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

KEI-P89-0801.QR2
July 24, 1990

Unocal Corporation
2000 Crow Canyon Place, Suite #400
P.O. Box 5155
San Ramon, CA 94583

Attention: Mr. Ron Bock

RE: Quarterly Report
Unocal Service Station #6034
4700 First Street
Livermore, California

Dear Mr. Bock:

This report presents the results of the second quarter of monitoring and sampling of the monitoring wells at the referenced site by Kaprealian Engineering, Inc. (KEI), per proposal KEI-P89-0801.P2 dated December 18, 1989. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from April through June, 1990.

BACKGROUND

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

KEI's work at the site began on August 2, 1989 when KEI was asked to collect soil samples from beneath two 12,000 gallon fuel storage tanks and one waste oil tank during their replacement. The tanks were made of steel and no apparent holes or cracks were observed in the tanks. The soil samples from beneath the fuel tanks were collected at depths of 15 to 16 feet. The soil sample from beneath the waste oil tank was taken at a depth of 8.5 feet. Pipe trench samples were collected at depths ranging from 2.5 to 3.5 feet. Ground water was encountered in the fuel tank pit at a depth of 17.5 feet during subsequent excavation of contaminated soil from the location where sample A3 was collected. One ground water sample was collected from the excavated pit. Analytical results of the soil samples, collected from the fuel tank pit and pipe trenches, indicated levels of TPH as gasoline ranging from non-detectable to 9.6 ppm for all samples except for sample A3, which showed 390 ppm. However, the area below sample A3 was excavated to the water table, as discussed above. The sample from beneath the waste oil tank showed non-detectable levels of all constituents analyzed, except for TPH as diesel at 1.4 ppm.

Analyses of the water sample showed 47,000 ppb TPH as gasoline, and 260 ppb of benzene. Results of the soil analyses are summarized in Table 3. Documentation of soil and water sample collection and analytical results are provided in KEI's report (KEI-J89-0801.R2) dated August 15, 1989. Based on the sample results, KEI recommended the installation of four monitoring wells.

On October 25 and 26, 1989, four two-inch diameter monitoring wells (designated as MW1, MW2, MW3 and MW4 on the attached Site Plan) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 26 to 28.5 feet. Ground water was encountered at depths ranging from 14.5 to 17.5 feet beneath the surface during drilling. Soil samples were collected beginning at approximately 5 feet below grade until ground water was encountered. The wells were developed on November 3 and 9, 1989 and sampled on November 18, 1989. Water and soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline and BTX&E. In addition, soil and water samples collected from MW1 were analyzed for TPH as diesel, EPA method 8010 compounds, and total oil and grease (TOG).

Analytical results of the soil samples, collected from the borings, indicated levels of TPH as gasoline ranging from non-detectable to 3.0 ppm for all samples, except for samples MW2(5), MW2(17) and MW4(15), which showed levels of TPH as gasoline at concentrations of 23 ppm, 790 ppm and 56 ppm, respectively. TPH as diesel and EPA method 8010 results were non-detectable, and TOG was <50 ppm in all samples.

Analytical results of the ground water samples, collected from monitoring wells MW1 and MW3, indicated non-detectable levels of TPH as gasoline. TPH as gasoline was detected in monitoring wells MW2 and MW4 at concentrations of 53,000 ppb and 990 ppb, respectively. Benzene was detected in monitoring wells MW2, MW3 and MW4 at concentrations of 540, 0.35 and 9.8 ppb, respectively. In MW1, TPH as diesel was detected at 400 ppb, TOG at 3.1 ppm, and EPA method 8010 constituents were non-detectable except for trichloroethene, which was detected at a concentration of 0.55 ppb. Analytical results of the soil samples are summarized in Table 4, and water samples in Table 2. Based on the analytical results, KEI recommended a monthly monitoring and quarterly sampling program. Documentation of the well installation and laboratory analyses are presented in KEI's report (KEI-J89-0801.R4) dated September 18, 1989. The monthly monitoring and quarterly sampling program began on January 4, 1990.

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 June 5, 1990. Prior to sampling, the wells were purged of between 15 and 55 gallons 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 the state certified laboratory.

HYDROLOGY

Based on the water level data gathered during the quarter, ground water flow direction appeared to be to the northwest on June 5, 1990, relatively unchanged from the previous quarter. Water levels have fluctuated during the quarter, showing a net decrease in MW1, MW2 and MW3 of 0.07, 0.06 and 0.06 feet, respectively, and a net increase in MW4 of 0.01 feet. The measured depth to ground water at the site on June 5, 1990 ranged between 15.31 and 16.72 feet.

ANALYTICAL RESULTS

Ground water samples were analyzed at Sequoia Analytical Laboratory in Redwood City, 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 EPA method 418.1 with clean up, and halogenated volatile organics using EPA method 8010.

Analytical results of the ground water samples, collected from monitoring wells MW1 and MW3, indicate non-detectable levels of TPH as gasoline and BTX&E, unchanged from the previous quarter. However, analytical results of the ground water samples, collected from MW2 and MW4, indicate levels of TPH as gasoline at concentrations of 31,000 ppb and 1,400 ppb, respectively. Benzene was detected in MW2 and MW4 at concentrations of 250 ppb and 1.2 ppb, respectively. In MW1, TPH as diesel, TOG and EPA method 8010 constituents were non-detectable. 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

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-P89-0801.P2) dated December 18, 1989. In addition, the subject site is situated approximately northwest (approximately upgradient) from adjacent Chevron and BP Service Stations located on South Front Road at First Street. These stations are both known to contain existing monitoring wells. KEI recommends that the four Unocal monitoring wells and Chevron monitoring wells be monitored for depth to water at the same time in order to more precisely determine the regional gradient. KEI will coordinate this activity with Chevron and their consultant.

DISTRIBUTION

A copy of this report should be sent to Mr. Lowell Miller of the Alameda County Health Agency, Mr. R. Griffith of the City of Livermore Fire Department, 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.

Don R. Braun
Certified Engineering Geologist

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

Mardo Kaprealian
President

jad

Attachments: Tables 1, 2, 3 & 4
Location Map
Site Plan
Laboratory Analyses
Chain of Custody documentation

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July 24, 1990

TABLE 1

SUMMARY OF MONITORING DATA

Date	Well No.	Depth to Water (feet)	Product Thickness	Sheen	Water Bailed (gallons)
6/05/90	MW1	16.72	0	None	15
	MW2	16.24	0	None	55
	MW3	15.38	0	None	15
	MW4	15.31	0	None	25
5/04/90	MW1	16.80	0	None	0
	MW2	16.33	0	None	55
	MW3	15.49	0	None	0
	MW4	15.52	0	None	0
4/04/90	MW1	16.85	0	None	0
	MW2	16.35	0	None	55
	MW3	15.50	0	None	0
	MW4	15.50	0	None	25

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TABLE 2

SUMMARY OF LABORATORY ANALYSES

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
7/05/90	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	31,000	250	460	9,200	950
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	1.2	4.7	12	24
3/08/90	MW1**	ND	ND	ND	ND	ND	ND
	MW2	--	26,000	230	410	2,100	1,300
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,200	18	8.4	28	37
11/18/89	MW1***	400	ND	ND	ND	ND	ND
	MW2	--	53,000	540	500	22,000	130
	MW3	--	ND	0.35	ND	ND	ND
	MW4	--	990	9.8	10	4.7	7.1
Detection Limits		50	30	0.3	0.3	0.3	0.3

* TOG and EPA method 8010 constituents were non-detectable.

** TOG showed 4.7 ppm. EPA method 8010 compounds were non-detectable.

*** TOG showed 3.1 ppm, and all EPA method 8010 compounds were non-detectable, except trichloroethene at 0.55 ppb.

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

(Samples collected on August 2 & 7, 1989)

Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
A1	15	---	2.1	ND	ND	0.21	ND
A2	15	---	1.6	ND	ND	ND	ND
A3	16	---	390	1.7	45	86	16
B1	15	---	ND	ND	ND	0.10	ND
B2	15	---	ND	ND	ND	ND	ND
B3	15	---	2.3	ND	ND	0.30	0.12
P1	3.5	---	9.6	ND	ND	0.94	0.16
P2	3.5	---	ND	ND	ND	ND	ND
P3	3.5	---	ND	ND	ND	ND	ND
P4	3.5	---	ND	ND	ND	ND	ND
P5	2.5	---	ND	ND	ND	ND	ND
P6	2.5	---	ND	ND	ND	ND	ND
P7	2.5	---	1.5	ND	ND	ND	ND
WO1*	8.5	1.4	ND	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.1

--- Indicates analysis not performed.

ND = Non-detectable.

* For sample WO1, TOG, all 8010 constituents, and 8270 constituents were non-detectable.

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

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TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on October 25 & 26, 1989)

Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
MW1(5)*	5	ND	ND	ND	ND	ND
MW1(7)*	7	ND	ND	ND	ND	ND
MW1(10)*	10	ND	ND	ND	ND	ND
MW1(12.5)*	12.5	ND	ND	ND	ND	ND
MW1(15)*	15	ND	ND	ND	ND	ND
MW1(17)*	17	ND	ND	ND	ND	ND
MW2(5)	5	23	ND	ND	ND	ND
MW2(10)	10	ND	ND	ND	ND	ND
MW2(12.5)	12.5	ND	ND	ND	ND	ND
MW2(15)	15	3.0	ND	ND	ND	ND
MW2(17)	17	790	0.14	0.23	10	2.7
MW3(5)	5	1.1	ND	ND	ND	ND
MW3(10)	10	ND	ND	ND	ND	ND
MW3(11.5)	11.5	ND	ND	ND	ND	ND
MW3(14)	14	ND	ND	ND	ND	ND
MW4(5)	5	1.9	ND	ND	ND	ND
MW4(9.5	9.5	ND	ND	ND	ND	ND
MW4(12)	12	ND	ND	ND	ND	ND
MW4(15)	15	56	0.10	0.11	1.5	1.5
Detection Limits		1.0	0.05	0.1	0.1	0.1

* TPH as diesel and EPA method 8010 constituents were non-detectable. TOG was <50 ppm.

ND = Non-detectable.

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

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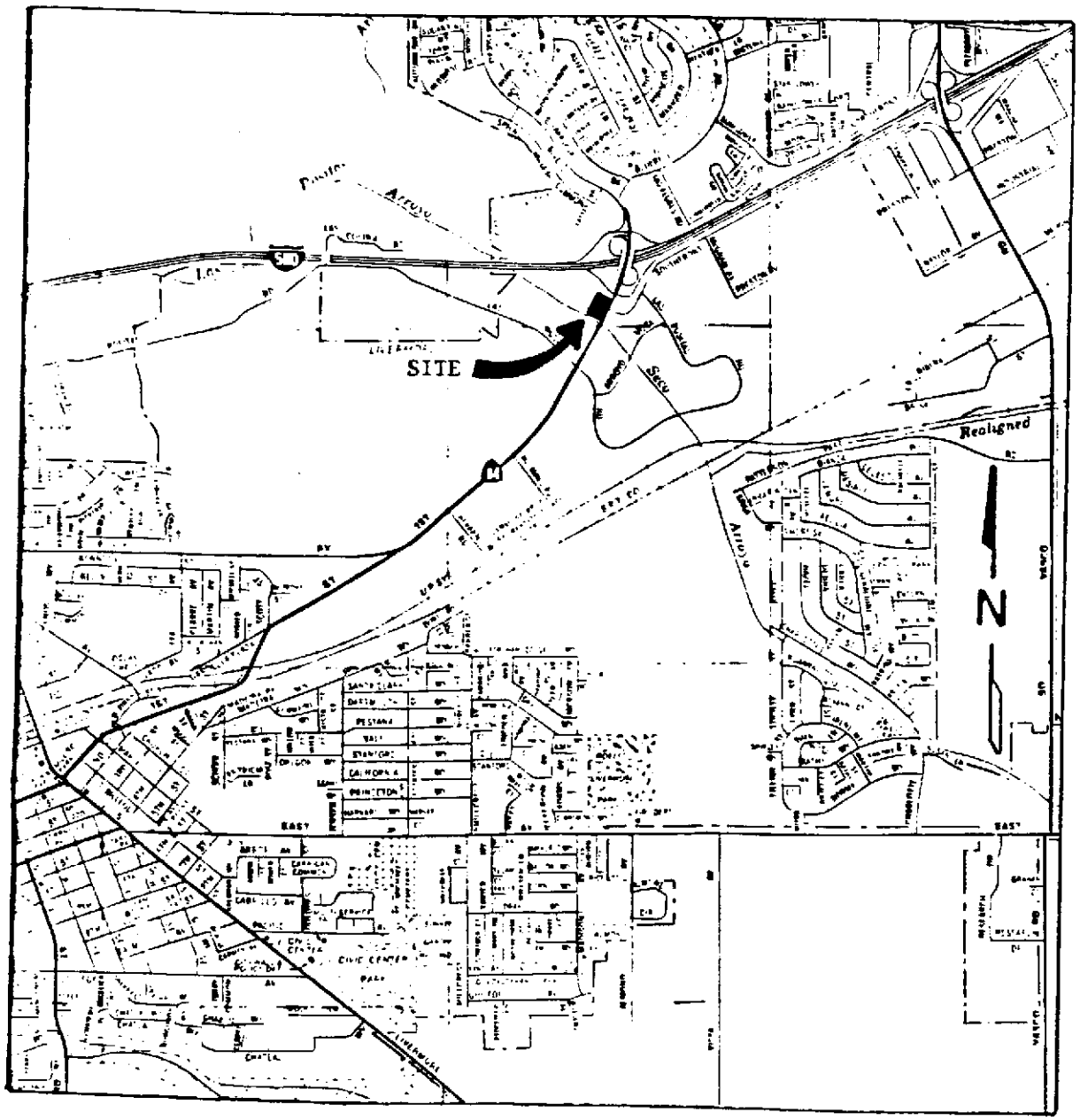

LOCATION MAP

Unocal S/S #6034
4700 First St.
Livermore, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
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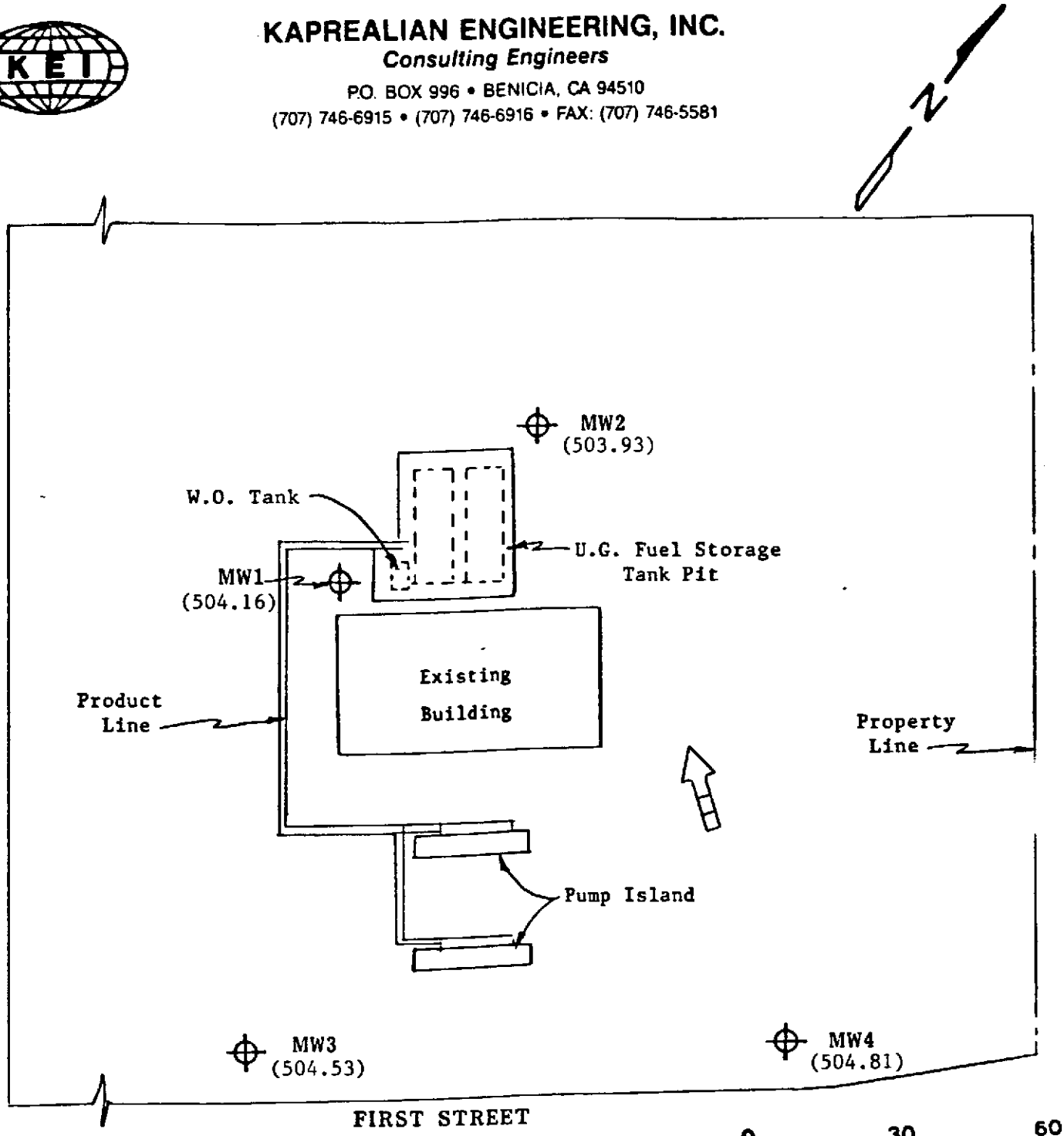

LEGEND

⊕ Monitoring Well

( ) Water Table Elevation in feet (MSL) on 6/5/90.

⇨ Direction of Ground Water Flow

SITE PLAN

Unocal S/S #6034
4700 First Street
Livermore, CA

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Livermore, 1st St.	Sampled:	Jun 5, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jun 5, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Jun 5, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	006-0428 A-B	Reported:	Jun 12, 1990

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)
0060428 A-B	MW1	N.D.	N.D.	N.D.	N.D.	N.D.
0060429 A-B	MW2	31,000	250	460	950	9,200
0060430 A-B	MW3	N.D.	N.D.	N.D.	N.D.	N.D.
0060431 A-B	MW4	1,400	1.2	4.7	24	12
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
Project Manager

60428.KEI <1>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Livermore, 1st St.	Sampled:	Jun 5, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jun 5, 1990
Benicia, CA 94510	Analysis Method:	EPA 3510/8015	Extracted:	Jun 7, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	006-0428 C	Analyzed:	Jun 8, 1990
			Reported:	Jun 12, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons µg/L (ppb)
k0060428 C	MW1	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
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Livermore, 1st St.	Sampled:	Jun 5, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jun 5, 1990
Benicia, CA 94510	Analysis Method:	EPA 418.1 (I.R. with clean-up)	Extracted:	Jun 11, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	006-0428 D	Analyzed:	Jun 11, 1990
			Reported:	Jun 12, 1990

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Sample Number	Sample Description	Petroleum Oil mg/L (ppm)
0060428 D	MW1	N.D.

Detection Limits:	1.0

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

60428.KEI <3>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kapreallan Engineering, Inc.	Client Project ID:	Unocal, Livermore, 1st St.	Sampled:	Jun 5, 1990
P.O. Box 996	Sample Descript:	Water, MW-1	Received:	Jun 5, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jun 6, 1990
Attention: Mardo Kapreallan, P.E.	Lab Number:	006-0428 E-F	Reported:	Jun 12, 1990

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	N.D.
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
Project Manager

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: Ray (KEI)

WITNESSING AGENCY:

SITE NAME & ADDRESS: UNOCAL LIVERMORE 1st Street

ANALYSES REQUESTED: TPHG / BTXE / TPHD as Diesel / TOG/HS.I / EPA 601

TURN AROUND TIME: 1 Week

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPHG	BTXE	TPHD as Diesel	TOG/HS.I	EPA 601	REMARKS
MW1	6-5-90	14:30		X	X		4 VOA 2 AMB		X	X	X	X	X	
MW2	"	"		X	X		2 VOA		X	X				
MW3	"	"		X	X		"		X	X				
MW4	"	"		X	X		"		X	X				

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Ray (KEI)	6-5-90 15:40	
	6/6/90 1540	Brent Kemper

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

Signature: [signature] Title: Engr Date: 6/5/90