KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581

March 27, 1991

Alameda County Health Care Services
80 Swan Way, Room 200
Oakland, CA 94621

RE: Unocal Service Station #3538
411 W. MacArthur Blvd. 94609
Oakland, California

Gentlemen:

Per the request of Mr. Rick Sisk of Unocal Corporation, enclosed please find our report and proposal, both dated February 28, 1991, for the above referenced site.

Should you have any questions, please feel free to call our office at (707) 746-6915.

Sincerely,

Kaprealian Engineering, Inc.

Judy A. Dewey

jad\82

Enclosure

cc: Rick Sisk, Unocal Corporation

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
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KEI-P89-0703.QR5
February 28, 1991

Unocal Corporation
2000 Crow Canyon Place, Suite 400
San Ramon, CA 94583

Attention: Mr. Rick Sisk

RE: Quarterly Report
Unocal Service Station #3538
411 W. MacArthur Blvd.
Oakland, California

Dear Mr. Sisk:

This report presents the results of the fifth quarter of monitoring and sampling of the monitoring wells at the referenced site by Kaprealian Engineering, Inc. (KEI), per proposal KEI-P89-0703.P2 dated November 23, 1989. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from November, 1990 through January, 1991.

BACKGROUND

The subject site is presently used as a gasoline station. A Location Map, Site Vicinity Map and Site Plans are attached to this report.

KEI's initial work at the site began in July, 1989 when KEI was asked to collect soil samples following the removal of two underground fuel storage tanks and one waste oil tank at the site. The tanks consisted of one 10,000 gallon super unleaded, one 12,000 gallon regular unleaded, and one 550 gallon waste oil tank. No apparent holes or cracks were observed in the fuel tanks; however, the waste oil tank had four small holes. Water was encountered in the fuel tank pit at a depth of 10.5 feet, thus prohibiting sampling directly from beneath the fuel tanks. Six sidewall samples, labeled SW1, SW1(4), SW2, SW3, SW4 and SW4(20), were collected from the fuel tank pit at a depth of 10 feet. The soil sample, labeled WO1, collected from beneath the waste oil tank was collected at a depth of 8.5 feet. KEI also collected four samples, labeled P1 through P4, from the piping trenches at depths of 5 to 10 feet. After sampling, the water was pumped from the fuel tank pit. Since there was no recharge, a water sample was not collected. All samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California, for total petroleum hydrocarbons (TPH) as gasoline, and benzene, toluene, xylenes and ethylbenzene (BTX&E).

In addition, the waste oil tank sample was analyzed for TPH as diesel, total oil and grease (TOG), and EPA methods 8010 and 8270 compounds.

The analytical results of the fuel tank pit soil samples showed levels of TPH as gasoline ranging from non-detectable to 11 ppm, except for sample SW1, which showed 3,100 ppm of TPH as gasoline. However, following excavation of approximately 4 feet of the sidewall where sample SW1 was collected, an additional sample, labeled SW1(4), was collected, analyzed, and indicated non-detectable levels of TPH as gasoline and BTX&E. The sample collected from the waste oil pit showed non-detectable levels of TPH as gasoline, TPH as diesel, and BTX&E, with TOG levels of 36 ppm. Results of the soil analyses are summarized in Table 3, and the sample locations are as shown on the attached Site Plan, Figure 2. Documentation of soil sample collection and sample analytical results from the tank excavation are summarized in KEI's report (KEI-J89-0703.R1) dated July 31, 1989. To comply with the requirements of the regulatory agencies and based on the results of the laboratory analyses, KEI recommended the installation of four monitoring wells.

On September 6 and 7, 1989, four two-inch diameter monitoring wells, designated as MW1, MW2, MW3 and MW4 on the attached Site Plan, Figure 1, were installed at the site. The four wells were drilled and completed to total depths ranging from 29 to 30 feet. Ground water was encountered at depths ranging from 19 to 19.5 feet beneath the surface during drilling. The wells were developed on September 12, 1989, and were initially sampled on September 15, 1989. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California. Samples were analyzed for TPH as gasoline and BTX&E. In addition, the sample collected from monitoring well MW1 was analyzed for TPH as diesel, TOG, and purgeable halocarbons using EPA method 8010. Analytical results of soil samples collected from the borings for the monitoring wells showed levels of TPH as gasoline ranging from non-detectable to 20 ppm in all samples. TPH as diesel and EPA method 8010 compounds were non-detectable in all samples collected from MW1. All TOG levels in MW1 were less than 50 ppm. Benzene levels were non-detectable in all samples except MW2 at 19 feet and MW3 at 10 feet, which were 1.5 ppm and 0.29 ppm, respectively. The analytical results of water samples collected from the monitoring wells indicated non-detectable levels of benzene in all wells. MW1 also revealed non-detectable levels of TPH as diesel and less than 50 ppm of TOG, however, 2.7 ppb of tetrachloroethene (PCE) was detected. TPH as gasoline levels were 290 ppb in MW2, 32 ppb in MW3, and non-detectable in wells MW1 and MW4. Laboratory results of the soil samples are summarized in Table 3 and water samples in

Table 2. The details of the monitoring well installation are presented in KEI's report (KEI-P89-0703.R5) dated October 23, 1989. Based on these analytical results, KEI recommended the implementation of a monthly monitoring and quarterly sampling program. The monthly monitoring and quarterly sampling was initiated in November, 1989, and the first quarter results are presented in KEI's report (KEI-P89-0703.QR1) dated February 20, 1990. This report presents the results of the most recent monitoring and sampling.

FIELD ACTIVITIES

The four wells (MW1 through MW4) were monitored three times and sampled once during the quarter. During monitoring, the wells were checked for depth to water and presence of free product and sheen. No free product or sheen was noted in any of the wells during the quarter. Monitoring data are summarized in Table 1.

Water samples were collected from the wells on January 15, 1991. Prior to sampling, the wells were purged of 15 to 55 gallons each using a surface pump. Samples were then collected using a clean Teflon bailer. Samples were decanted into clean VOA vials and/or one liter amber bottles as appropriate which were sealed with Teflon-lined screw caps and stored in a cooler on ice until delivery to a certified laboratory.

HYDROLOGY

Based on the water level data gathered during the quarter, ground water flow direction appeared to be generally toward the east at an approximate gradient of .005 on January 15, 1991, relatively unchanged from the previous quarter. Water levels have fluctuated during the quarter, showing a net increase of 0.07 to 0.14 feet in all wells since October 16, 1990. The measured depth to ground water at the site on January 15, 1991 ranged between 18.33 to 18.57 feet.

ANALYTICAL RESULTS

Ground water samples were analyzed at Sequoia Analytical Laboratory in Concord, California, and were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, and BTX&E using EPA method 8020. In addition, the ground water sample collected from MW1 was analyzed for TPH as diesel using EPA method 3510 in conjunction with modified 8015, TOG using standard method 5520B&F, and halogenated volatile organics using EPA method 8010.

Analytical results of the ground water samples, collected from monitoring wells MW1 and MW4, indicate non-detectable levels of TPH as gasoline and BTX&E. Analytical results of the ground water samples, collected from monitoring wells MW2 and MW3, indicate levels of TPH as gasoline at concentrations of 680 ppb, and 3,200 ppb, respectively. Benzene was detected in monitoring wells MW2 and MW3 at concentrations of 170 ppb, and 460 ppb, respectively. In MW1, TPH as diesel, TOG and EPA method 8010 compounds were non-detectable except for 2.1 ppb of tetrachloroethene. Concentrations of TPH as gasoline and benzene detected in ground water are plotted on the attached Site Plan, Figure 1a. Results of the analyses are summarized in Table 2. Copies of the analytical results and Chain of Custody documentation are attached to this report.

DISCUSSION AND RECOMMENDATIONS

The BP Service Station located northeast from the subject site was under construction activities in late October, 1990. Based on a site visit during February, 1991, it appears that one monitoring well was installed.

Based on the analytical results collected and evaluated to date and no evidence of free product or sheen in any of the wells, KEI recommends the continuation of the current monitoring and sampling program of the existing wells per KEI's proposal (KEI-P89-0703.P2) dated October 23, 1989.

In addition, based on contaminant levels observed in monitoring wells MW2 and MW3, KEI recommends the installation of two additional off-site wells as shown on the attached Site Vicinity Map. KEI considered proposing installation of monitoring wells in the median strip in the center of MacArthur Boulevard; however, access is precluded due to the presence of utility poles and trees (see the attached Site Vicinity Map). Our work plan/proposal is enclosed for your review and consideration.

DISTRIBUTION

A copy of this report should be sent to Alameda County Health Care Services, and to the Regional Water Quality Control Board, San Francisco Bay Region.

LIMITATIONS

Environmental changes, either naturally-occurring or artificially-induced, may cause changes in ground water levels and flow paths, thereby changing the extent and concentration of any contaminants.

Our studies assume that the field and laboratory data are reasonably representative of the site as a whole, and assume that subsurface conditions are reasonably conducive to interpolation and extrapolation.

The results of this study are based on the data obtained from the field and laboratory analyses obtained from a state certified laboratory. We have analyzed this data using what we believe to be currently applicable engineering techniques and principles in the Northern California region. We make no warranty, either expressed or implied, regarding the above, including laboratory analyses, except that our services have been performed in accordance with generally accepted professional principles and practices existing for such work.

If you have any questions regarding this report, please do not hesitate to call me at (707) 746-6915.

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins
Senior Environmental Engineer

Don R. Braun
Certified Engineering Geologist

License No. 1310
Exp. Date 6/30/92

\bam:jad

Attachments: Tables 1, 2 & 3
Location Map
Site Vicinity Map
Site Plans - Figure 1, 1a & 2
Laboratory Analyses
Chain of Custody documentation
Work Plan/Proposal

KEI-P89-0703.QR5
February 28, 1991

TABLE 1

SUMMARY OF MONITORING DATA

Date	Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness	Sheen	Water Bailed (gallons)
1/15/91	MW1	82.28	18.54	0	None	15
	MW2	81.61	18.39	0	None	55
	MW3	81.84	18.57	0	None	55
	MW4	82.02	18.33	0	None	15
12/11/90	MW1	82.22	18.60	0	None	0
	MW2	81.64	18.36	0	None	55
	MW3	81.83	18.58	0	None	55
	MW4	81.99	18.36	0	None	0
11/13/90	MW1	82.14	18.68	0	None	0
	MW2	81.55	18.45	0	None	55
	MW3	81.76	18.65	0	None	55
	MW4	81.91	18.44	0	None	0

Well #	Surface Elevation* (feet)
MW1	100.82
MW2	100.00
MW3	100.41
MW4	100.35

* Elevation of top of well covers surveyed to assumed datum of 100.00 feet at top of well cover MW2.

KEI-P89-0703.QR5
February 28, 1991

TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene	PCE
1/15/91	MW1*	ND	ND	ND	ND	ND	ND	2.1
	MW2	--	680	170	0.7	81	19	--
	MW3	--	3,200	460	1.5	270	120	--
	MW4	--	ND	ND	ND	ND	ND	--
10/16/90	MW1*	ND	ND	ND	ND	ND	ND	2.0
	MW2	--	1,400	430	2.0	240	48	--
	MW3	--	740	210	1.4	82	2.5	--
	MW4	--	ND	ND	ND	ND	ND	--
7/17/90	MW1*	ND	ND	ND	ND	ND	ND	1.7
	MW2	--	490	76	0.59	46	11	--
	MW3	--	4,000	270	48	250	130	--
	MW4	--	ND	ND	ND	ND	ND	--
4/19/90	MW1*	ND	ND	ND	ND	ND	ND	2.2
	MW2	--	3,900	550	5.1	390	91	--
	MW3	--	3,100	600	27	220	54	--
	MW4	--	ND	ND	0.48	ND	ND	--
1/23/90	MW1**	ND	ND	1.5	2.3	4.3	ND	2.1
	MW2	--	400	73	36	40	10	--
	MW3	--	450	110	1.2	11	4.4	--
	MW4	--	ND	ND	0.40	ND	ND	--
9/15/89	MW1***	ND	ND	ND	0.61	ND	ND	2.7
	MW2	--	290	ND	12	ND	ND	--
	MW3	--	32	ND	ND	ND	ND	--
	MW4	--	ND	ND	ND	ND	ND	--
Detection Limits		50	30	0.3	0.3	0.3	0.3	0.5

* TOG was non-detectable. All EPA method 8010 compounds were non-detectable, except for PCE (see above).
** TOG was 1.5 ppm. All EPA method 8010 compounds were non-detectable, except for PCE (see above).
*** TOG was <50 ppm. All EPA method 8010 compounds were non-detectable, except for PCE. (see above).
ND = Non-detectable.
-- Indicates analysis not performed.
Results in parts per billion (ppb), unless otherwise indicated.

KEI-P89-0703.QR5
February 28, 1991

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
(Collected on July 12 & 17, 1989)							
SW1	10	--	3,100	12	300	730	110
SW1(4)	10	--	ND	ND	ND	ND	ND
SW2	10	--	1.1	0.10	ND	0.18	ND
SW3	10	--	5.7	0.26	ND	0.45	0.23
SW4	10	--	2.5	ND	ND	0.24	ND
SW4(2)	10	--	11	0.61	0.51	1.3	0.44
P1	6.5	--	ND	ND	ND	ND	ND
P2	6.5	--	ND	ND	ND	ND	ND
P3	5.5	--	ND	ND	ND	ND	ND
P4	10	--	170	0.71	12	47	6.8
WO1*	8.5	ND	ND	ND	ND	ND	ND
(Collected on September 6 & 7, 1989)							
MW1**	5	ND	3.4	ND	ND	ND	ND
MW1**	10	ND	5.0	ND	ND	ND	ND
MW1**	15	ND	2.2	ND	ND	ND	ND
MW1**	19	ND	ND	ND	ND	ND	ND
MW2	5	--	1.4	ND	ND	ND	ND
MW2	10	--	ND	ND	ND	ND	ND
MW2	15	--	1.8	ND	ND	ND	ND
MW2	19	--	13	1.5	2.1	1.8	0.34
MW3	5	--	1.3	ND	ND	ND	ND
MW3	10	--	1.8	0.29	ND	ND	ND
MW3	15	--	3.3	ND	ND	ND	ND
MW3	18.5	--	ND	ND	ND	ND	ND
MW4	5	--	3.1	ND	ND	ND	ND
MW4	10	--	17	ND	ND	0.10	ND
MW4	15	--	20	ND	ND	0.27	ND
MW4	18.5	--	2.1	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.11

KEI-P89-0703.QR5
February 28, 1991

TABLE 3 (Continued)

SUMMARY OF LABORATORY ANALYSES
SOIL

* TOG 36 ppm, and 8010 and 8270 constituents were non-detectable.

** TOG was <50 ppm for these samples. EPA method 8010 compounds were non-detectable for these samples.

ND = Non-detectable.

-- Indicates analysis not performed.

Results in parts per million (ppm), unless otherwise indicated.

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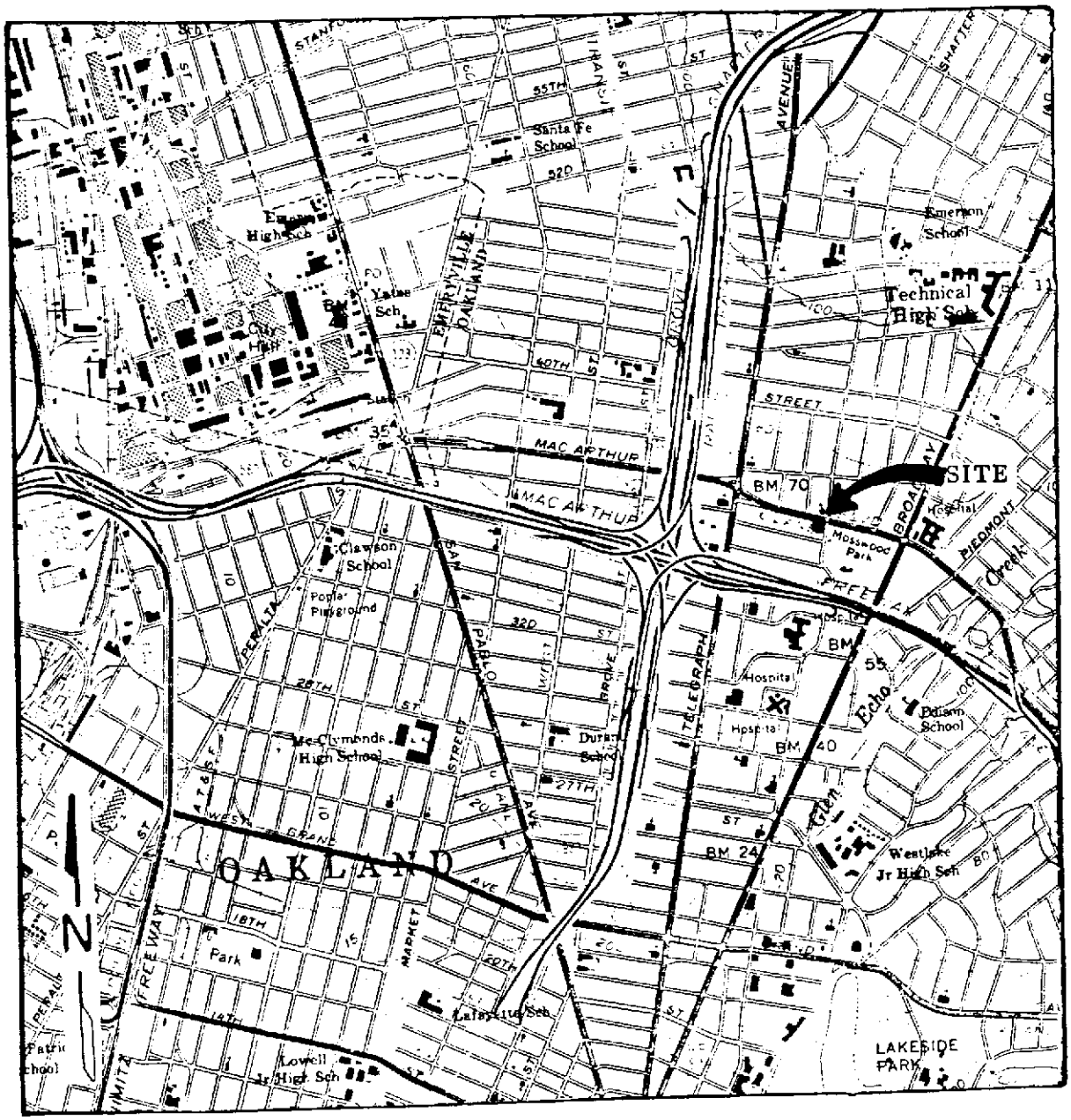

LOCATION MAP

Unocal S/S #3538
411 W. MacArthur Blvd.
Oakland, CA

KAPREALIAN ENGINEERING, INC.
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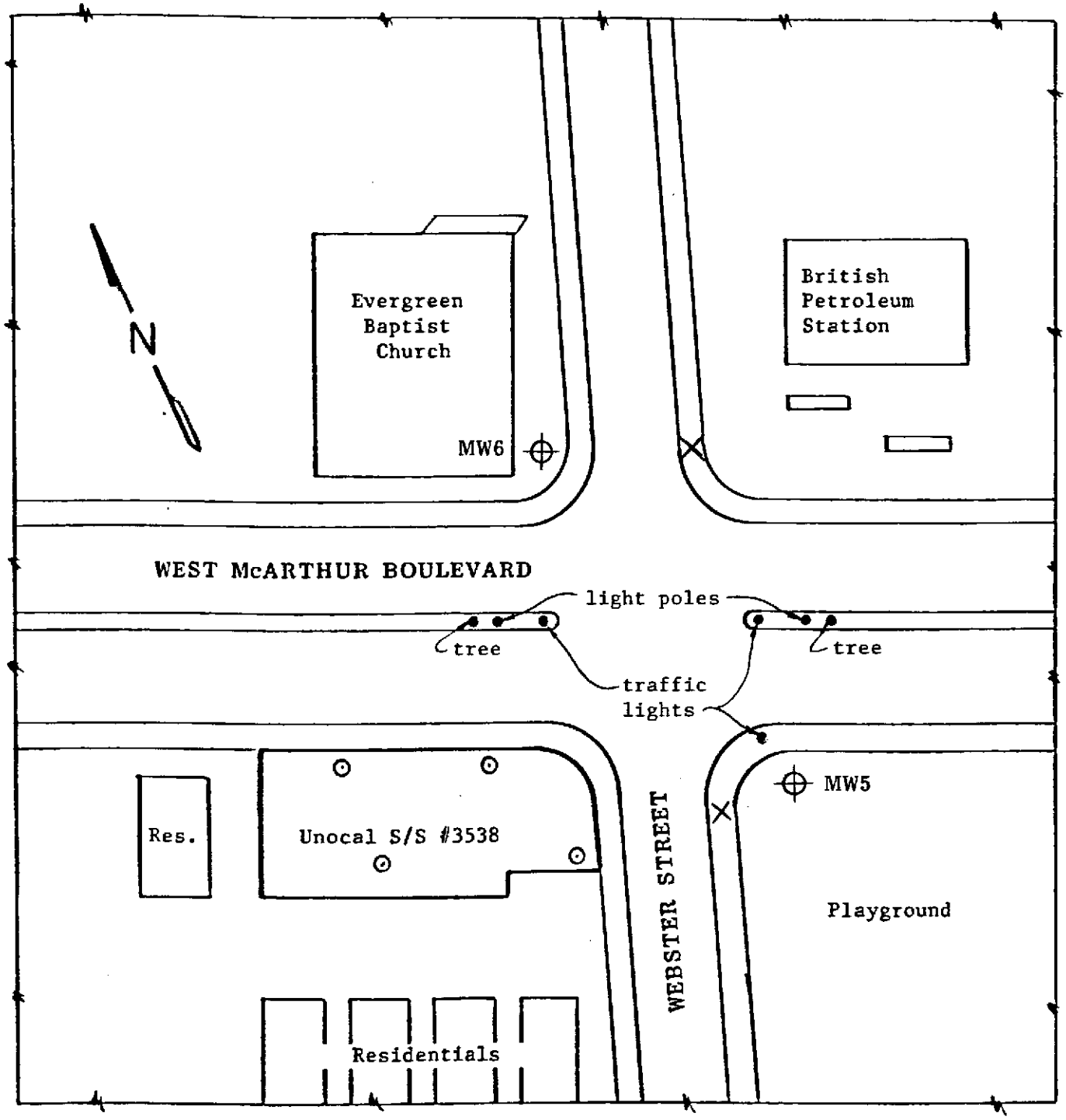

LEGEND

- ⊙ Monitoring well (existing)
- ⊕ Monitoring well (proposed)
- X Utility pole & overhead lines
- ⇨ Direction of ground water flow

SITE VICINITY MAP

0 60 120
Approx. scale feet

Unocal S/S #3538
411 W. McArther Boulevard
Oakland, CA

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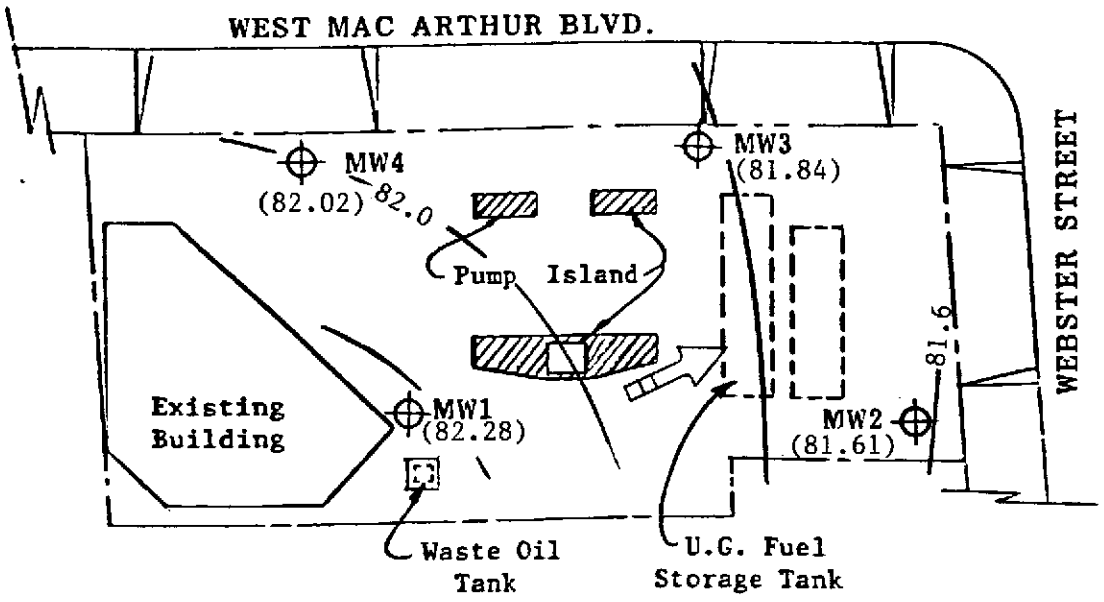
1-2



SITE PLAN
Figure 1

LEGEND

- Monitoring Well
- ( ) Water Table elevation in feet on 1/15/91. Top of MW2 wellcover assumed 100.00 feet as datum
- Ground water flow direction
- Contours on ground water surface in feet

0 30 60
Approx. Scale feet

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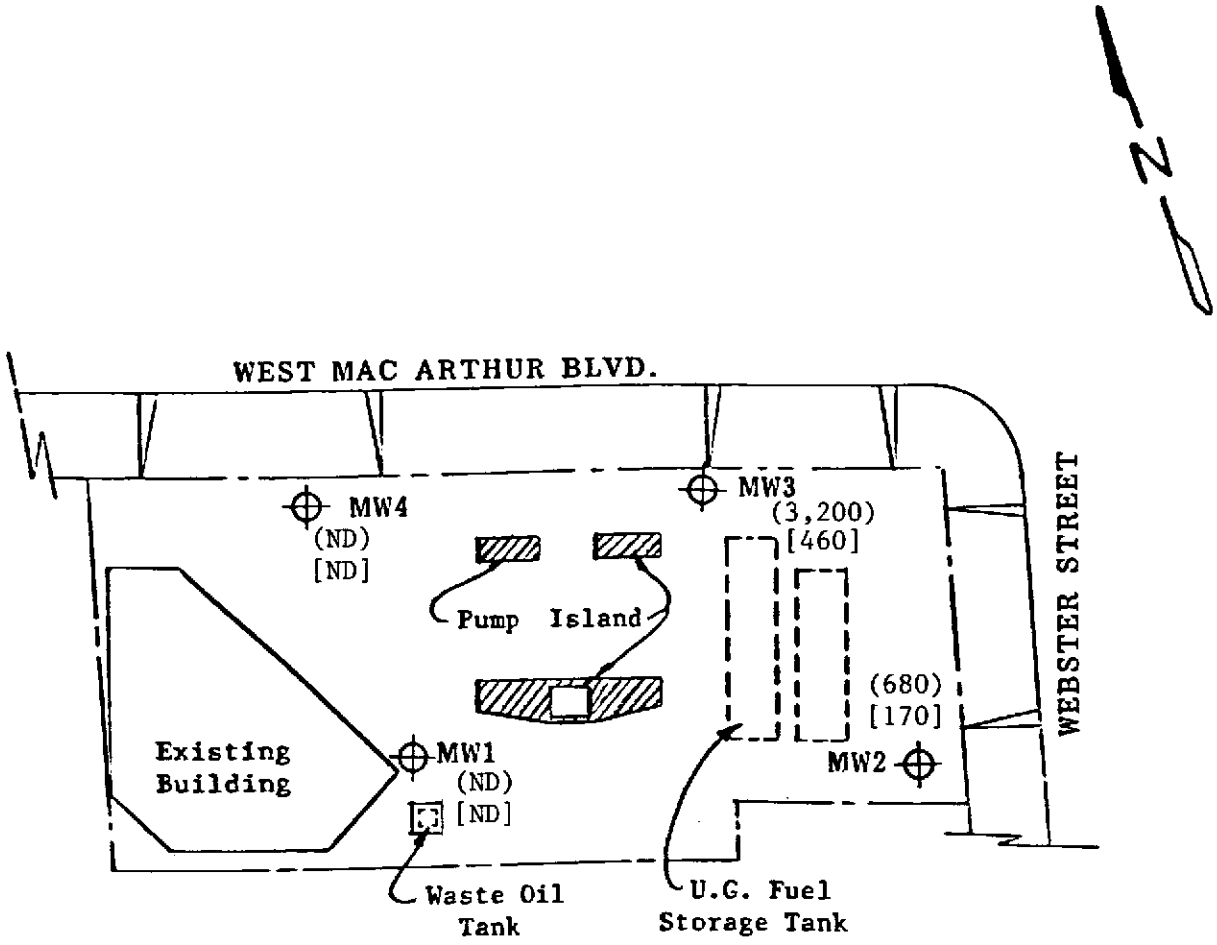

SITE PLAN
Figure 1a

LEGEND

⊕ Monitoring Well

( ) Concentration of TPH as gasoline in ppb on 1/15/91

[ ] Concentration of benzene in ppb on 1/15/91

ND = Non-detectable

0 30 60
Approx. Scale feet

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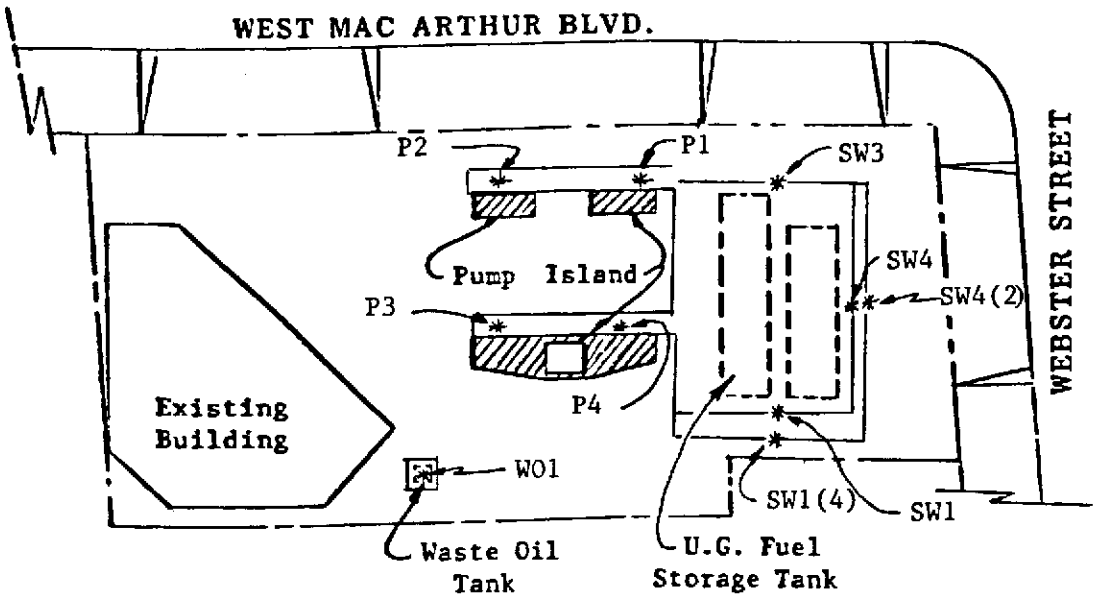

SITE PLAN
Figure 2

LEGEND

* Soil Sample Point Location

0 30 60
Approx. Scale feet

Unocal S/S #3538
411 W. MacArthur Blvd.
Oakland, CA

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 411 W. McArthur Blvd., Oakland	Sampled:	Jan 15, 1991
P.O. Box 996	Matrix Descript:	Water	Received:	Jan 15, 1991
Benicia, CA 94510	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Jan 25, 1991
Attention: Mardo Kaprealian, P.E.	First Sample #:	101-0256 A-B	Reported:	Jan 28, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
101-0256 A-B	MW-1	N.D.	N.D.	N.D.	N.D.	N.D.
101-0257 A-B	MW-2	680	170	0.70	19	81
101-0258 A-B	MW-3	3,200	460	1.5	120	270
101-0259 A-B	MW-4	N.D.	N.D.	N.D.	N.D.	N.D.
Detection Limits:		**30**	**0.30**	**0.30**	**0.30**	**0.30**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 411 W. McArthur Blvd., Oakland	Sampled:	Jan 15, 1991
P.O. Box 996	Matrix Descript:	Water	Received:	Jan 15, 1991
Benicia, CA 94510	Analysis Method:	EPA 3510/8015	Extracted:	Jan 17, 1991
Attention: Mardo Kaprealian, P.E.	First Sample #:	101-0256 C	Analyzed:	Jan 24, 1991
			Reported:	Jan 28, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons µg/L (ppb)
101-0256 C	MW-1	N.D.

Detection Limits:	50

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 411 W. McArthur Blvd., Oakland	Sampled:	Jan 15, 1991
P.O. Box 996	Matrix Descript:	Water	Received:	Jan 15, 1991
Benicia, CA 94510	Analysis Method:	SM 5520 B&F (Gravimetric)	Extracted:	Jan 22, 1991
Attention: Mardo Kaprealian, P.E.	First Sample #:	101-0256 D	Analyzed:	Jan 24, 1991
			Reported:	Jan 28, 1991

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/L (ppm)
101-0256 D	MW-1	N.D.

Detection Limits:	5.0

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

1010256.KEI <3>

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 411 W. McArthur Blvd., Oakland	Sampled:	Jan 15, 1991
P.O. Box 996	Sample Descript:	Water, MW-1	Received:	Jan 15, 1991
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jan 16, 1991
Attention: Mardo Kaprealian, P.E.	Lab Number:	101-0256 E-F	Reported:	Jan 28, 1991

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	1.0	N.D.
Bromoform	1.0	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	1.0	N.D.
Chlorobenzene	1.0	N.D.
Chloroethane	5.0	N.D.
2-Chloroethylvinyl ether	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	0.50	N.D.
Dibromochloromethane	0.50	N.D.
1,2-Dichlorobenzene	2.0	N.D.
1,3-Dichlorobenzene	2.0	N.D.
1,4-Dichlorobenzene	2.0	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	1.0	N.D.
Total 1,2-Dichloroethene	1.0	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	2.0	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	2.1
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	1.0	N.D.
Vinyl chloride	2.0	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: JOE

WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal / Oakland
411 W. MacArthur Blvd.

ANALYSES REQUESTED: TPHG, BTXE; 5010; TOG (5520 E/F); TPHD

TURN AROUND TIME: ~~RUSH~~ REGULAR

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	REMARKS
MW-1	1/15/91			✓	✓		6	1010 [illegible] 6AF	VOA's preserved
MW-2	"	1:45 p.m.		✓	✓		2	257 AB	
MW-3	"			✓	✓		2	258	
MW-4	"	11:20 a.m.		✓	✓		2	259	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	1/15/91	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time 1/16 10:30	Received by: (Signature) [signature]
Relinquished by: (Signature)	Date/Time 1/15/91	Received by: (Signature) [signature]

The following MUST BE completed by the laboratory accepting samples for analysis:

1. Have all samples received for analysis been stored in ice? Yes
2. Will samples remain refrigerated until analyzed? Yes
3. Did any samples received for analysis have head space? No
4. Were samples in appropriate containers and properly packaged? Yes

BS — Signature; Login — Title; 1/15/91 — Date

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581

KEI-P89-0703.P3
February 28, 1991

Unocal Corporation
2000 Crow Canyon Place, Suite 400
San Ramon, CA 94583

Attention: Mr. Rick Sisk

RE: Work Plan/Proposal
Unocal Service Station #3538
411 W. MacArthur Boulevard
Oakland, California

INTRODUCTION

1. Background:

The subject site is presently used as a gasoline station. A Location Map, Site Vicinity Map, and Site Plans are attached to this work plan.

Kaprealian Engineering, Inc's. (KEI) initial work at the site began in July, 1989 when KEI was asked to collect soil samples following the removal of two underground fuel storage tanks and one waste oil tank at the site. The tanks consisted of one 10,000 gallon super unleaded, one 12,000 gallon regular unleaded, and one 550 gallon waste oil tank. No apparent holes or cracks were observed in the fuel tanks; however, the waste oil tank had four small holes. Water was encountered in the fuel tank pit at a depth of 10.5 feet, thus prohibiting sampling directly from beneath the fuel tanks. Six sidewall samples, labeled SW1, SW1(4), SW2, SW3, SW4 and SW4(20), were collected from the fuel tank pit at a depth of 10 feet. The soil sample, labeled WO1, collected from beneath the waste oil tank was collected at a depth of 8.5 feet. KEI also collected four samples, labeled P1 through P4, from the piping trenches at depths of 5 to 10 feet. After sampling, the water was pumped from the fuel tank pit. Since there was no recharge, a water sample was not collected. All samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California, for total petroleum hydrocarbons (TPH) as gasoline, and benzene, toluene, xylenes and ethylbenzene (BTX&E). In addition, the waste oil tank sample was analyzed for TPH as diesel, total oil and grease (TOG), and EPA methods 8010 and 8270 compounds.

The analytical results of the fuel tank pit soil samples showed levels of TPH as gasoline ranging from non-detectable to 11 ppm, except for sample SW1, which showed 3,100 ppm of TPH as gasoline. However, following excavation of approximately 4 feet of the sidewall where sample SW1 was collected, an additional sample, labeled SW1(4), was collected, analyzed, and indicated non-detectable levels of TPH as gasoline and BTX&E. The sample collected from the waste oil pit showed non-detectable levels of TPH as gasoline, TPH as diesel, and BTX&E, with TOG levels of 36 ppm. Results of the soil analyses are summarized in Table 3, and the sample locations are as shown on the attached Site Plan, Figure 2. Documentation of soil sample collection and sample analytical results from the tank excavation are summarized in KEI's report (KEI-J89-0703.R1) dated July 31, 1989. To comply with the requirements of the regulatory agencies and based on the results of the laboratory analyses, KEI recommended the installation of four monitoring wells.

On September 6 and 7, 1989, four two-inch diameter monitoring wells, designated as MW1, MW2, MW3 and MW4 on the attached Site Plan, Figure 1, were installed at the site. The four wells were drilled and completed to total depths ranging from 29 to 30 feet. Ground water was encountered at depths ranging from 19 to 19.5 feet beneath the surface during drilling. The wells were developed on September 12, 1989, and were initially sampled on September 15, 1989. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California. Samples were analyzed for TPH as gasoline and BTX&E. In addition, the sample collected from monitoring well MW1 was analyzed for TPH as diesel, TOG, and purgeable halocarbons using EPA method 8010. Analytical results of soil samples collected from the borings for the monitoring wells showed levels of TPH as gasoline ranging from non-detectable to 20 ppm in all samples. TPH as diesel and EPA method 8010 compounds were non-detectable in all samples collected from MW1. All TOG levels in MW1 were less than 50 ppm. Benzene levels were non-detectable in all samples except MW2 at 19 feet and MW3 at 10 feet, which were 1.5 ppm and 0.29 ppm, respectively. The analytical results of water samples collected from the monitoring wells indicated non-detectable levels of benzene in all wells. MW1 also revealed non-detectable levels of TPH as diesel and less than 50 ppm of TOG, however, 2.7 ppb of tetrachloroethene (PCE) was detected. TPH as gasoline levels were 290 ppb in MW2, 32 ppb in MW3, and non-detectable in wells MW1 and MW4. Laboratory results of the soil samples are summarized in Table 3 and water samples in Table 2. The details of the monitoring well installation

are presented in KEI's report (KEI-P89-0703.R5) dated October 23, 1989. Based on these analytical results, KEI recommended the implementation of a monthly monitoring and quarterly sampling program. The monthly monitoring and quarterly sampling was initiated in November, 1989, and the most recent quarter results are presented in KEI's report (KEI-P89-0703.QR5) dated February 28, 1991.

2. Site Description:

The service station site occupies the southwest corner at the intersection of west MacArthur Boulevard and Webster Street in Oakland, California. A Location Map and Site Plans are attached to this report.

3. Hydrology

Based on the water level data gathered during the most recent quarter, ground water flow direction appeared to be generally toward the east at an approximate gradient of .005 on January 15, 1991. Water levels have fluctuated during the previous quarter, showing a net increase of 0.07 to 0.14 feet in all wells since October 16, 1990. The measured depth to ground water at the site on January 15, 1991 ranged between 18.33 to 18.57 feet. The summary of monitoring data for the most recent quarter of monitoring and sampling is presented in Table 1.

PHASE II - DEFINING THE EXTENT OF SUBSURFACE CONTAMINATION

1. KEI proposes to install two additional two-inch diameter monitoring wells, designated as MW5 and MW6 on the attached Site Vicinity Map, using hollow stem auger equipment. Permits will be obtained from the Alameda County Flood Control and the City of Oakland as necessary prior to beginning work. Also, off-site access permission will be obtained from any affected private property owners.

   The wells will be drilled about 10 to 15 feet into the saturated zone of the first encountered ground water unless a 5 foot thick clay aquitard is encountered first, at which time drilling will be terminated.

2. Soil samples will be collected at a maximum spacing of 5 foot intervals, significant changes in lithology, at obvious areas of contamination, and at/or within the soil/ground water interface beginning at a depth of about 4 to 5 feet below grade. Sampling for laboratory analyses and lithologic

logging purposes will continue until the first water table is encountered. Sampling for lithologic logging purposes only will continue below the water table at the total depth drilled. Classification of soil will be done using the Unified Soils Classification System (USCS) by KEI's field engineer or geologist. Samples will be collected in a California modified split-spoon sampler with two-inch diameter brass liners. The sampler will be advanced ahead of the drilling augers at designated depths by dropping a 140 pound hammer 30 inches. Blow counts will be recorded. Samples will be removed from the sampler and retained in brass liners. The liners will be sealed with aluminum foil, plastic caps and tape. They will be labeled and stored on ice for delivery to a state certified laboratory.

3. Finalized Boring Logs will be prepared from field logs and submitted to the Alameda County Health Care Services and to the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region.

4. Ground water is anticipated at approximately 18 to 19 feet below grade based on the ground water level found in the existing monitoring wells.

5. Well Construction:

   Casing Type: Schedule 40 PVC, flush threaded joints, 0.010 inch factory slot, two-inch diameter. Screen to run from total depth of the well to approximately 5 feet above the depth of the first encountered ground water. Monterey sand (#2/16) will fill the annular space from total depth to 2 feet above the perforated casing interval. A 2 foot thick bentonite seal will be placed in the annular space on top of the sand pack. Neat cement grout or a cement/sand slurry will be placed on top of the bentonite seal to the surface.

   Well casings will be secured with a waterproof cap and a padlock. A round, watertight, flush-mounted well cover will be concreted in place over the top of each casing.

6. Water levels will be measured with an electronic sounder. The wells will be developed using a surface pump approximately one week after well completion. Wells will be pumped until expelled water is clear and free of turbidity. Effluent generated during well development will be contained in barrels and hauled from the site by a licensed hazardous materials hauler.

Casing elevations will be surveyed by a licensed land surveyor to Mean Sea Level and to a vertical accuracy of 0.01 feet.

7. Ground Water Sampling:

The wells will be purged with a surface bailer approximately four casing volumes prior to sampling, at least 72 hours after development. After recovery, samples will be collected using a clean Teflon bailer and promptly decanted into 40 ml VOA vials and/or one liter amber bottles, as appropriate. Vials and/or bottles will be sealed with Teflon-lined screw caps, labeled and stored on ice for delivery to a state certified laboratory. The sampling bailer will be cleaned with soap and a clean water rinse between uses.

Wells will be checked for free product and sheen (using an interface probe and/or paste tape) prior to development and sampling.

Properly executed Chain of Custody documentation will accompany all samples.

8. Laboratory Analyses:

Water and selected soil samples will be analyzed by Sequoia Analytical Laboratory in either Concord or Redwood City, California, a state certified laboratory, for TPH as gasoline using EPA method 5030 in conjunction with modified 8015 and BTX&E using EPA method 8020 as recommended by the RWQCB and as specified in the Tri-regional guidelines.

Analytical results will be presented in tabular form, showing sample depths, results and detection limits.

The analytical results will be used to delineate the vertical and lateral extent of the contaminants in soil and ground water.

9. Hydrology:

Ground water flow direction will be determined from the survey data and water table depths from both the new and existing wells. The flow direction will be shown on the Site Plan.

10. Ongoing Pumping, Monitoring and Sampling:

10.1 Monitor all monitoring wells on-site on a monthly basis. Record the elevation of the water table and any abnormal conditions noted during inspection, including presence of product and sheen.

10.2 Purge and sample ground water from all monitoring wells, and analyze for TPH as gasoline and BTX&E on a quarterly basis. In addition, ground water from MW1 (adjacent to the waste oil tank), will be analyzed for TPH as diesel, TOG, and 601 constituents. Prior to sampling, water table elevation will be recorded as well as the presence of any free product.

10.3 Preparation and submission of quarterly technical reports summarizing the field activity water sampling and analyses with discussion and recommendations.

11. Conclusions:

Conclusions and results of Phase II will be described in a technical report.

The technical report will be submitted to the Alameda County Health Care Services, and to the RWQCB, San Francisco Bay Region.

PHASE III

Once the zero line is established through the completion of Phase II, a final remedial plan will be developed.

PHASE IV

Implementation of the remediation plan.

LIMITATIONS

Soil deposits and rock formations may vary in thickness, lithology, saturation, strength and other properties across any site. In addition, environmental changes, either naturally-occurring or artificially-induced, may cause changes in the extent and concentration of any contaminants. Our studies assume that the field and laboratory data are reasonably representative of the site as a whole, and assume that subsurface conditions are reasonably conducive to interpolation and extrapolation.

The results of this study are based on the data obtained from the field and laboratory analyses obtained from a state certified laboratory. We have analyzed this data using what we believe to be currently applicable engineering techniques and principles in the Northern California region. We make no warranty, either expressed or implied, regarding the above, including laboratory analyses, except that our services have been performed in accordance with generally accepted professional principles and practices existing for such work.

Approved by:

Don R. Braun
Certified Engineering Geologist

License No. 1310
Exp. Date 6/30/92

\bam

Attachments: Tables 1, 2 & 3
Location Map
Site Vicinity Map
Site Plans - Figures 1 & 2
Well Completion Diagram

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TABLE 1

SUMMARY OF MONITORING DATA

Date	Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness	Sheen	Water Bailed (gallons)
1/15/91	MW1	82.28	18.54	0	None	15
	MW2	81.61	18.39	0	None	55
	MW3	81.84	18.57	0	None	55
	MW4	82.02	18.33	0	None	15
12/11/90	MW1	82.22	18.60	0	None	0
	MW2	81.64	18.36	0	None	55
	MW3	81.83	18.58	0	None	55
	MW4	81.99	18.36	0	None	0
11/13/90	MW1	82.14	18.68	0	None	0
	MW2	81.55	18.45	0	None	55
	MW3	81.76	18.65	0	None	55
	MW4	81.91	18.44	0	None	0

Well #	Surface Elevation* (feet)
MW1	100.82
MW2	100.00
MW3	100.41
MW4	100.35

* Elevation of top of well covers surveyed to assumed datum of 100.00 feet at top of well cover MW2.

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TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene	PCE
1/15/91	MW1*	ND	ND	ND	ND	ND	ND	2.1
	MW2	--	680	170	0.7	81	19	--
	MW3	--	3,200	460	1.5	270	120	--
	MW4	--	ND	ND	ND	ND	ND	--
10/16/90	MW1*	ND	ND	ND	ND	ND	ND	2.0
	MW2	--	1,400	430	2.0	240	48	--
	MW3	--	740	210	1.4	82	2.5	--
	MW4	--	ND	ND	ND	ND	ND	--
7/17/90	MW1*	ND	ND	ND	ND	ND	ND	1.7
	MW2	--	490	76	0.59	46	11	--
	MW3	--	4,000	270	48	250	130	--
	MW4	--	ND	ND	ND	ND	ND	--
4/19/90	MW1*	ND	ND	ND	ND	ND	ND	2.2
	MW2	--	3,900	550	5.1	390	91	--
	MW3	--	3,100	600	27	220	54	--
	MW4	--	ND	ND	0.48	ND	ND	--
1/23/90	MW1**	ND	ND	1.5	2.3	4.3	ND	2.1
	MW2	--	400	73	36	40	10	--
	MW3	--	450	110	1.2	11	4.4	--
	MW4	--	ND	ND	0.40	ND	ND	--
9/15/89	MW1***	ND	ND	ND	0.61	ND	ND	2.7
	MW2	--	290	ND	12	ND	ND	--
	MW3	--	32	ND	ND	ND	ND	--
	MW4	--	ND	ND	ND	ND	ND	--
Detection Limits		50	30	0.3	0.3	0.3	0.3	0.5

* TOG was non-detectable. All EPA method 8010 compounds were non-detectable, except for PCE (see above).
** TOG was 1.5 ppm. All EPA method 8010 compounds were non-detectable, except for PCE (see above).
*** TOG was <50 ppm. All EPA method 8010 compounds were non-detectable, except for PCE. (see above).
ND = Non-detectable.
-- Indicates analysis not performed.
Results in parts per billion (ppb), unless otherwise indicated.

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TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
(Collected on July 12 & 17, 1989)							
SW1	10	--	3,100	12	300	730	110
SW1(4)	10	--	ND	ND	ND	ND	ND
SW2	10	--	1.1	0.10	ND	0.18	ND
SW3	10	--	5.7	0.26	ND	0.45	0.23
SW4	10	--	2.5	ND	ND	0.24	ND
SW4(2)	10	--	11	0.61	0.51	1.3	0.44
P1	6.5	--	ND	ND	ND	ND	ND
P2	6.5	--	ND	ND	ND	ND	ND
P3	5.5	--	ND	ND	ND	ND	ND
P4	10	--	170	0.71	12	47	6.8
WO1*	8.5	ND	ND	ND	ND	ND	ND
(Collected on September 6 & 7, 1989)							
MW1**	5	ND	3.4	ND	ND	ND	ND
MW1**	10	ND	5.0	ND	ND	ND	ND
MW1**	15	ND	2.2	ND	ND	ND	ND
MW1**	19	ND	ND	ND	ND	ND	ND
MW2	5	--	1.4	ND	ND	ND	ND
MW2	10	--	ND	ND	ND	ND	ND
MW2	15	--	1.8	ND	ND	ND	ND
MW2	19	--	13	1.5	2.1	1.8	0.34
MW3	5	--	1.3	ND	ND	ND	ND
MW3	10	--	1.8	0.29	ND	ND	ND
MW3	15	--	3.3	ND	ND	ND	ND
MW3	18.5	--	ND	ND	ND	ND	ND
MW4	5	--	3.1	ND	ND	ND	ND
MW4	10	--	17	ND	ND	0.10	ND
MW4	15	--	20	ND	ND	0.27	ND
MW4	18.5	--	2.1	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.11

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TABLE 3 (Continued)

SUMMARY OF LABORATORY ANALYSES
SOIL

* TOG 36 ppm, and 8010 and 8270 constituents were non-detectable.

** TOG was <50 ppm for these samples. EPA method 8010 compounds were non-detectable for these samples.

ND = Non-detectable.

-- Indicates analysis not performed.

Results in parts per million (ppm), unless otherwise indicated.

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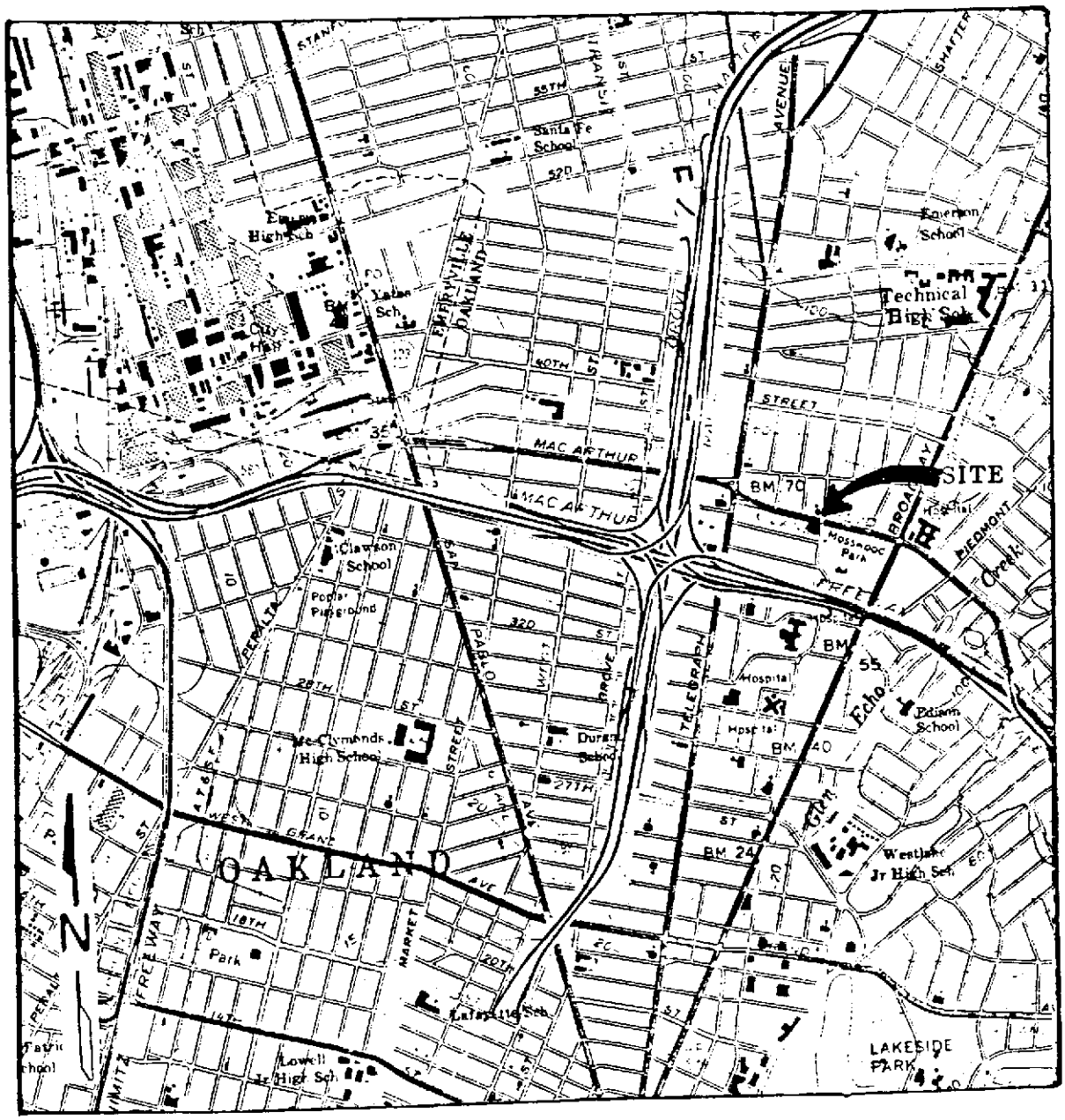

LOCATION MAP

Unocal S/S #3538
411 W. MacArthur Blvd.
Oakland, CA

KAPREALIAN ENGINEERING, INC.
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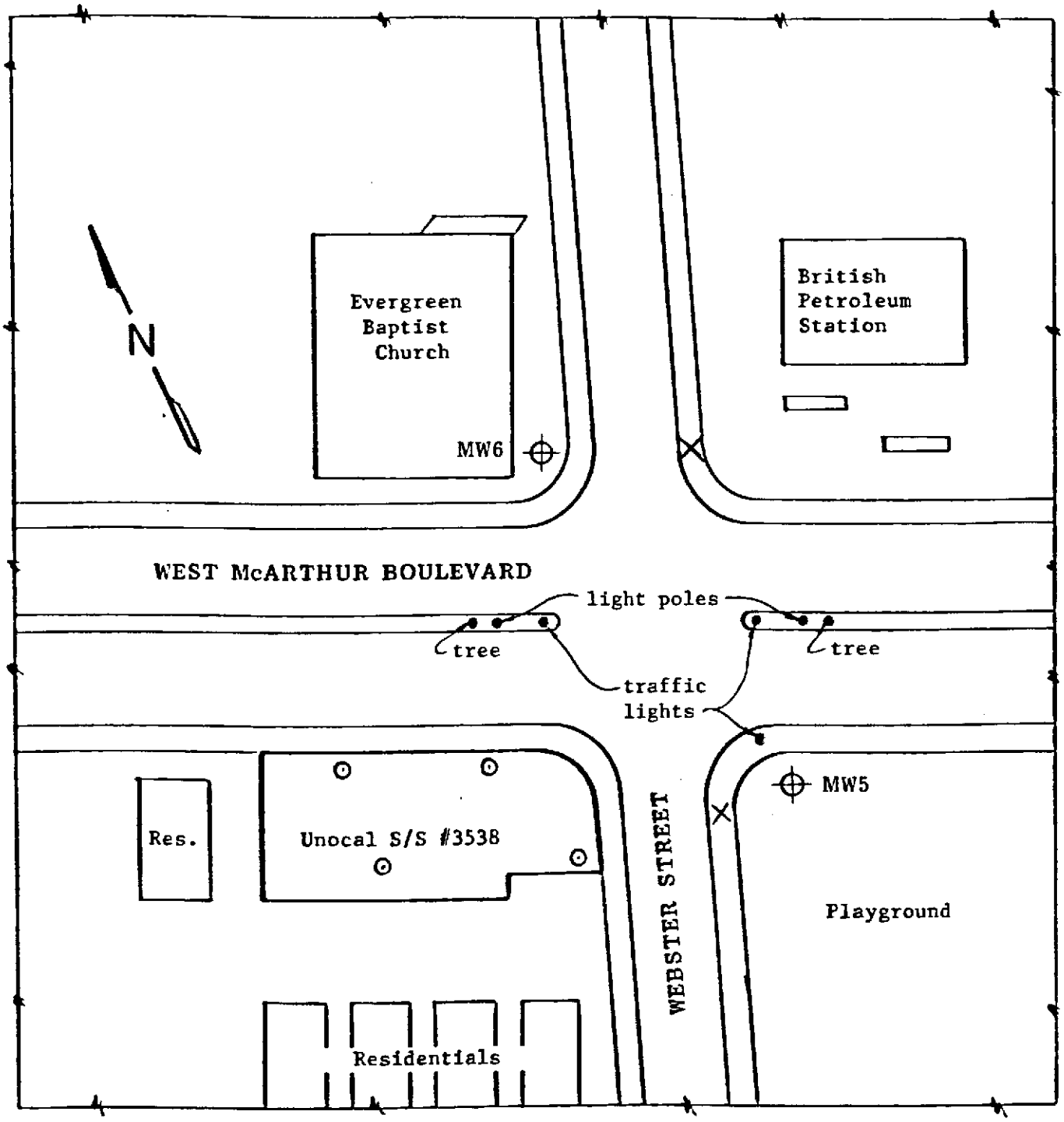

LEGEND

- ⊙ Monitoring well (existing)
- ⊕ Monitoring well (proposed)
- X Utility pole & overhead lines
- ⇨ Direction of ground water flow

SITE VICINITY MAP

0 60 120
Approx. scale feet

Unocal S/S #3538
411 W. McArther Boulevard
Oakland, CA

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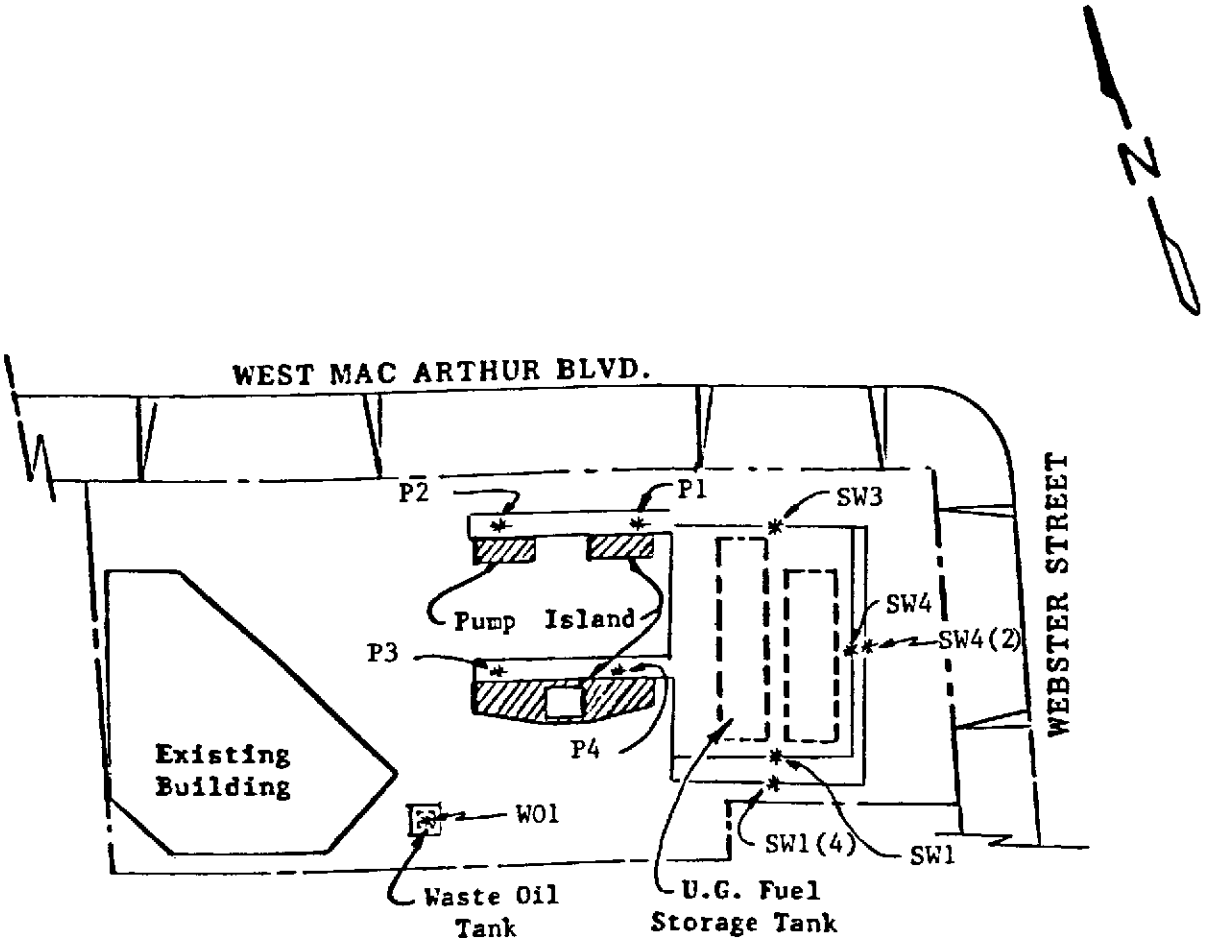

SITE PLAN
Figure 2

LEGEND

* Soil Sample Point Location

0 30 60
Approx. Scale feet

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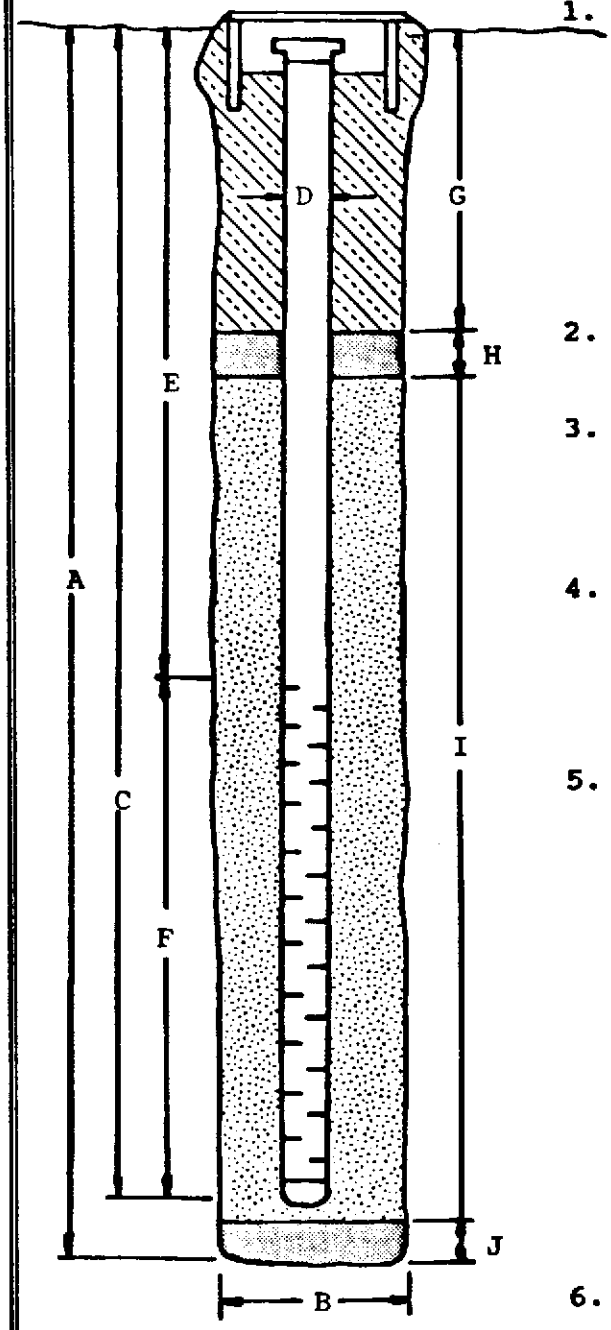
WELL COMPLETION DIAGRAM
(SCHEMATIC)

Flush-mounted Well Cover



WELL DETAILS*

1. Well will be terminated 10 to 15 feet into first ground water unless a five foot thick aquitard is encountered below the water table, in which case the aquitard will be backfilled with bentonite pellets and the well terminated at the top of this aquitard [A].
2. Boring diameter [B] is 9 inches for 2 inch wells and 12 inches for 4 inch wells.
3. Perforated interval [F] will extend from bottom of casing to five feet above first ground water table (unless water <5 feet deep).
4. Schedule 40, PVC casing, 2 inch in diameter [D], will be used [C]. Screen is 0.020 or 0.010 inch factory machined slots, depending on filter pack grain size.
5. Filter pack will be placed from bottom of casing to two feet above perforated interval [I]. (Bottom seal [J] is not installed unless required.) Two feet of bentonite [H] will be placed above the filter pack. Concrete grout [G] will be placed from top of bentonite seal to the surface (unless modified due to shallow water). Blank casing [E] will extend from the top of the perforated casing to the top of the hole.
6. The well will be installed with a waterproof cap, padlock and a flush-mounted well cover.

* See text for additional information.