water quality in the vicinity of the underground storage

tanks. The wells will also be used to monitor the site and provide information on the ground-water flow direction and gradient.

This report describes the work associated with drilling the three soil borings, installing the monitoring wells, collecting and analyzing soil and ground water samples; summarizes the analytical results obtained; and presents our conclusions and recommendations.

SITE DESCRIPTION AND BACKGROUND

UNOCAL Service Station No. 5484 is located on Lake Chabot Road south of Quail Avenue in Castro Valley, California. The location of the site is shown on the Site Vicinity Map, Plate P-1. The locations of two 10,000-gallon product tanks and dispensers and other pertinent site features are shown on the Generalized Site Plan, Plate P-2. The north storage tank is used to store regular-unleaded gasoline, and the south tank is used to store premium-unleaded gasoline for retail sale. The site is bounded on the north, south, and east by residential properties. Several commercial businesses are located to the west across Lake Chabot Road.

WELL SEARCH

A records search of water wells within a 1/2-mile radius of the site was conducted. Two wells are located approximately 1/2-mile south of the site. The locations of the wells are shown on the Site Vicinity Map. One well (State Well No. 3S/2W 4F 1) is a test well located on Betrose Court, approximately 1/2-mile south of the subject site. The water level in this well is unknown, and the total depth of the well is 52 feet. The second well (State Well No. 3S/2W 4H 2) is a domestic well located on Lenard Drive, approximately 1/2-mile south-southeast of the subject site. The water level in this well is 36 feet below the ground surface and the total depth of the well is 220 feet. Both wells are located in Castro Valley, downgradient of UNOCAL Station No. 5484, based on ground-water flow calculations made by Applied GeoSystems and discussed in this report. Records of these wells are kept by the Alameda County Flood Control and Water Conservation District (ACFCWCD) in Hayward.

FIELD WORK

Prior to commencing field work, an application for permits to install the monitoring wells at the site was submitted to Zone 7

of the ACFCWCD in Pleasanton. In addition, approximately 1 day prior to commencing work, the ACFCWCD was notified verbally of the work to be performed. A copy of the permit application is included in Appendix A of this report.

Field work performed by Applied GeoSystems personnel at the subject site was conducted in accordance with a Project Safety Plan specific to the subject site and approved by Applied GeoSystems' Health and Safety Officer. The project safety plan addresses the expected potential hazards that may be encountered on the project site, discusses various safety requirements, and provides appropriate emergency response procedures.

A geologist from Applied GeoSystems observed soil borehole drilling and well construction on July 12 and 13, 1988. The borings were drilled with a Mobile B-61 truck-mounted rig operated by Datum Exploration, Inc., of Pittsburg, California. Steam-cleaned, 8-inch-diameter, continuous-flight, hollow-stem augers were used to drill borings B-1, B-2, and B-3 to depths of 30.5, 19.5, and 20.5 feet, respectively. Ground water was initially encountered at about 8 feet below the ground surface in boring B-1 and 20 feet below the ground surface in boring B-3. Water was not encountered during the drilling of boring B-2.

Monitoring wells MW-1, MW-2, and MW-3 were installed in borings B-1, B-2, and B-3, respectively. The locations of the wells are shown on the Generalized Site Plan. Monitoring well MW-1 was installed adjacent to and in the inferred upgradient direction from the underground storage tanks. Monitoring wells MW-2 and MW-3 were located along the western boundary of the property, downgradient of the underground gasoline storage tanks. The downgradient direction of ground-water flow was inferred to be approximately southwest based on regional topography.

Soil samples were collected from the boreholes with a California-modified, split-spoon sampler. The Unified Soil Classification System, which was used to identify the soil, is summarized on Plate P-3. Descriptions of earth materials encountered in borings B-1 through B-3 are presented on the Logs of Boring, Plates P-4 through P-6. The earth materials encountered at this site consist primarily of clayey silt overlying fine grained sandstone and siltstone. The soil units at this site are typical of an estuarine depositional environment; they are extensively interbedded and contain many lenses of silt and fine-grained sand.

Cuttings from the boreholes were stockpiled at the rear of the station building near the southeast corner of the property. At the request of UNOCAL, Applied GeoSystems has arranged for the disposal of these cuttings.

SOIL SAMPLING

Six soil samples from boring B-1 and four samples each from borings B-2 and B-3 were collected and described during drilling. These samples, which were labeled as indicated on the boring logs, were collected at 5-foot intervals from the borings. The soil samples were collected by advancing the boring to a point immediately above the sampling depth and then driving a California-modified, split-spoon sampler (2-1/2-inch-inside-diameter) into the soil through the hollow center of the auger. The sampler was driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each 6 inches was counted and recorded to evaluate the relative consistency of soil materials.

The samples were removed from the sampler and immediately sealed in their brass sleeves with aluminum foil, plastic caps, and airtight tape. The samples were labeled, placed in iced storage,

and were delivered to Applied GeoSystems laboratory in Fremont, California, for analytical testing. The laboratory is certified by the State of Caloifornia to perform the requested analyses. The completed Chain of Custody Record and laboratory Analysis Reports for the tested samples are included in Appendix B of this report.

An organic vapor meter (OVM) was used to evaluate the organic vapor concentrations present in soil samples collected from the borings. Readings were collected by placing the rubber cup that skirts the intake probe flush against the soil in the sample immediately after it was removed from the sampler. Measurements from instruments such as the OVM indicate relative organic vapor concentrations in soil but cannot be used to measure directly the concentrations of hydrocarbon contaminants in the soil. The OVM readings are shown in the boring logs. Moderate concentrations (approximately 200 parts per million [ppm]) were measured in borings B-1 and B-2, and high concentrations (greater than 2,000 ppm) were measured in boring B-3. Below a depth of 14 feet, volatile hydrocarbons above ambient levels were not detected in any of the three borings.

MONITORING WELL CONSTRUCTION

Three ground-water monitoring wells were constructed at the site in soil borings B-1, B-2, and B-3. The wells were completed with 2-inch-inside-diameter, polyvinyl chloride (PVC) casing. Casing was set 30 feet deep in well MW-1, 19 feet deep in well MW-2, and 20 feet deep in well MW-3. The casing consists of machine-slotted PVC casing with 0.020-inch-wide slots set from the total depth of each well to approximately 10 feet below the ground surface in MW-1, and to approximately 5 feet below the ground surface in wells MW-2 and MW-3. Blank PVC casing was set from the top of the screened casing to the surface. All casing joints are flush-threaded, and no glues, chemical cements, or solvents were used in well construction. The top of each casing is covered with a locking plug, and the bottom has a threaded end plug.

The annular space of each well was backfilled with No. 3 Monterey sand from the total depth of the well to approximately 1 foot above the top of the screened casing. A bentonite plug, approximately 1 foot thick, was placed above the sand as a seal against cement entering the sand pack, and the remaining annulus was backfilled with neat cement to a few inches below grade.

Graphic representations of the well constructions are shown in the right column of the boring logs.

An aluminum utility box with a PVC apron was placed over the well heads and secured in place with concrete set flush with the surrounding ground surface. The utility box has a watertight seal to protect the ground-water wells from infiltration of surface water. Access to the box requires a specially designed wrench; this design discourages vandalism and reduces the possibility of accidental disturbance of the well.

WELL DEVELOPMENT AND GROUND-WATER SAMPLING

Water samples for subjective inspection were collected from each monitoring well by gently lowering half the length of a Teflon bailer past the air/water interface. The samples were retrieved and examined for floating product, sheen, color, and clarity. No subjective evidence of hydrocarbon contamination was detected in the samples.

The wells were developed by bailing water until the wells were dry. The wells were allowed to recover and were again bailed until dry. This procedure allows sampling of water

representative of the formation. After the wells had recovered to their static water levels, samples were collected using a Teflon bailer that had been washed with Alconox and deionized water. The bailer was lowered through the air/water interface in each well to retrieve a sample of the water.

The samples were transferred to laboratory-cleaned, 40-milliliter glass sample vials. Hydrochloric acid was added to each sample vial as a preservative. The vials were immediately sealed with Teflon-lined caps, labeled, and placed in iced storage for transport to Applied GeoSystems' laboratory in Fremont, California. The laboratory is certified to perform the requested analyses. The Chain of Custody Record and Analysis Reports for the water samples are included in Appendix B of this report.

LABORATORY ANALYSES

The soil sample nearest and above the static water level in boring B-1 (S-15-B1), and the samples corresponding to the highest OVM readings for borings B-2 and B-3 (S-5-B2 and S-5-B3) were selected for analysis. These samples and one water sample each from wells MW-1, MW-2, and MW-3 were analyzed for total

petroleum hydrocarbons (TPH) and the hydrocarbon constituents benzene, toluene, ethylbenzene, and total xylene isomers (BTEX).

The TPH analyses were conducted using a gas chromatograph equipped with an flame-ionization detector according to Environmental Protection Agency (EPA) Method 8015. The BTEX analyses of the soil and water samples were conducted using a gas chromatograph fitted with a photoionization detector and a flame-ionization detector in series, according to EPA Methods 8020 and 602, respectively. Contaminants detected in the soil and water samples are shown in Table 1 and in the Analysis Reports in Appendix B of this report.

TABLE 1
RESULTS OF LABORATORY ANALYSES
OF SOIL AND WATER SAMPLES
UNOCAL Service Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

Sample	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH
S-15-B1	0.06	0.56	0.24	1.21	3
S-5-B2	0.16	0.92	0.66	3.58	12
S-5-B3	0.83	6.63	3.81	26.12	79
W-7-MW1	0.0061	0.0827	0.0356	0.1803	0.54
W-9-MW2	0.072	0.139	0.033	0.157	1.08
W-9-MW3	0.385	0.640	0.369	2.258	7.8

Results in parts per million (ppm)
TPH = Total petroleum hydrocarbons
Sample designation: S-15-B1

- Boring (B) or monitoring well (MW) and number
- Approximate depth of sample
- Soil (S) or water (W) sample

ANALYTICAL RESULTS OF SOIL ANALYSES

The three soil samples were collected from near the water table. Results of soil analyses revealed relatively low levels (less than 100 ppm) of TPH contamination. Boring B-3 containing the highest concentration of TPH (79 ppm), followed by borings B-2 and B-1, with 12 and 3 ppm, respectively. The soil collected

from boring B-3 also showed substantially higher levels of BTEX than were detected in borings B-1 and B-2. The benzene concentration in the soil analyzed from boring B-3 was 0.830 ppm.

ANALYTICAL RESULTS OF WATER ANALYSES

Each water sample collected from the three monitoring wells at the site contained detectable amounts of BTEX. The benzene concentration in each of the wells was above the maximum concentration for drinking water (0.0007 ppm) recommended by the California Department of Health Services (DHS) with the highest level (0.385 ppm) occurring in well MW-3. Toluene concentrations were above the DHS maximum concentration (0.100 ppm) in water samples from both wells MW-2 and MW-3; the highest concentration of toluene (0.640 ppm) was found in water from well MW-3. Well MW-3 also contained 2.258 ppm of total xylene isomers which exceeds the DHS' recommendation for maximum total xylene isomers (0.620). None of the water samples contained concentrations of ethylbenzene over the DHS' maximum concentration.

EVALUATION OF GROUND-WATER FLOW DIRECTION

The ground-water flow direction across the site was evaluated using a Wild NA-24 automatic level. The leveling instrument was used to measure the difference in elevation between the instrument and the top of the casing of each of the monitoring wells. Measurements were recorded to the nearest 0.001-foot, although accuracy of the instrument is limited to 0.005-foot over the maximum distance required (approximately 100 feet). The static water level in each well was measured to the nearest 0.01-foot using a Solinst water level sounder. The difference in well-head and ground-water elevations were combined to calculate the difference in water-level elevations between each well. The results of the survey are presented on Table 2. A graphical interpretation of the ground-water flow at the site on July 14, 1988, is presented on the Ground-Water Potentiometric Surface Map, Plate P-7.

The ground-water gradient calculated from the above measurements is 0.14 (14 feet vertical per 100 feet horizontal). The measured difference in ground-water elevations indicates a ground-water flow direction of approximately south 33 degrees west.

TABLE 2
GROUND-WATER ELEVATION DIFFERENCES
UNOCAL Service Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

Monitoring Well Number	Top of Casing Below Datum (c)	Static Water Level (w)	Water Level Below Datum (c + w)
MW-1	0.000	5.16	5.16
MW-2	4.780	7.49	12.27
MW-3	2.046	6.85	8.90

Measurements in feet.
Static water level measured in feet below top of casing.
Datum is an arbitrary elevation equal to the top of the highest well casing (MW-1).

CONCLUSIONS AND RECOMMENDATIONS

Concentrations of hydrocarbon contamination detected in the soil and water samples from boring B-3 and well MW-3, respectively, were greater in magnitude than the concentrations detected in either borings B-1 or B-2 or wells MW-1 or MW-2. Concentrations of total xylene isomers in each soil and water sample were significantly greater than the concentrations of the remaining constituents of benene, toluene, or xylene isomers in the same sample. These trends imply that the release of contaminants at UNOCAL Station No. 5484 was probably not recent,

based on the high relative concentration of heavier-end volatiles (i.e., xylenes vs. benzene and toluene).

Contaminant constituents detected at the site generally exhibit their lowest concentrations on the upgradient side of the tank pit, which suggests that contamination is greatest in the area southwest of the service islands. The values obtained at boring B-1 (well MW-1) and boring B-3 (well MW-3) suggest a general decrease in contaminant concentration with distance from the underground storage tanks.

Two wells, one domestic water-supply and one test well, are known to exist approximately 1/2-mile downgradient of the site. As a precaution, we recommend that the domestic well be sampled and analyzed for hydrocarbon contamination and a search be conducted for possible contaminant sources between the domestic well and the subject site.

We also recommend that the water in the three wells be qualitatively and quantitatively monitored on a quarterly basis. The water samples collected should be analyzed for TPH and for BTEX. The results may show a trend in contaminant concentrations and ground-water quality at the site.

We also recommend that UNOCAL submit a copy of this report to Mr. Larry Seto, Hazardous Materials Specialist, Alameda County Health Care Services, 470 27th Street, Third Floor, Oakland, California 94612, and Ms. Lisa McCann, Water Quality Control Board, San Francisco Bay Region, 1111 Jackson Street, Room 6040, Oakland, California 94607.

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 for the purpose of evaluating environmental conditions of the soil and ground water with respect to hydrocarbon product contamination in the vicinity of the subject property. 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.

Source: U.S. Geological Survey
7.5-Minute Quadrangle
Hayward, California
Photorevised 1980

N

Approximate Scale

2000 1000 0 2000 4000

feet

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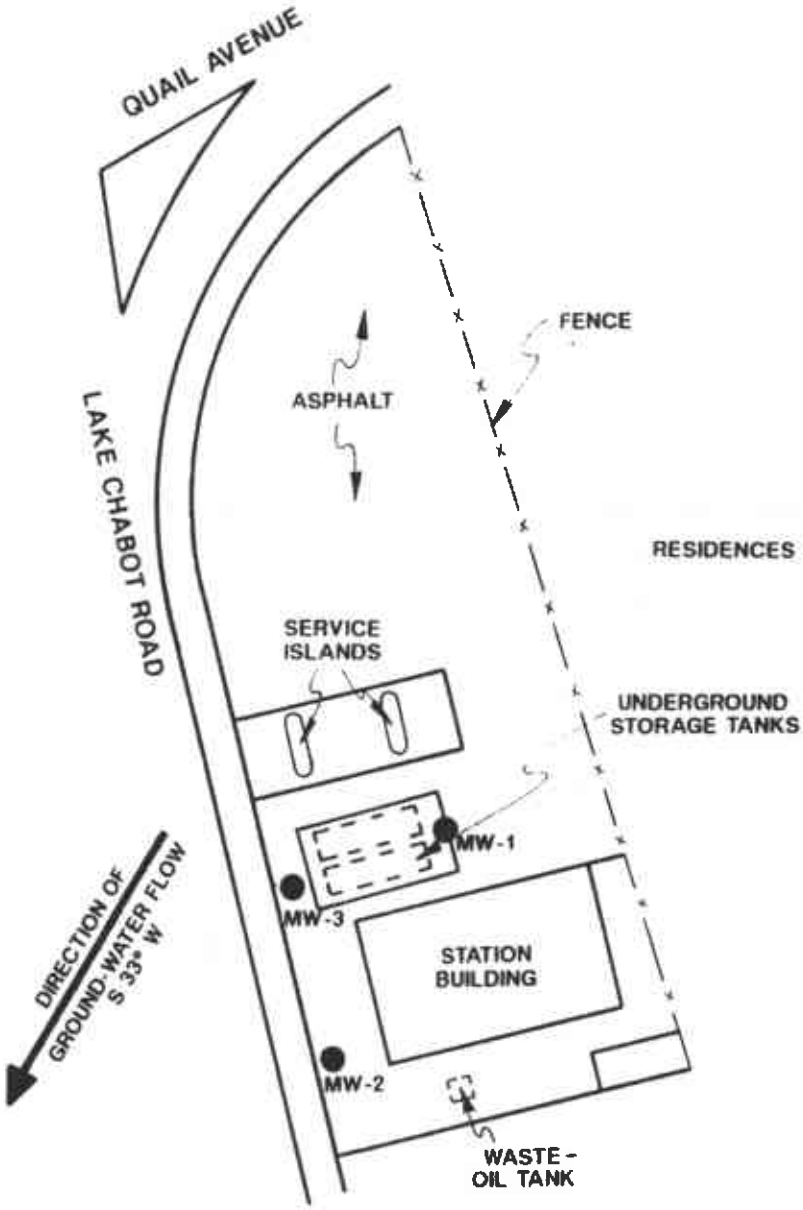
PROJECT NO. 018061-1

SITE VICINITY MAP
UNOCAL Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

PLATE
P - 1



MW-3 ● = Monitoring well location

Source: Measured by tape and compass

N

Approximate Scale

40 20 0 40 80

feet

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PROJECT NO. 018061-1

GENERALIZED SITE PLAN
UNOCAL Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

PLATE
P - 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel sand mixtures, little or no fines.	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.
		GP	Poorly-graded gravels or gravel sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		GM	Silty gravels, gravel-sand-clay mixtures.			OL	Organic silts and organic silt-clays of low plasticity.
		GC	Clayey gravels, gravel-sand-clay mixtures.		SILTS AND CLAYS LL<50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.			CH	Inorganic clays of high plasticity, fat clays.
		SP	Poorly-graded sands or gravelly sands, little or no fines.			OH	Organic clays of medium to high plasticity.
		SM	Silty sands, sand-silt mixtures.	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
		SC	Clayey sands, sand-clay mixtures.				


Depth through which sampler is driven


Relatively undisturbed sample


Missed sample


Ground water level observed in boring

S-10 Sample number

OVM Organic vapor meter reading


Sand pack


Bentonite annular seal


Neat cement annular seal


Blank PVC


Machine-slotted PVC

BLOW/FT. REPRESENTS THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH THE LAST 12 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.

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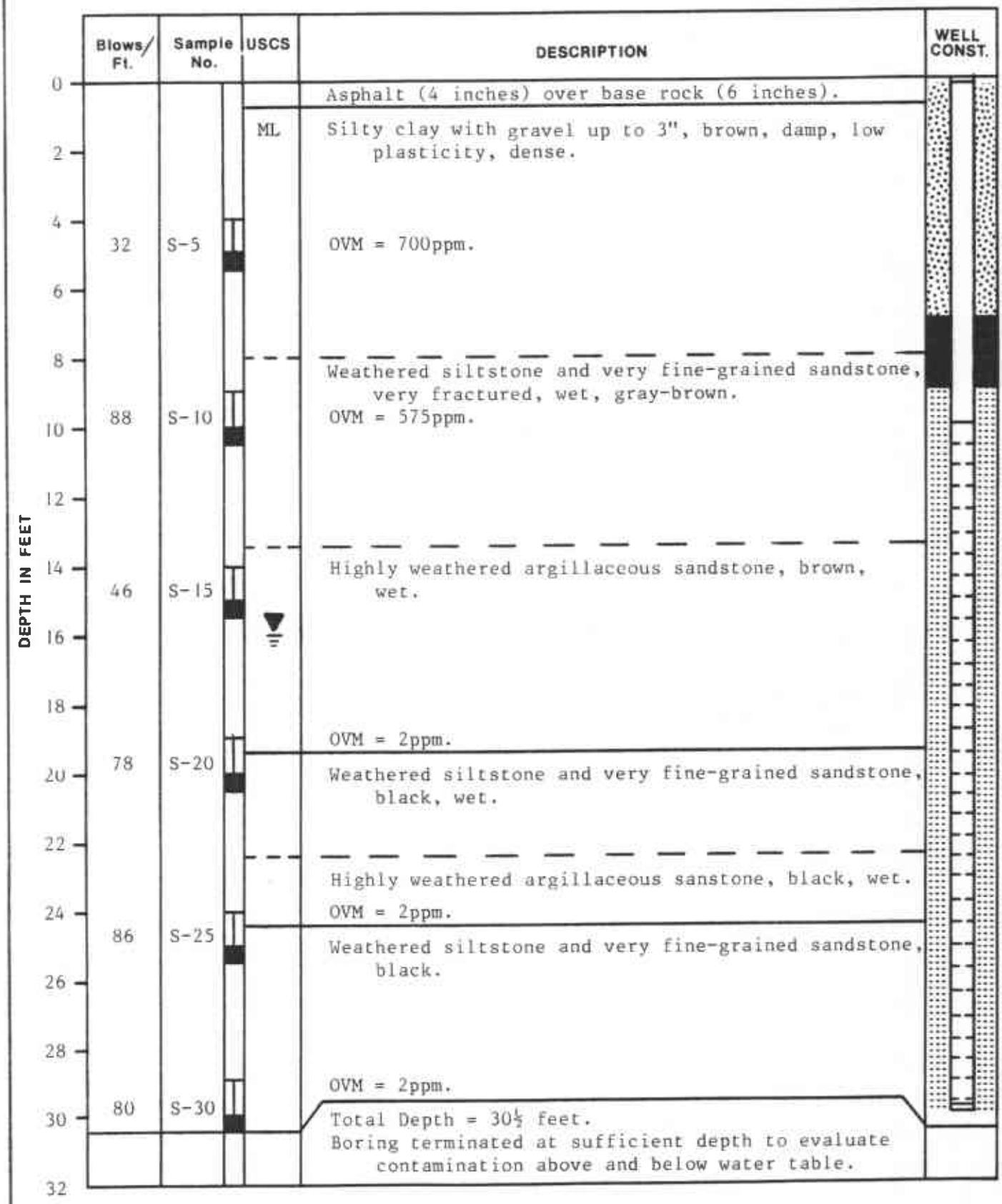
PROJECT NO. 018061-1

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
UNOCAL Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

PLATE
P - 3



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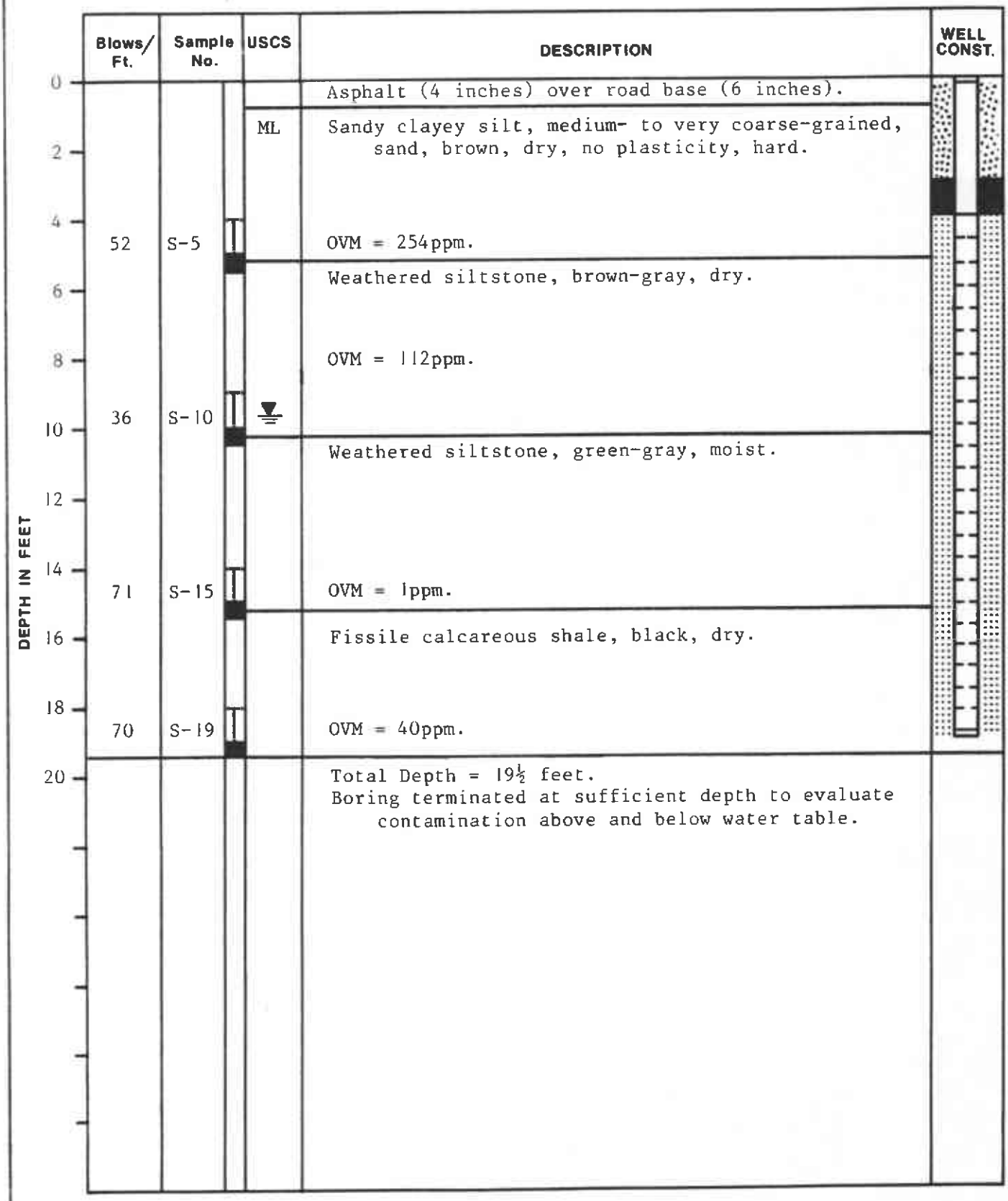
LOG OF BORING B-1/MW-1

UNOCAL Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

PLATE
P - 4

PROJECT NO. 018061-1



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PROJECT NO. 018061-1

LOG OF BORING B-2/MW-2

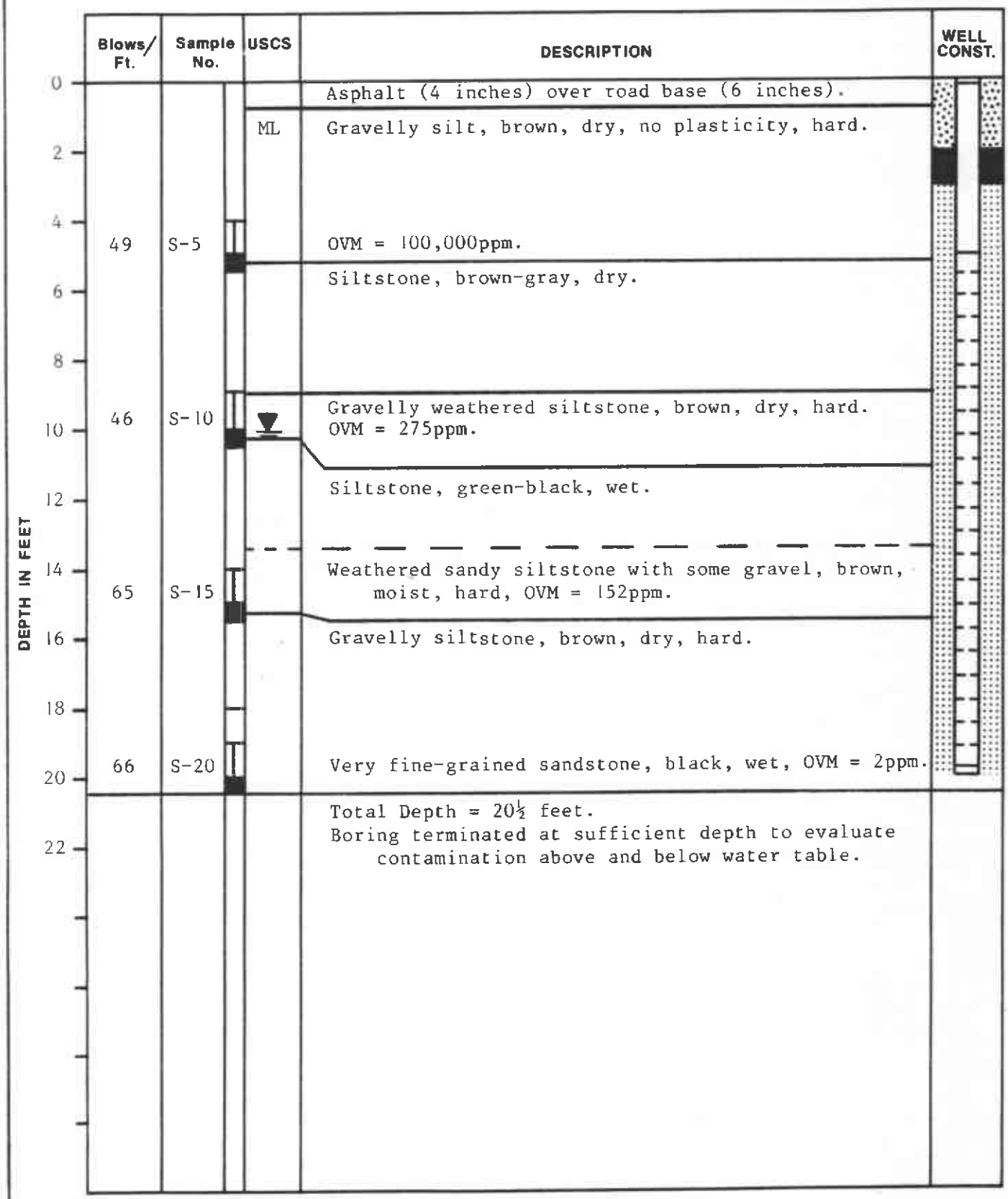
UNOCAL Station No. 5484

18950 Lake Chabot Road

Castro Valley, California

PLATE

P - 5



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LOG OF BORING B-3/MW-3

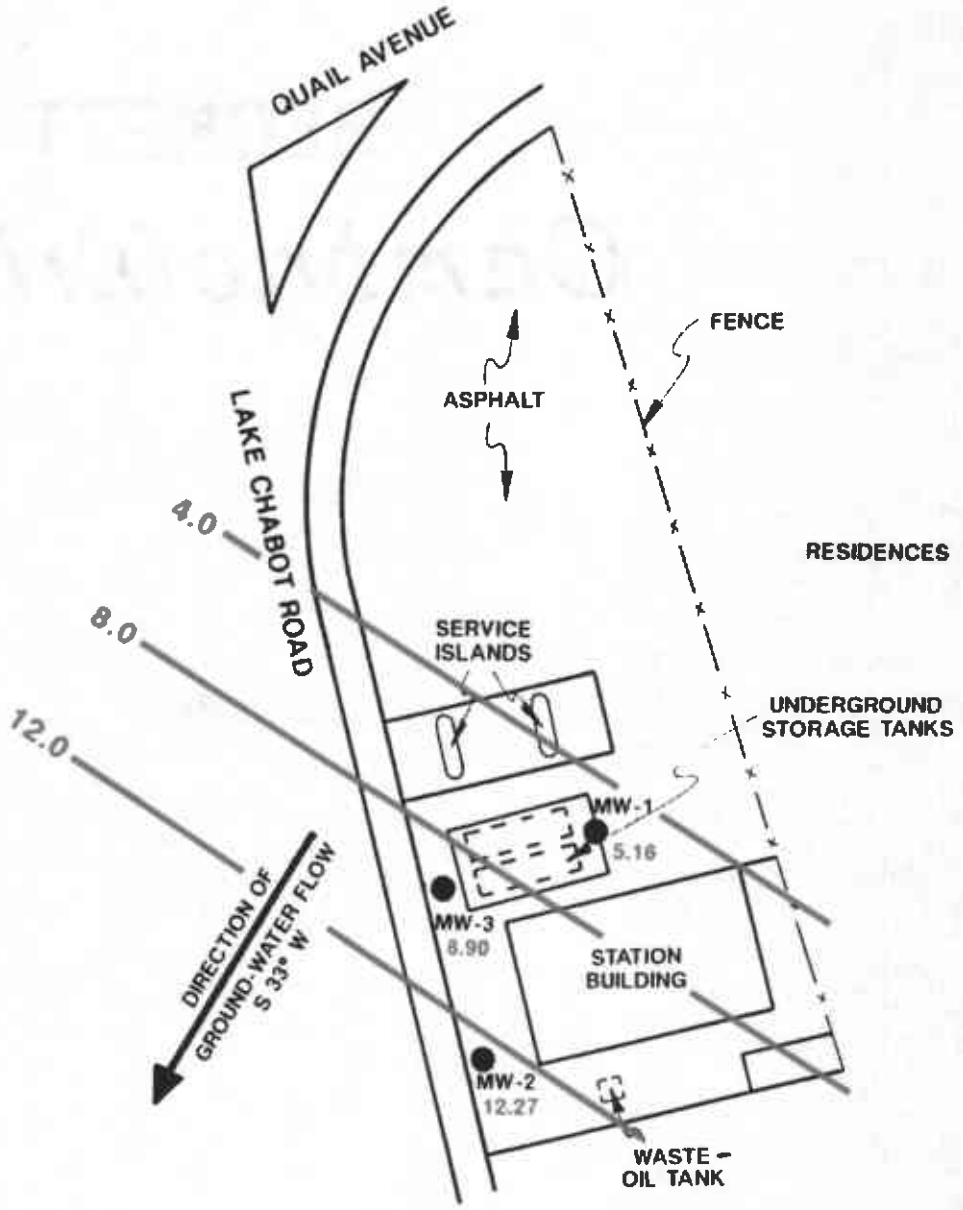
UNOCAL Station No. 5484

18950 Lake Chabot Road

Castro Valley, California

PLATE

P - 6



Approximate ground-water gradient = 14ft/100ft

12.0 = Line of equal depth in feet to ground water

MW-3 ● = Monitoring well location

Source: Measured by tape and compass

N

Approximate Scale

40 20 0 40 80

feet

Applied GeoSystems

PROJECT NO. 018061-1

GROUND-WATER POTENTIOMETRIC SURFACE MAP
UNOCAL Station No. 5484
18950 Lake Chabot Road
Castro Valley, California

PLATE
P - 7

APPENDIX A

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 19950 LAKE CHABOT RD. CASTRO VALLEY, CA.

(2) CLIENT
Name UNOCAL CORP.
Address 2175 N. CALIFORNIA Phone 945-7676
City WALNUT CREEK Zip 94596

(3) APPLICANT
Name APPLIED GEOSYSTEMS
Address 43255 MISSION BLVD Phone 651-1906
City FREMONT Zip 94539

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

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

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

WELL PROJECTS
Drill Hole Diameter 8 in. Depth(s) 30 ft.
Casing Diameter 2 in. Number
Surface Seal Depth 14 ft. of Wells ___
Driller's License No. ___

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

(7) ESTIMATED STARTING DATE 6-28-88
ESTIMATED COMPLETION DATE 6-28-88

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

APPLICANT'S SIGNATURE [signature] Date 6-21-88

FOR OFFICE USE

PERMIT NUMBER 88286
LOCATION NUMBER ___

Approved Wyman Hong Date 22 Jun 88
Wyman Hong

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.

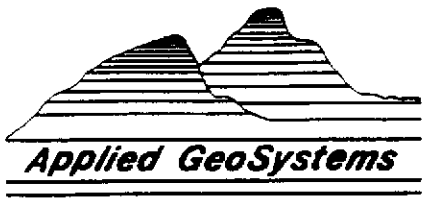
D. CATHODIC. Fill hole above anode zone with concrete placed by tremie, or equivalent.

E. WELL DESTRUCTION. See attached.

91987

APPENDIX B

CHAIN OF CUSTODY RECORD



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

SAMPLER (signature): William C Given

Phone: (415) 651-1906

LABORATORY: APPLIED GEOSYSTEMS

TURNAROUND TIME: 2 WEEKS

Project Leader: ANDREW GILPIN

Phone No. (415) 651-1906

SHIPPING INFORMATION:

Shipper _____

Address _____

Date Shipped _____

Service Used _____

Airbill No. _____ Cooler No. _____

Relinquished by: (signature)	Received by: (signature)	Date	Time
William C Given		7-13-88	5PM
	Received for laboratory by:	7-14-88	1615

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-15-B1	AGS-019061-1	7-12-88	TPH AND BETX	ICED
S-5-B2	"	7-13-88	" " "	"
S-5-B3	"	7-13-88	" " "	"

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-14-88
Laboratory Number: 07028S01
Project: 018061-2
Sample: S-15-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	3		2		07-26-88	
TEH as Diesel						NR
Benzene	0.06		0.05		07-26-88	
Toluene	0.56		0.05		07-26-88	
Ethylbenzene	0.24		0.05		07-26-88	
Total Xylenes	1.21		0.05		07-26-88	

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

7-29-88
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-14-88
Laboratory Number: 07028S02
Project: 018061-2
Sample: S-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	12		2		07-26-88	
TEH as Diesel						NR
Benzene	0.16		0.05		07-26-88	
Toluene	0.92		0.05		07-26-88	
Ethylbenzene	0.66		0.05		07-26-88	
Total Xylenes	3.58		0.05		07-26-88	

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PROCEDURES

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Tia Tran, Laboratory Supervisor

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-14-88
Laboratory Number: 07028S03
Project: 018061-2
Sample: S-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	79		2		07-26-88	
TEH as Diesel						NR
Benzene	0.83		0.05		07-26-88	
Toluene	6.63		0.05		07-26-88	
Ethylbenzene	3.81		0.05		07-26-88	
Total Xylenes	26.12		0.05		07-26-88	

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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.

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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

7-29-88
Date Reported

CHAIN OF CUSTODY RECORD

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

SAMPLER (signature): James Orr
Phone: (415) 651-1906

LABORATORY: Applied Geo Systems

TURNAROUND TIME: Two Weeks

Project Leader: Drew Gilpin
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
James Orr		7-15-88	8 AM
	Received for laboratory by:	7-15-88	1000

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-7-MW1	0180 6HR J.O	7-14-88 J.O	TPH, BETX J.O	Iced + HCL J.O
W-9-MW3				
W-9-MW2	J.O	J.O		

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-15-88
Laboratory Number: 07029W01
Project: 018061-2
Sample: W-7-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		0.54		0.02	07-26-88	
TEH as Diesel						NR
Benzene		0.0061		0.0005	07-26-88	
Toluene		0.0827		0.0005	07-26-88	
Ethylbenzene		0.0356		0.0005	07-26-88	
Total Xylenes		0.1803		0.0005	07-26-88	

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PROCEDURES

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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

7-29-88
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-15-88
Laboratory Number: 07029W02
Project: 018061-2
Sample: W-9-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		1.08		0.02	07-26-88	
TEH as Diesel						NR
Benzene		0.072		0.002	07-26-88	
Toluene		0.139		0.002	07-26-88	
Ethylbenzene		0.033		0.002	07-26-88	
Total Xylenes		0.157		0.002	07-26-88	

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Fremont, CA 94539
Attention: Andrew J. Gilpin

Date Received: 7-15-88
Laboratory Number: 07029W03
Project: 018061-2
Sample: W-9-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		7.8		0.1	07-26-88	
TEH as Diesel						NR
Benzene		0.385		0.005	07-26-88	
Toluene		0.640		0.005	07-26-88	
Ethylbenzene		0.369		0.005	07-26-88	
Total Xylenes		2.258		0.005	07-26-88	

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NR = Analysis not required.

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Tia Tran, Laboratory Supervisor

7-29-88
Date Reported