KAPREALIAN ENGINEERING
INCORPORATED

KEI-P89-0801.QR9
August 12, 1992

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

Attention: Mr. Bob Boust

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

Dear Mr. Boust:

This report presents the results of the most recent quarter of monitoring and sampling of the monitoring wells at the referenced site by Kaprealian Engineering, Inc. (KEI), per KEI's proposal (KEI-P89-0801.P3) dated January 31, 1992, and as modified in KEI's quarterly reports (KEI-P89-0801.QR5) dated August 7, 1991, and (KEI-P89-0801.QR8) dated May 4, 1992. The wells are currently monitored and sampled on a quarterly basis, except for well MW1, which is no longer sampled. This report covers the work performed by KEI from May through July of 1992.

BACKGROUND

The subject site currently contains a service station facility. Two underground gasoline storage tanks, one waste oil tank, and the product piping were removed from the site in August of 1989, during tank replacement activities. The fuel tank pit was subsequently overexcavated to a depth of 17.5 feet below grade (the ground water depth at that time) in order to remove contaminated soil. Seven monitoring wells have been installed at the site.

A site description, detailed background information including a summary of all of the soil and ground water subsurface investigation/remediation work conducted to date, site hydrogeologic conditions, and tables that summarize all of the soil and ground water sample analytical results are presented in KEI's quarterly report (KEI-P89-0801.QR8) dated May 4, 1992.

RECENT FIELD ACTIVITIES

The seven monitoring wells (MW1 through MW7) were monitored twice and were sampled once during the quarter, except for well MW1, which is no longer sampled. During monitoring, the wells were checked for depth to water and the presence of free product. Prior

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to sampling, the wells were also checked for the presence of a sheen. No free product or sheen was noted in any of the wells during the quarter. The monitoring data collected this quarter are summarized in Table 1.

Water samples were collected from all of the wells (except MW1) on July 7, 1992. Prior to sampling, the wells were each purged of between 6 to 8 gallons of water by the use of a surface pump. The samples were then collected by the use of a clean Teflon bailer. The samples were decanted into clean VOA vials that were then sealed with Teflon-lined screw caps and stored in a cooler, on ice, until delivery to the state-certified laboratory.

HYDROLOGY

The measured depth to ground water at the Unocal site on July 7, 1992, ranged between 14.86 to 16.17 feet below grade. The water levels in all of the wells have shown net decreases ranging from 0.11 to 0.55 feet since April 6, 1992, except in wells MW1 and MW3, where the water level increased by 0.06 and 0.15 feet, respectively. Based on the water level data gathered on July 7, 1992, the ground water flow direction appeared to be to the north-northwest, as shown on the attached Potentiometric Surface Map, Figure 1. The flow direction reported this quarter is relatively similar to the predominantly northwest flow direction reported in previous quarters. The average hydraulic gradient across the site on July 7, 1992, was approximately 0.005.

ANALYTICAL RESULTS

The ground water samples were analyzed at Sequoia Analytical Laboratory and were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline by EPA method 5030/modified 8015, and benzene, toluene, xylenes, and ethylbenzene (BTX&E) by EPA method 8020. The sample from well MW5 was also analyzed for methyl tert butyl ether (MTBE) by EPA method 8020/modified.

The ground water sample analytical results are summarized in Table 2. The concentrations of TPH as gasoline and benzene detected in the ground water samples collected this quarter are shown on the attached Figure 2. Copies of the laboratory analytical results and Chain of Custody documentation are attached to this report.

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results for the ground water samples 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 quarterly monitoring and sampling program, per KEI's proposal (KEI-P89-0801.P3) dated January 31, 1991, and as modified in KEI's quarterly reports (KEI-P89-0801.QR8) dated May 4, 1992, and (KEI-P89-0801.QR5) dated August 7, 1991.

As shown in Table 2, Sequoia Analytical Laboratory reported that the level of low/medium boiling point (LMBP) hydrocarbons detected in well MW5 on April 6, 1992, "does not appear to contain gasoline," and that the "LMBP is mostly due to unidentified peaks." Therefore, KEI recommended that future samples collected from well MW5 be analyzed for MTBE. The ground water sample collected from well MW5 on July 7, 1992, detected MTBE at a concentration of 1.5 ppb. Thus, KEI recommends that the future ground water samples collected from well MW5 continue to be analyzed for MTBE.

Monitoring wells MW3, MW6, and MW7 continue to show non-detectable levels of TPH as gasoline and BTX&E; however, upgradient monitoring well MW4, located at the southeast corner of the Unocal site, has consistently shown TPH as gasoline levels of 340 ppb or greater in the 11 quarterly samples collected to date. As previously stated, these findings appear to indicate that off-site contamination has migrated onto the Unocal site.

As discussed in KEI's previous quarterly report, joint monitoring with Alton Geoscience (the consultant for the Chevron site) was conducted on April 6, 1992. Based on the data gathered on that date, the Chevron site is upgradient of the Unocal site. Joint sampling data from the Unocal and Chevron sites has not been collected to date; therefore, KEI has not been able to unilaterally determine the effect of the Chevron contamination on to the Unocal site. KEI has tentatively scheduled a joint monitoring and sampling episode with Alton Geoscience in October of 1992. A meeting with representatives of Chevron will be scheduled following the upcoming joint monitoring and sampling event.

On May 19, 1992, a KEI representative conducted a file review at the office of the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, in Oakland, California, in order to obtain copies of the most recent reports containing analytical data on the Chevron site. No recent reports were found on file at the RWQCB. Subsequently, on May 28, 1992, the KEI representative contacted Mr. Scott Seery of the Alameda County Health Care Services Agency (ACHCS), who indicated that as of May of 1992, the pump-and-treat system at the Chevron site had been shut down for more than 15 months. Mr. Seery also supplied KEI with the analytical results of ground water samples collected on April 6, 1992, from 18 on-site and off-site monitoring wells at the Chevron service station. KEI

had previously concluded that the Chevron site was a possible source of off-site contamination for the Unocal site; based on the upgradient location of the Chevron site from the Unocal site, the recent analytical results of the ground water samples collected at the Chevron site (indicating high levels of TPH as gasoline), and the shutdown of the remedial pump-and-treat system at the Chevron service station for more than 15 months, KEI's conclusion appears to be confirmed and the Chevron site remains a possible source of at least a portion of the contamination at the subject Unocal site.

DISTRIBUTION

A copy of this report should be sent to the ACHCS, and to the RWQCB, 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 these 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 (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins
Senior Environmental Engineer

Joel G. Greger, C.E.G.
Senior Engineering Geologist

License No. 1633
Exp. Date 6/30/94

Timothy R. Ross
Project Manager

/bp

Attachments: Tables 1 & 2
Location Map
Potentiometric Surface Map - Figure 1
Concentrations of Petroleum Hydrocarbons - Figure 2
Laboratory Analyses
Chain of Custody documentation

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TABLE 1

SUMMARY OF GROUND WATER MONITORING
AND PURGING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (gallons)
(Monitored and Sampled on July 7, 1992)					
MW1	504.71	16.17	0	--	0
MW2	504.50	15.67	0	No	7
MW3	505.05	14.86	0	No	8
MW4	505.05	15.07	0	No	8
MW5	504.41	16.17	0	No	6
MW6	504.28	15.06	0	No	7
MW7	504.33	15.04	0	No	7
(Monitored on May 6, 1992)					
MW1	504.90	15.98	0	--	0
MW2	504.67	15.50	0	--	53
MW3	505.27	14.64	0	--	0
MW4	505.46	14.66	0	--	0
MW5	504.71	15.87	0	--	0
MW6	504.40	14.94	0	--	0
MW7	504.45	14.92	0	--	0

Well #	Surface Elevation* (feet)
MW1	520.88
MW2	520.17
MW3	519.91
MW4	520.12
MW5	520.58
MW6	519.34
MW7	519.37

-- Sheen determination was not performed.

* The elevations of the tops of the well covers have been surveyed relative to Mean Sea Level (MSL), per the City of Livermore Benchmark No. C-18-5 (elevation = 551.77 MSL).

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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
7/07/92	MW2	--	44,000	160	1,100	17,000	1,000
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	ND	2.2	2.4	2.4
	MW5	--	76♦	0.48	1.1	1.3	0.32
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
4/06/92	MW2	--	760	6.3	2.1	130	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	1.3	3.8	4.1	2.9
	MW5	--	240♦♦	ND	ND	ND	0.35
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
1/14/92	MW2	--	5,600	36	120	2,600	450
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	4.2	7.1	9.2	18
	MW5	--	99	1.0	1.2	0.32	ND
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
10/14/91	MW2	--	11,000	79	130	4,700	660
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	3.8	2.2	5.8	8.6
	MW5	--	660	55	4.4	66	50
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
7/10/91	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	14,000	70	160	5,400	570
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	8.4	19	7.2	7.7
	MW5	--	220	5.1	8.7	9.7	9.1
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
4/10/91	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	22,000	170	190	6,200	490
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	[illegible]	0.84	4.3	5.0	9.6
	MW5	--	630	35	14	30	47
	MW6	--	ND	ND	ND	ND	ND
	MW7	-	ND	ND	ND	ND	ND

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TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
12/24/90	MW1*	ND	ND	ND	ND	0.40	ND
	MW2	--	32,000	440	340	13,000	460
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	ND	8.7	10	15
9/07/90	MW1*	ND	ND	ND	1.2	ND	ND
	MW2	--	ND	ND	1.5	ND	ND
	MW3	--	1,100	11	ND	16	6.6
	MW4	--	15,000	100	140	4,600	210
6/05/90	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

♦ MTBE was detected at a concentration of 1.5 ppb.

♦♦ The laboratory reported that the sample "does not appear to contain gasoline," and that the low/medium boiling point hydrocarbons detected are "mostly due to unidentified peaks."

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

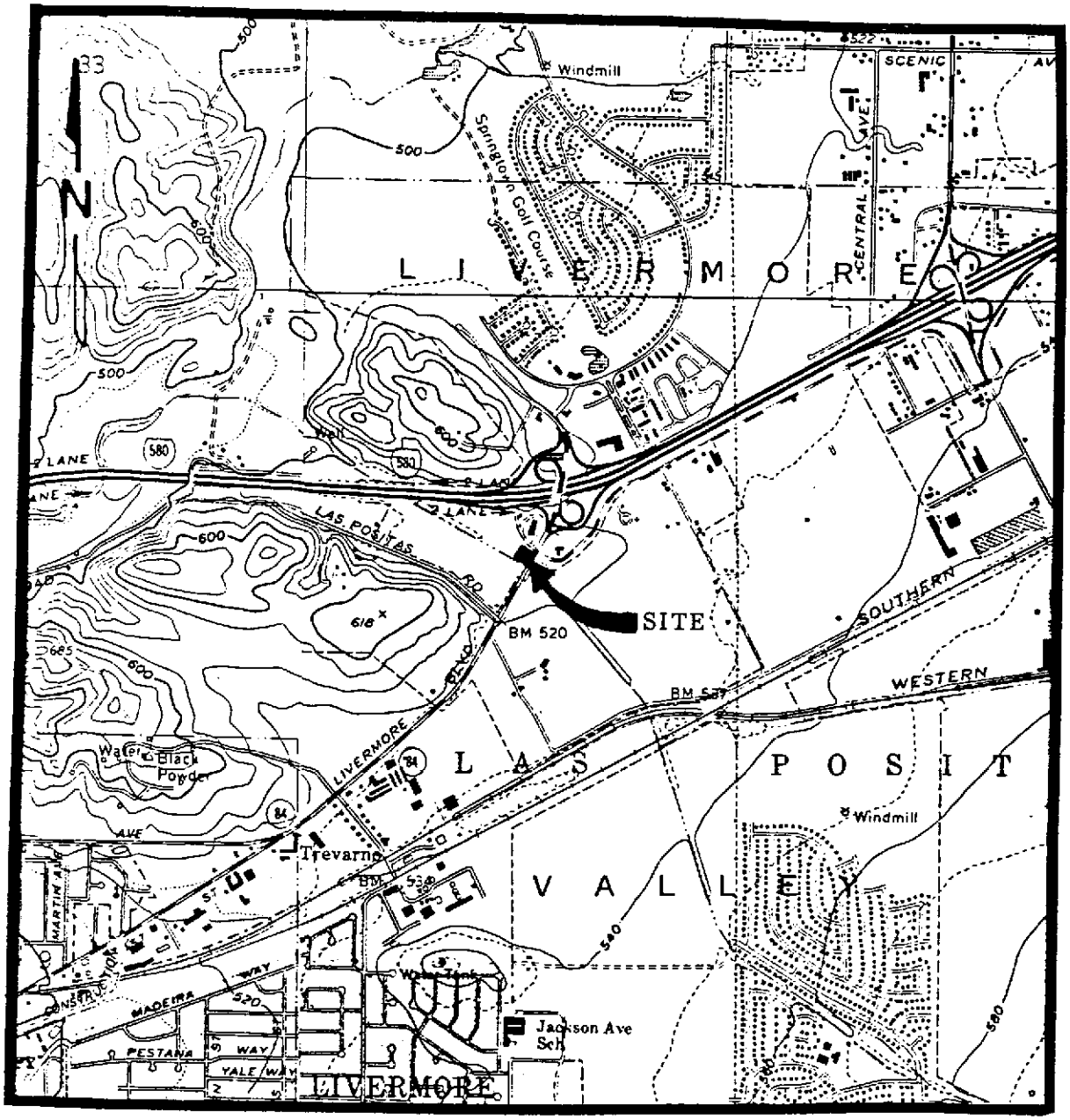
** TOG showed 4.7 ppm. All EPA method 8010 compounds were non-detectable.

*** 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 was not performed.

Results in parts per billion (ppb), unless otherwise indicated.

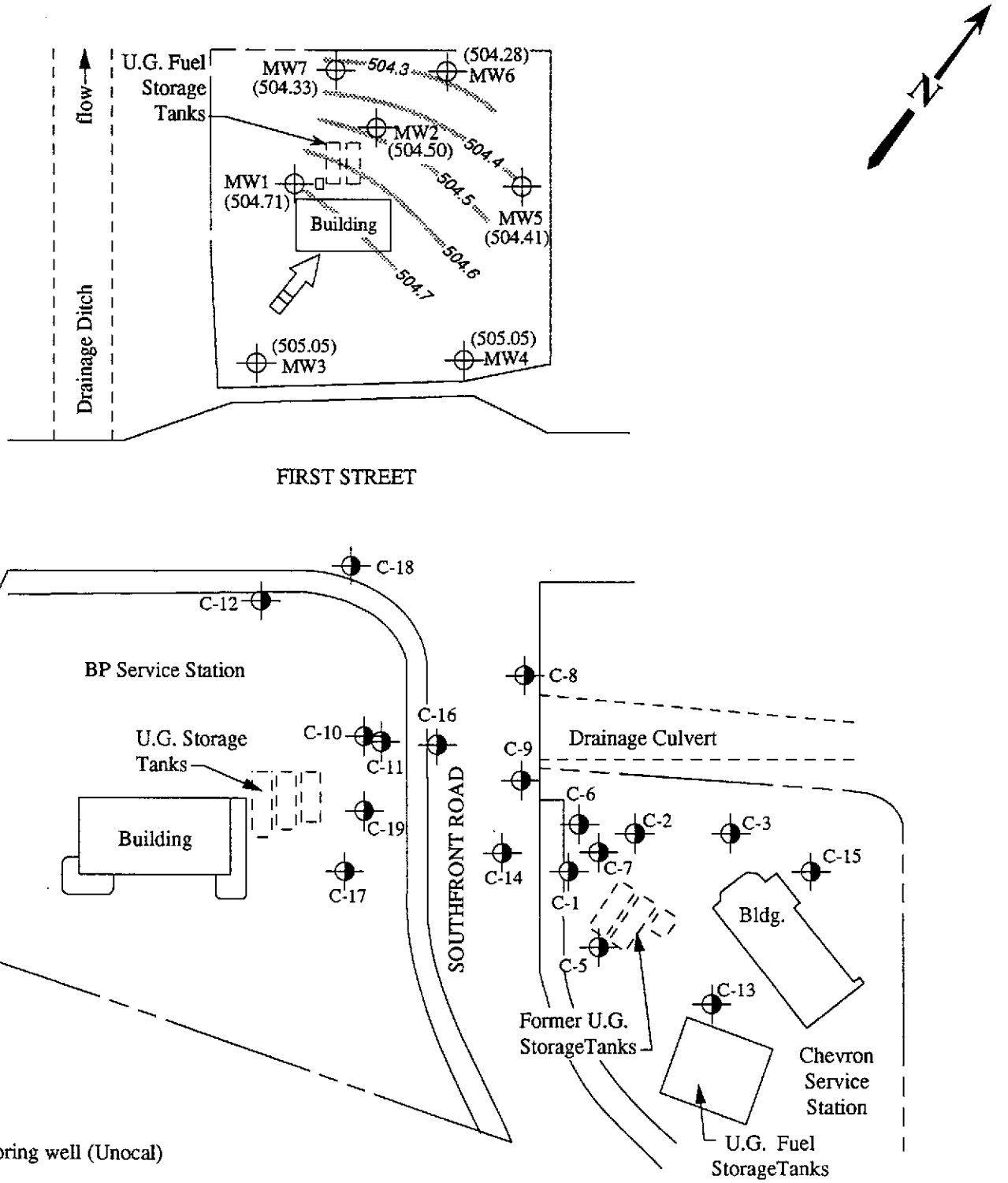


Base modified from 7.5 minute U.S.G.S. Livermore and Altamont Quadrangles (photorevised 1980 and 1981 respectively)

0 2000 4000

Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #6034 4700 FIRST STREET LIVERMORE, CA	LOCATION MAP



POTENTIOMETRIC SURFACE MAP FOR THE JULY 7, 1992 MONITORING EVENT

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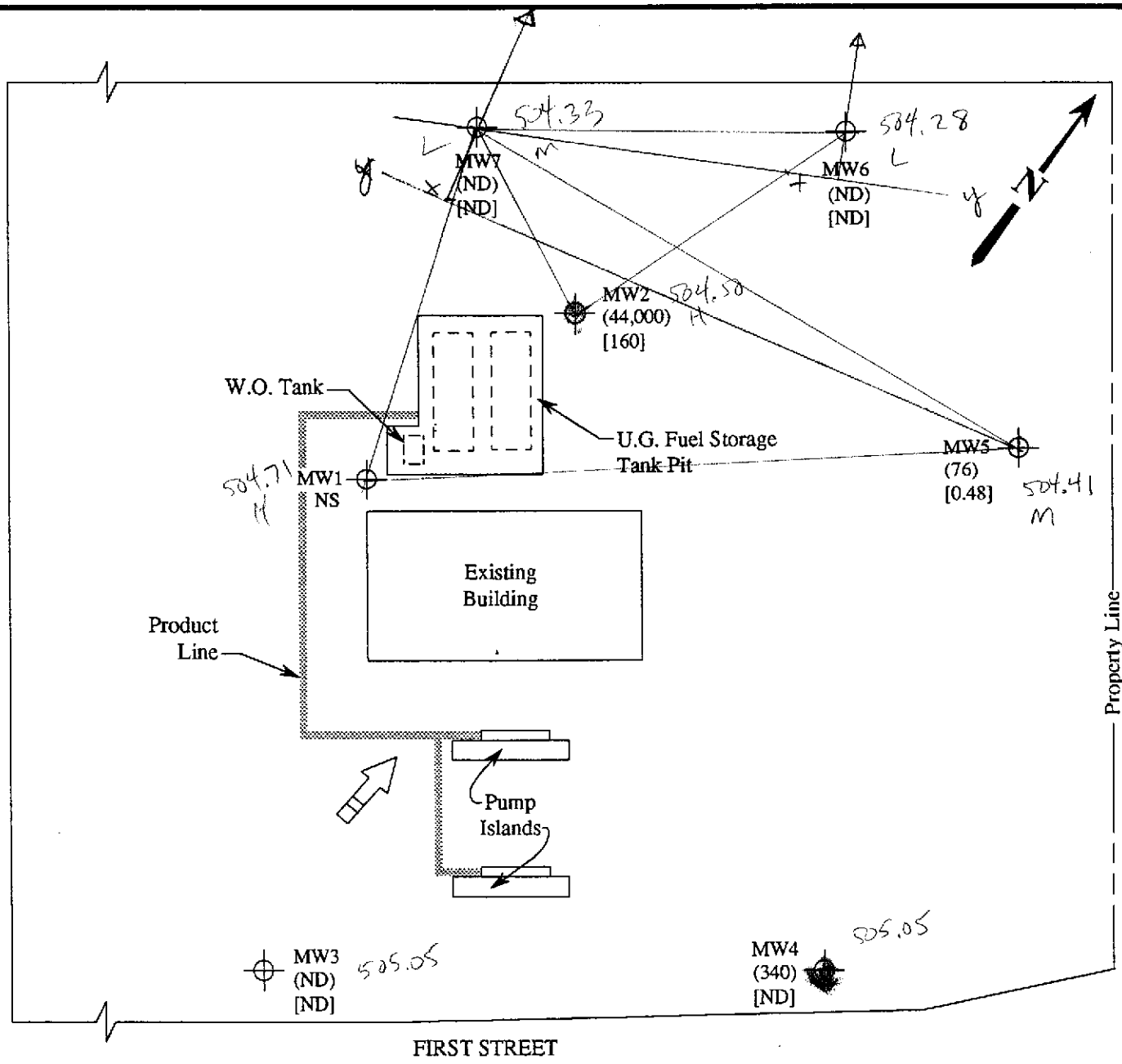
INCORPORATED

UNOCAL SERVICE STATION # 6034
4700 FIRST STREET
LIVERMORE, CA

FIGURE
1



LEGEND

- ⊕ Monitoring well
- ( ) Concentration of TPH as gasoline in ppb
- [ ] Concentration of benzene in ppb
- ⇨ Direction of ground water flow
- ····· Contours of ground water elevation

0 30 60

Approx. scale feet

PETROLEUM HYDROCARBON CONCENTRATIONS IN GROUND WATER ON JULY 7, 1992

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #6034
4700 FIRST STREET
LIVERMORE, CA

FIGURE
2

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 4700 First St., Livermore	Sampled:	Jul 7, 1992
2401 Stanwell Drive, Suite 400	Matrix Descript:	Water	Received:	Jul 7, 1992
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Analyzed:	7/13 - 7/14/92
Attention: Mardo Kaprealian, P.E.	First Sample #:	207-0284	Reported:	Jul 16, 1992

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons ug/L (ppb)	Benzene ug/L (ppb)	Toluene ug/L (ppb)	Ethyl Benzene ug/L (ppb)	Xylenes ug/L (ppb)
207-0284	MW-2	44,000	160	1,100	1,000	17,000
207-0285	MW-3	N.D.	N.D.	N.D.	N.D.	N.D.
207-0286	MW-4	340	N.D.	2.2	2.4	2.4
207-0287	MW-5	76	0.48	1.1	0.32	1.3
207-0288	MW-6	N.D.	N.D.	N.D.	N.D.	N.D.
207-0289	MW-7	N.D.	N.D.	N.D.	N.D.	N.D.
Method Detection Limits:		**50**	**0.50**	**0.50**	**0.50**	**0.50**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.

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Scott A. Chieffo
Project Manager

SEQUOIA ANALYTICAL

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Kapreallan Engineering, Inc.	Client Project ID:	Unocal, 4700 First St., Livermore	Sampled:	Jul 7, 1992
2401 Stanwell Drive, Suite 400	Sample Descript:	Water	Received:	Jul 7, 1992
Concord, CA 94520	Analysis for:	MTBE (EPA 8020 - Modified)		
Attention: Mardo Kaprealian, P.E.	First Sample #:	207-0287	Analyzed:	7/13 - 7/14/92
			Reported:	Jul 16, 1992

LABORATORY ANALYSIS FOR: MTBE (EPA 8020 - Modified)

Sample Number	Sample Description	Detection Limit ug/L	Sample Result ug/L
207-0287	MW-5	0.60	1.5

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

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Scott A. Chieffo
Project Manager

SEQUOIA ANALYTICAL

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Kaprealian Engineering, Inc.
2401 Stanwell Drive, Suite 400
Concord, CA 94520
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 4700 First St., Livermore
QC Sample Group: 2070284-289
Reported: Jul 16, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	J.F.	J.F.	J.F.	J.F.
Reporting Units:	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992
QC Sample #:	Matrix Blank	Matrix Blank	Matrix Blank	Matrix Blank
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	20	20	20	60
Conc. Matrix Spike:	20	20	19	62
Matrix Spike % Recovery:	100	100	95	103
Conc. Matrix Spike Dup.:	20	20	20	63
Matrix Spike Duplicate % Recovery:	100	100	100	105
Relative % Difference:	0.0	0.0	5.1	1.6

Laboratory Blank contained the following analytes: None detected.

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Scott A. Chieffo
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

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Kaprealian Engineering, Inc.
P.O. Box 996
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 4700 First St., Livermore
QC Sample Group: 2070284-289

Reported: Jul 16, 1992

QUALITY CONTROL DATA REPORT

SURROGATE

Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	J.F.	J.F.	J.F.	J.F.	J.F.	J.F.	J.F.
Reporting Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992	Jul 14, 1992
Sample #:	207-0284	207-0285	207-0286	207-0287	207-0288	207-0289	Matrix Blank
Surrogate % Recovery:	97	100	92	100	102	100	105

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Scott A. Chieffo
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: Vartkes

WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal / Livermore 4700 First str.

ANALYSES REQUESTED: TPHG; BTXE; MTBE

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPHG	BTXE	MTBE	REMARKS
MW-2	7/7/92	11:30 A.M.		X	X		2	Monitoring Well	X			2070284AB
MW-3	"			X	X		2	" "	X			285AB
MW-4	"			X	X		2	" "	X			286AB
MW-5	"			X	X		4	" "	X	X		287AD
MW-6	"			X	X		2	" "	X			288AB
MW-7	"	2:15 P.M.		X	X		2	" "	X			289AB

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
W. Vartkes	7/7/92 3:50	K. Walton 7/7/92 3:50
K. Walton	7/8/92 1255	
	7 8 92 0505	

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	Title	Date
KCJ	LAB-10	7/7/92