



KAPREALIAN ENGINEERING
INCORPORATED

KEI-P89-0801.QR8
May 4, 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, 1991, and as modified in KEI's quarterly report KEI-P89-0801.QR5 dated August 7, 1991. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from February through April 1992.

SITE DESCRIPTION AND BACKGROUND

The subject site is presently used as a service station. The subject site is situated on gently sloping, northwest trending topography, and is located adjacent to and northeast of the drainage channel for Arroyo Seco. In addition, the site is located approximately 9,000 feet northwest of the Lawrence Radiation Laboratory and the University of California. BP and Chevron service stations are located to the south and southeast of the Unocal site. A Location Map, a Site Vicinity Map, and Site Plans are attached to this report.

KEI's initial work at the site began on August 2, 1989, when KEI was retained by Unocal to collect soil samples from beneath two 12,000 gallon gasoline 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. Six soil samples (designated as A1, A2, A3, B1, B2, and B3) were collected from beneath the fuel tanks at depths of 15 to 16 feet below grade, and one soil sample, labeled W01, was collected from beneath the waste oil tank at a depth of 8.5 feet below grade. KEI returned to the site on August 7, 1989, in order to collect soil samples from the product pipe trenches. Seven soil samples, labeled P1 through P7, were collected from the pipe trenches at depths ranging from 2.5 to 3.5 feet below grade. Ground water was encountered in the fuel

tank pit at a depth of 17.5 feet below grade during subsequent excavation of contaminated soil from the location where sample A3 was collected. The sample point locations are shown on the attached Site Plan, Figure 2. One ground water sample, labeled W1, was collected from the excavated pit.

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 sample collected from beneath the waste oil tank was analyzed for TPH as diesel, total oil and grease (TOG), and EPA methods 8010 and 8270 compounds. 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 depth of the water table. The soil sample collected from beneath the waste oil tank showed non-detectable levels of all constituents analyzed, except for TPH as diesel at 1.4 ppm. Analytical results of the water sample collected from the fuel tank pit showed 47,000 ppb of TPH as gasoline, and 260 ppb of benzene. The results of the soil analyses are summarized in Table 5, and the results of the water sample are summarized in Table 6. Documentation of the tank and piping removal procedures, sample collection techniques, and the 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, Figure 1, and on the attached Site Vicinity Map) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 26 to 28.5 feet below grade. Ground water was encountered at depths ranging from 14.5 to 17.5 feet beneath the surface during drilling. The wells were developed on November 3 and 9, 1989, and were initially sampled on November 18, 1989. Water and selected 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 monitoring well MW1 were analyzed for TPH as diesel, EPA method 8010 compounds, and TOG.

Analytical results of the soil samples collected from the borings for the monitoring wells 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, EPA method 8010 constituents, and TOG were non-detectable in all soil samples collected from MW1.

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 ppb, 0.35 ppb, and 9.8 ppb, respectively. In monitoring well 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. The analytical results of the soil samples are summarized in Table 4, and the analytical results of the water samples are summarized in Table 2. Based on the analytical results, KEI recommended a monthly monitoring and quarterly sampling program. Documentation of the well installation procedures, sample collection techniques, and the analytical results are presented in KEI's report (KEI-J89-0801.R4) dated December 18, 1989. The monthly monitoring and quarterly sampling program began on January 4, 1990.

Based on the levels of TPH as gasoline and benzene detected in well MW2 on December 24, 1990, KEI recommended the installation of three additional monitoring wells in KEI's fourth quarterly report (KEI-P89-0801.QR4) dated January 31, 1991.

On April 2, 1991, three additional two-inch diameter monitoring wells (designated as MW5, MW6, and MW7 on the attached Site Plan, Figure 1, and the Site Vicinity Map) were installed at the site. The wells were drilled and completed to total depths ranging from 24 to 24.5 feet below grade. Ground water was encountered at depths ranging from 15.5 to 16 feet beneath the surface during drilling. The surface of each well cover was surveyed by Kier & Wright of Pleasanton, California, to Mean Sea Level (MSL) and to a vertical accuracy of 0.01 feet.

Wells MW5, MW6, and MW7 were developed on April 5, 1991, and all of the wells were sampled on April 10, 1991. Water samples from all wells, and selected soil samples from the borings of MW5 through MW7, were analyzed at Sequoia Analytical Laboratory in Concord, California, for TPH as gasoline and BTX&E. In addition, the water sample collected from MW1 was analyzed for TPH as diesel, TOG, and EPA method 8010 constituents.

Analytical results of the soil samples collected from the borings for monitoring wells MW5, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and benzene in all analyzed samples. Analytical results of the water samples collected from monitoring wells MW1, MW3, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and BTX&E. In wells MW2, MW4, and MW5, levels of TPH as gasoline were detected at 22,000 ppb, 950 ppb, and 630 ppb,

respectively, with benzene levels at 170 ppb, 0.84 ppb, and 35 ppb, respectively. In monitoring well MW1, TPH as diesel, TOG and all EPA method 8010 constituents were non-detectable. The results of the soil analyses are summarized in Table 3, and the results of the water analyses are summarized in Table 2. Documentation of the well installation procedures, sample collection techniques, and the analytical results are presented in KEI's report (KEI-P89-0801.R5) dated May 10, 1991. Based on the analytical results, KEI recommended the continuation of the monthly monitoring and quarterly sampling program.

On January 24, 1991, KEI reviewed the most recent quarterly report (available for review by KEI) prepared for Chevron USA by Western Geologic Resources, Inc., dated June 12, 1990. At the time, there were 18 active monitoring wells (designated as C-1 through C-19 on the attached Site Vicinity Map) in the vicinity of the Chevron station. Chevron monitoring well C-4 had been previously destroyed.

A review of the historical water quality data for Chevron's monitoring wells (C-2, C-3, C-6, C-7, C-8, and C-9) that are located directly upgradient of Unocal's monitoring well MW4 showed that "total fuel hydrocarbons" (TFH) were detected in ground water samples collected from these wells in 1988 at levels ranging from 2,100 ppb to 86,000 ppb. Based on analytical results from samples collected on January 1, 1990, the levels of contamination detected in each of the above mentioned Chevron wells had decreased significantly due to remediation activities at the site. However, "total petroleum hydrocarbons" (TPH) were still detected in each of the wells at levels ranging from 910 ppb to 5,600 ppb. KEI concluded that the elevated levels of TPH as gasoline detected in Unocal's upgradient monitoring well MW4, and the general northwesterly ground water flow direction, suggested that upgradient contamination from the Chevron station has migrated onto the Unocal site and may be contributing to contamination detected in Unocal's monitoring well MW2.

Based on discussions (during November of 1991) with the City of Livermore Public Works Department, Jack Fong of the Alameda County Flood Control and Water Conservation District (Zone 7), and Tom Ruark of Bissel-Karngreiner Construction, a new development (named Plaza 580) is being constructed in the vicinity of the subject Unocal site by Mervyns and Target Stores (and which will include other retail space to be leased). As a condition of the permitting of construction, Zone 7 required an improvement to an earth channel that is part of the storm drain system in the area. The improvement consisted of realignment, widening, and deepening the Arroyo Seco transitional channel by using concrete to replace the old earth channel. During construction, ground water was encountered

and pumped from the area in order to better facilitate construction. The new channel is now complete and extends 12 feet deep (to a six-inch thick pad that is underlain by drain rock). The newly constructed channel and the significant pumping of ground water during construction of the channel may have affected ground water elevation and flow direction in the vicinity of the site.

RECENT FIELD ACTIVITIES

The seven wells (MW1 through MW7) were monitored three times and six of the wells (MW2 through MW7) were sampled once during the quarter. Well MW1 is no longer sampled based on previous non-detectable levels detected in the well. During monitoring, the wells were checked for depth to water and the presence of free product. During sampling, the wells were also checked for the presence of sheen. No free product or sheen was noted in any of the wells during the quarter. Well MW2 was also purged of 38 and 55 gallons during the first two monitoring events of the quarter. Monitoring data for Unocal's monitoring wells are summarized in Table 1.

Water samples were collected from wells MW2 through MW7 on April 6, 1992. Prior to sampling, the wells were each purged of between 8 and 9 gallons by the use of a Teflon bailer. Samples were then collected by the use of a clean Teflon bailer. 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 a state-certified laboratory.

HYDROLOGY AND GEOLOGY

Based on the water level data gathered on April 6, 1992, the ground water flow direction appeared to be predominantly toward the west-northwest at the Unocal site (varying from approximately due west to the northwest), which is relatively similar to the flow direction reported in previous quarters. The average hydraulic gradient at the site on April 6, 1992, was approximately 0.006. Water levels have fluctuated during the quarter, showing a net increase of 0.01 to 0.02 feet in wells MW3, MW4, and MW7, and a net decrease of 0.01 to 0.03 feet in wells MW1, MW2, MW5, and MW6 since January 14, 1992. The measured depth to ground water at the site on April 6, 1992, ranged between 14.63 and 16.23 feet below grade.

KEI conducted a joint monitoring and sampling program on April 6, 1992, with the nearby Chevron service station located to the southeast of the Unocal service station. The ground water flow direction was predominantly toward the west-northwest, as shown on the attached Site Vicinity Map. The monitoring data for Chevron's monitoring wells are summarized in Table 1a.

KEI also coordinated joint monitoring on December 24, 1990, with the BP and Chevron stations located to the south and southeast, respectively, of the Unocal station (across First Street). The ground water flow direction on that date appeared to be generally toward the northwest from the BP and Chevron stations (i.e., toward the Unocal station).

A review of the Fall 1990 Ground Water Level Report, produced by the Alameda County Flood Control and Water Conservation District, indicates that the subject site is located near the northeastern corner of the Mocho Subbasin (Mocho 1), and near the boundary with the Spring Subbasin, where the regional ground water flow direction is toward the northwest.

Based on review of regional geologic maps (U.S. Geological Survey Open-File Report 80-533B "Preliminary Geologic Map of the Livermore Quadrangle, Alameda and Contra Costa Counties, California" by Thomas W. Dibblee, Jr., 1980), the subject site is inferred to be underlain by Quaternary-age alluvium. In addition, adjacent hillside areas northwest and southwest of the site are mapped as being underlain by the Livermore Gravel formation. The Livermore Gravel is typically composed of light redding-gray cobble-pebble gravel, pebbly sand, silt, and clay.

The results of our previous subsurface study indicate that the subject site is underlain by Quaternary alluvium materials to the maximum depth explored (28.5 feet below grade). These alluvium materials generally consist of a gravelly unit at the surface that varies from about 5 to 7 feet thick. This upper gravel unit is underlain by a clay unit to depths below grade of about 11 to 12.5 feet. A second gravelly unit underlies the clay unit, but this unit varies significantly in thickness (from about 6.5 to 8 feet thick in the vicinity of MW1 and MW2, to about 12.5 feet thick in the vicinity of MW3). This second gravelly unit is in turn underlain by a second clay unit, which locally contains sandy and gravelly lenses and extends from depths below grade of about 23.5 to 25 feet to the maximum depths explored (26 to 28.5 feet below grade).

The results of our most recent subsurface study indicate that the site is underlain by fill materials that extend to depths below grade of about 4 to 5.75 feet at MW6 and MW7 and that may extend to a depth of about 6.5 feet below grade at MW5. The fill materials are in turn underlain by clay and/or silt materials to depths below grade of about 12.25 feet at MW6, and to about 15 to 15.5 feet at MW5 and MW7. These fine-grained soils are in turn underlain by silty to clayey sand and gravel materials at MW5 and MW6 to depths below grade of about 16 to 18 feet. At MW5 and MW6, these coarse-grained soils are in turn underlain by clay and silt materials,

which extend to depths below grade of about 17.5 feet at MW6, and to about 22.75 feet at MW5. Underlying the clay and silt soils at depths below grade of about 22.75 feet at MW5, 17.5 feet at MW6, and 15 feet at MW7, is a zone of well graded gravel, which is about 4 to 7 feet thick at MW6 and MW7, and by clayey sand at MW5, which is about 0.5 feet thick. These coarse-grained soils are in turn underlain by clay materials at depths of about 21.5 to 23.25 feet below grade that extend to the maximum depths explored (24 to 24.5 feet below grade).

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 by EPA method 5030 in conjunction with modified 8015, and BTX&E by EPA method 8020.

Analytical results of ground water samples collected from monitoring wells MW3, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and BTX&E. In wells MW2, MW4, and MW5, levels of TPH as gasoline were detected at concentrations of 760 ppb, 660 ppb and 240 ppb, respectively. The laboratory indicated that the reported level of TPH as gasoline detected in well MW5 was due to unidentified peaks, and that the water sample from this well "does not appear to contain gasoline." Benzene was detected in wells MW2 and MW4 at concentrations of 6.3 ppb and 1.3 ppb, respectively, and was non-detectable in well MW5. Concentrations of TPH as gasoline and benzene detected in the ground water samples collected on April 6, 1992, are shown on the attached Site Plan, Figure 1. The results of the analyses are summarized in Table 2. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results collected and evaluated to date, KEI recommends the continuation of the current quarterly sampling program of the existing wells. However, since no evidence of free product or sheen has been detected in any of the wells at the Unocal site to date, and since a consistent west-northwest ground water flow direction has been established at and in the vicinity of the site, KEI recommends that the monitoring frequency of the Unocal wells be reduced from monthly to quarterly. In addition, as recommended in KEI's report (KEI-P89-0801.QR5) dated August 7, 1991, well MW1 will no longer be sampled. However, well MW1 should continue to be monitored quarterly in order to collect ground water elevation data.

As shown on the attached laboratory analysis sheet, 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." Sequoia verbally informed KEI that the unidentified peaks were most likely due to the compound methyl tert butyl ether (MTBE). Thus, KEI recommends that the future ground water samples collected from well MW5 also 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 600 ppb or greater in the ten quarterly samples collected to date. As previously stated, these findings appear to indicate that off-site contamination has migrated onto the Unocal site.

As previously discussed, 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. Since the Chevron wells are currently sampled semi-annually, KEI will schedule a joint monitoring and sampling episode with Alton Geoscience in the upcoming quarter. A meeting with representatives of Chevron will be scheduled following the upcoming joint monitoring and sampling event.

DISTRIBUTION

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

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.

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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.

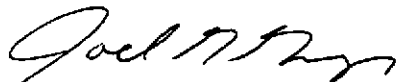
Should you have any questions regarding this report, please do not hesitate to call me at (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.



Thomas J. Berkins
Senior Environmental Engineer



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

License No. 1633
Exp. Date 6/30/92



Timothy R. Ross
Project Manager

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Attachments: Tables 1, 1a & 2 through 6
Location Map
Site Vicinity Map
Site Plans - Figures 1 & 2
Laboratory Analyses
Chain of Custody documentation

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TABLE 1

SUMMARY OF GROUND WATER MONITORING
AND PURGING DATA

<u>Well No.</u>	<u>Ground Water Elevation (feet)</u>	<u>Depth to Water (feet)</u>	<u>Product Thickness (feet)</u>	<u>Sheen</u>	<u>Water Bailed (gallons)</u>
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(Monitored and Sampled on April 6, 1992)

MW1	504.65	16.23	0	--	0
MW2	504.61	15.56	0	No	8
MW3	504.90	15.01	0	No	8
MW4	505.49	14.63	0	No	9
MW5	504.96	15.62	0	No	9
MW6	504.54	14.80	0	No	8
MW7	504.57	14.80	0	No	8

(Monitored on March 9, 1992)

MW1	505.16	15.72	0	--	0
MW2	504.91	15.26	0	--	38
MW3	505.57	14.34	0	--	0
MW4	505.94	14.18	0	--	0
MW5	505.12	15.46	0	--	0
MW6	504.62	14.72	0	--	0
MW7	504.65	14.72	0	--	0

(Monitored on February 13, 1992)

MW1	505.20	15.68	0	--	0
MW2	504.97	15.20	0	--	55
MW3	505.57	14.34	0	--	0
MW4	506.25	13.87	0	--	0
MW5	505.27	15.31	0	--	0
MW6	504.71	14.63	0	--	0
MW7	504.75	14.62	0	--	0

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TABLE 1 (Continued)

SUMMARY OF GROUND WATER MONITORING
AND PURGING DATA

<u>Well #</u>	<u>Surface Elevation*</u> <u>(feet)</u>
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 to MSL, per City of Livermore Benchmark No. C-18-5.

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TABLE 1a
SUMMARY OF MONITORING DATA
CHEVRON WELLS

<u>Date</u>	<u>Well</u>	<u>Well Case Elevation (feet above MSL)</u>	<u>Ground Elevation (feet)</u>	<u>Depth to Water (feet)</u>
4/06/92	C1	520.39	507.33	13.06
	C2	520.76	507.29	13.47
	C3	521.31	507.48	13.83
	C4	WELL DESTROYED		
	C5	520.82	507.53	13.29
	C6	519.62	507.14	12.48
	C7	520.30	507.28	13.02
	C8	519.74	506.62	13.12
	C9	519.72	507.18	12.54
	C10	520.41	506.20	14.21
	C11	520.04	506.48	13.56
	C12	519.82	506.01	13.81
	C13	522.24	507.81	14.43
	C14	520.08	507.64	12.44
	C15	522.41	507.53	14.88
	C16	519.68	506.50	13.18
	C17	520.82	506.68	14.14
	C18	518.96	505.89	13.07
	C19	520.99	506.41	14.58

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TABLE 2
 SUMMARY OF LABORATORY ANALYSES
 WATER

<u>Date</u>	<u>Sample Well #</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
4/06/92	MW2	--	760	6.3	2.1	130	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	660	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
MW3		--	ND	ND	ND	ND	ND
MW4		--	1,500	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
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	880	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
MW2		--	14,000	70	160	5,400	570
MW3		--	ND	ND	ND	ND	ND
MW4		--	830	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	--	950	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
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

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
 WATER

<u>Date</u>	<u>Sample Well #</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
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
Detection Limits		50	30	0.30	0.30	0.30	0.30

- ♦ The laboratory reported that the sample "does not appear to contain gasoline," and that the low/medium boiling point hydrocarbons detected is "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.

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TABLE 3
SUMMARY OF LABORATORY ANALYSES
SOIL

<u>Date</u>	<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
4/02/91	MW5(5)	5.0	ND	ND	0.0056	ND	ND
	MW5(10)	10.0	ND	ND	ND	ND	ND
	MW5(15.5)	15.5	ND	ND	ND	0.0060	ND
	MW6(5)	5.0	ND	ND	0.010	0.0086	ND
	MW6(10)	10.0	ND	ND	ND	0.017	ND
	MW6(15.5)	15.5	ND	ND	ND	0.058	ND
	MW7(5.5)	5.5	ND	ND	ND	ND	ND
	MW7(10)	10.0	ND	ND	0.0086	0.030	ND
	MW7(15)	15.0	ND	ND	0.0098	0.010	ND
Detection Limits			1.0	0.0050	0.0050	0.0050	0.0050

ND = Non-detectable.

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

KEI-P89-0801.QR8
 May 4, 1992

TABLE 4
 SUMMARY OF LABORATORY ANALYSES
 SOIL

<u>Date</u>	<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
10/25/89	MW1 (5) *	5.0	ND	ND	ND	ND	ND
&	MW1 (7) *	7.0	ND	ND	ND	ND	ND
10/26/89	MW1 (10) *	10.0	ND	ND	ND	ND	ND
	MW1 (12.5) *	12.5	ND	ND	ND	ND	ND
	MW1 (15) *	15.0	ND	ND	ND	ND	ND
	MW1 (17) *	17.0	ND	ND	ND	ND	ND
	MW2 (5)	5.0	23	ND	ND	ND	ND
	MW2 (10)	10.0	ND	ND	ND	ND	ND
	MW2 (12.5)	12.5	ND	ND	ND	ND	ND
	MW2 (15)	15.0	3.0	ND	ND	ND	ND
	MW2 (17)	17.0	790	0.14	0.23	10	2.7
	MW3 (5)	5.0	1.1	ND	ND	ND	ND
	MW3 (10)	10.0	ND	ND	ND	ND	ND
	MW3 (11.5)	11.5	ND	ND	ND	ND	ND
	MW3 (14)	14.0	ND	ND	ND	ND	ND
	MW4 (5)	5.0	1.9	ND	ND	ND	ND
	MW4 (9.5)	9.5	ND	ND	ND	ND	ND
	MW4 (12)	12.0	ND	ND	ND	ND	ND
	MW4 (15)	15.0	56	0.10	0.11	1.5	1.5
Detection Limits			1.0	0.05	0.1	0.1	0.1

* TPH as diesel, TOG, and all EPA method 8010 constituents were non-detectable.

ND = Non-detectable.

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

May 4, 1992

TABLE 5SUMMARY OF LABORATORY ANALYSES
SOIL

<u>Date</u>	<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
8/02/89	A1	15.0	--	2.1	ND	ND	0.21	ND
&	A2	15.0	--	1.6	ND	ND	ND	ND
8/07/89	A3	16.0	--	390	1.7	45	86	16
	B1	15.0	--	ND	ND	ND	0.10	ND
	B2	15.0	--	ND	ND	ND	ND	ND
	B3	15.0	--	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

* TOG, and all EPA method 8010 and 8270 constituents were non-detectable.

-- Indicates analysis was not performed.

ND = Non-detectable.

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

KEI-P89-0801.QR8

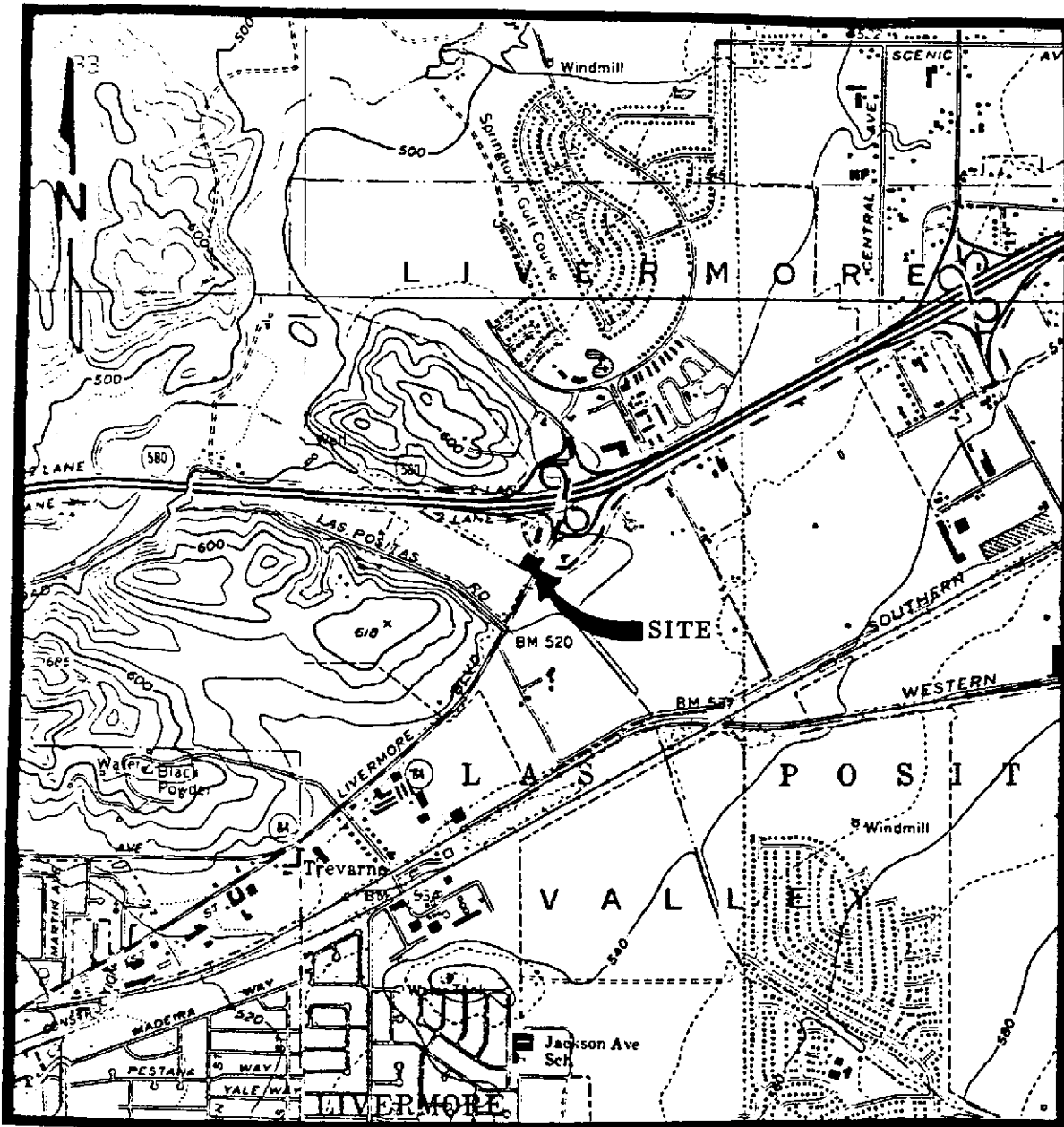
May 4, 1992

TABLE 6

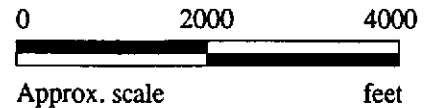
SUMMARY OF LABORATORY ANALYSES
WATER


<u>Date</u>	<u>Sample</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
8/07/89	W1	47,000	260	840	9,400	830
Detection Limits		30	0.3	0.3	0.3	0.3

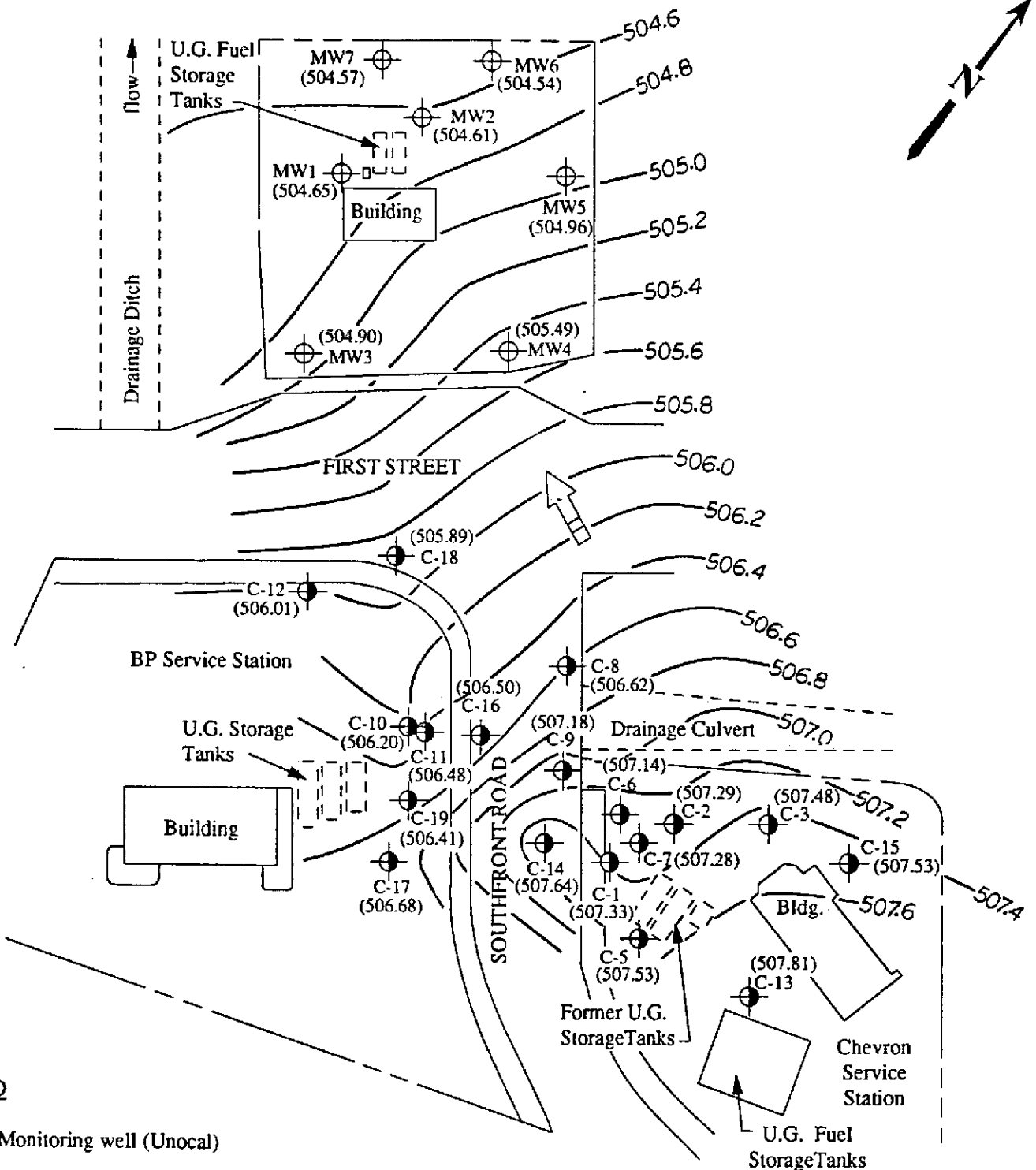
Results in parts per billion (ppb), unless otherwise indicated.



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

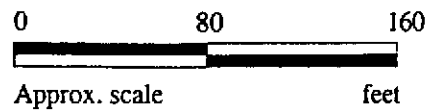


 <p>KAPREALIAN ENGINEERING INCORPORATED</p>	<p>UNOCAL SERVICE STATION #6034 4700 FIRST STREET LIVERMORE, CA</p>	<p>LOCATION MAP</p>
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LEGEND

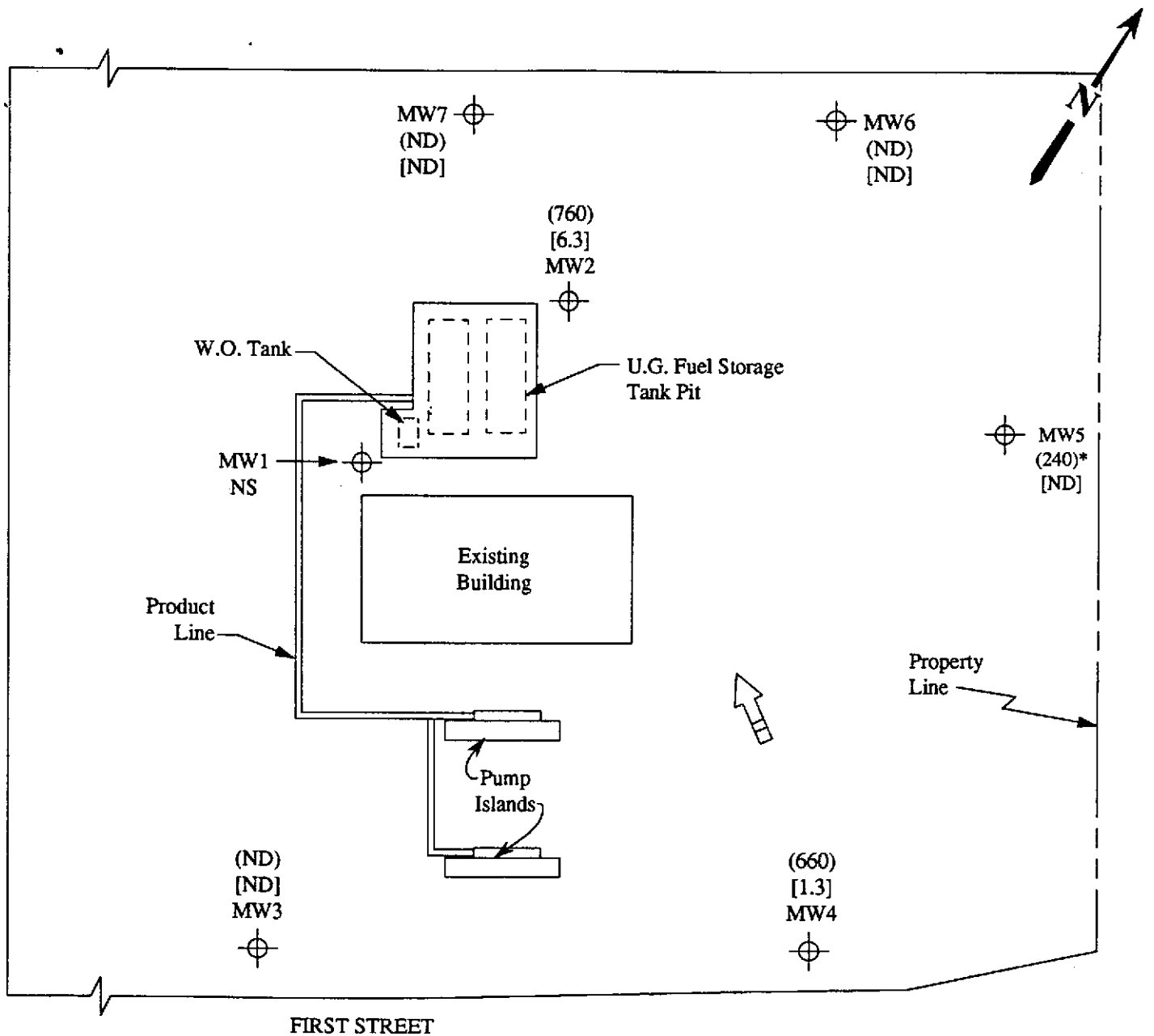
- Monitoring well (Unocal)
- Monitoring well (Chevron)
- () Ground water elevation in feet above Mean Sea Level on 4/6/92
- Direction of ground water flow
- Contours of ground water elevation



**KAPREALIAN ENGINEERING
INCORPORATED**

**UNOCAL SERVICE STATION # 6034
4700 FIRST STREET
LIVERMORE, CA**

**SITE
VICINITY
MAP**



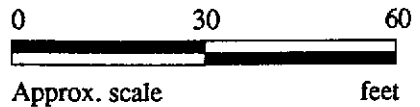
FIRST STREET

SITE PLAN

(Samples Collected on 4/6/92)

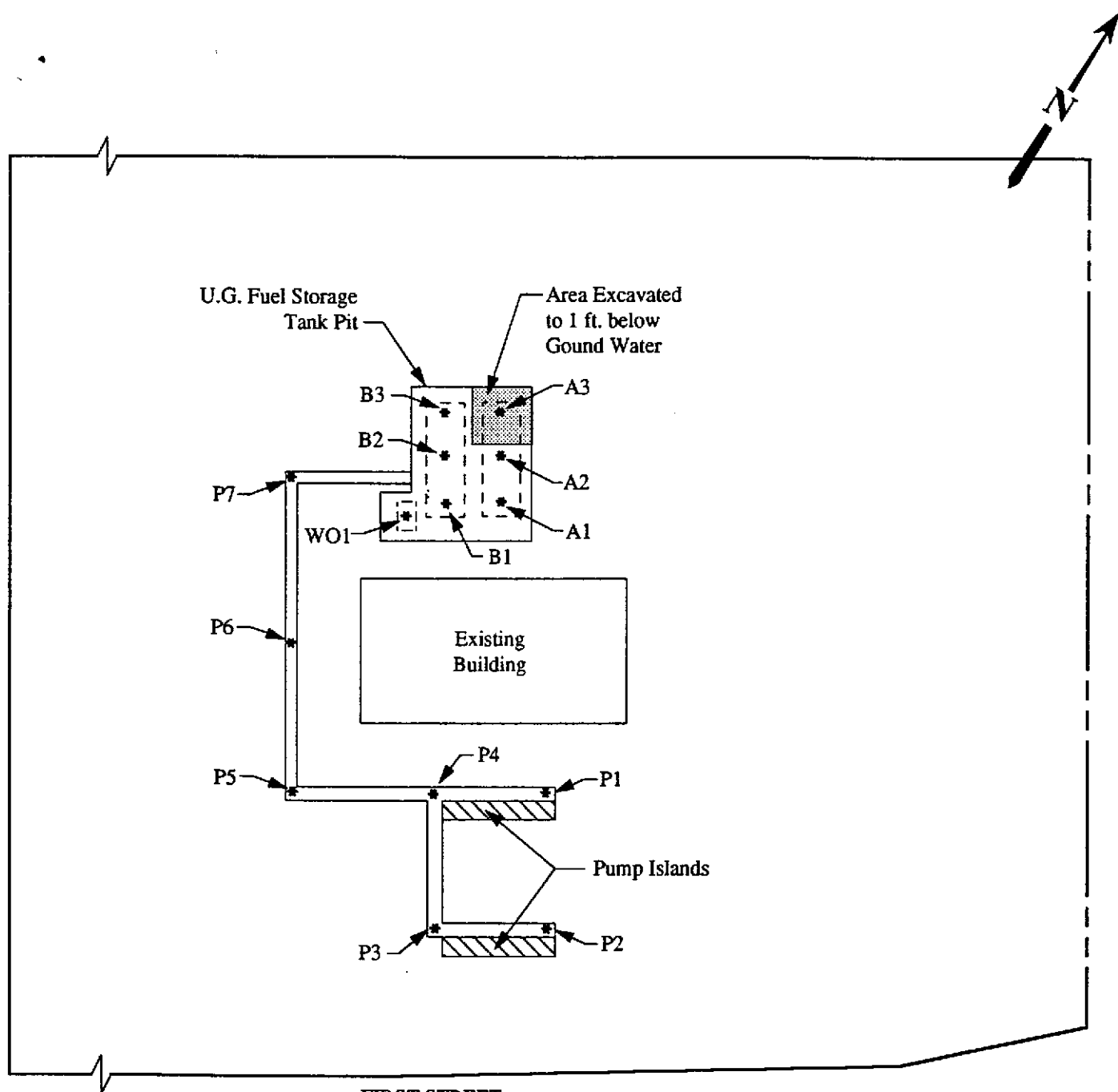
LEGEND

- ⊕ Monitoring well
- () Concentrations of TPH as gasoline in ppb
- [] Concentrations of benzene in ppb
- ➡ Direction of ground water flow
- ND = Non-detectable
- NS = Not sampled
- * The lab reported that the "sample does not appear to contain gasoline."



**UNOCAL SERVICE STATION #6034
4700 FIRST STREET
LIVERMORE, CA**

**FIGURE
1**

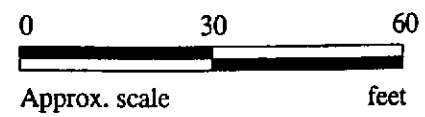


FIRST STREET

SITE PLAN

LEGEND

* Sample Point Location



**UNOCAL SERVICE STATION #6034
 4700 FIRST STREET
 LIVERMORE, CA**

**FIGURE
 2**



SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc. 2401 Stanwell Drive, Suite 400 Concord, CA 94520 Attention: Mardo Kaprealian, P.E.	Client Project ID: Unocal, 4700 First Street, Livermore Matrix Descript: Water Analysis Method: EPA 5030/8015/8020 First Sample #: 204-0217	Sampled: Apr 6, 1992 Received: Apr 6, 1992 Analyzed: 4/15 - 4/16/92 Reported: Apr 21, 1992
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TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons			Ethyl Benzene	Xylenes
		ug/L (ppb)	Benzene ug/L (ppb)	Toluene ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
204-0217	MW-2	760	6.3	2.1	N.D.	130
204-0218	MW-3	N.D.	N.D.	N.D.	N.D.	N.D.
204-0219	MW-4	660	1.3	3.8	2.9	4.1
204-0220	MW-5*	240	N.D.	N.D.	0.35	N.D.
204-0221	MW-6	N.D.	N.D.	N.D.	N.D.	N.D.
204-0222	MW-7	N.D.	N.D.	N.D.	N.D.	N.D.

Method Detection Limits:	30	0.30	0.30	0.30	0.30
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Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.

SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Laboratory Director

Please Note:	*The above sample does not appear to contain gasoline. LMBP is mostly due to unidentified peaks.
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Kaprealian Engineering, Inc.
2401 Stanwell Drive, Suite 400
Concord, CA 94520

Client Project ID: Unocal, 4700 First Street, Livermore

Attention: Mardo Kaprealian, P.E. QC Sample Group: 2040217 - 222

Reported: Apr 21, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
	Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	K.N.	K.N.	K.N.	K.N.
Reporting Units:	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992	Apr 15, 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:	18	17	19	57
Matrix Spike % Recovery:	90	85	95	95
Conc. Matrix Spike Dup.:	17	17	19	55
Matrix Spike Duplicate % Recovery:	85	85	95	92
Relative % Difference:	5.7	0.0	0.0	3.6

Laboratory blank contained the following analytes: None detected

SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Laboratory Director

% Recovery:	$\frac{\text{Conc. of M.S.} - \text{Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$
Relative % Difference:	$\frac{\text{Conc. of M.S.} - \text{Conc. of M.S.D.}}{(\text{Conc. of M.S.} + \text{Conc. of M.S.D.}) / 2} \times 100$

2040217.KEI <2>



SEQUOIA ANALYTICAL

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(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.
2401 Stanwell Drive, Suite 400
Concord, CA 94520

Client Project ID: Unocal, 4700 First Street, Livermore

Attention: Mardo Kaprealian, P.E. QC Sample Group: 2040217 - 222

Reported: Apr 21, 1992

QUALITY CONTROL DATA REPORT

SURROGATE

	EPA	EPA	EPA	EPA	EPA	EPA	EPA
Method:	8015/8020	8015/8020	8015/8020	8015/8020	8015/8020	8015/8020	8015/8020
Analyst:	K.N.	K.N.	K.N.	K.N.	K.N.	K.N.	K.N.
Reporting Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992	Apr 15, 1992
Sample #:	204-0217	204-0218	204-0219	204-0220	204-0221	204-0222	Blank

Surrogate % Recovery:	86	93	92	97	96	91	88
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SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Laboratory Director

% Recovery:	$\frac{\text{Conc. of M.S.} - \text{Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$
Relative % Difference:	$\frac{\text{Conc. of M.S.} - \text{Conc. of M.S.D.}}{(\text{Conc. of M.S.} + \text{Conc. of M.S.D.}) / 2} \times 100$

2040217.KEI <3>



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER <u>Joe</u>		SITE NAME & ADDRESS <u>Unocal/Livermore</u> <u>4700 First st.</u>					ANALYSES REQUESTED			TURN AROUND TIME: <u>Regular</u>
WITNESSING AGENCY							<u>TPHG, BTKE</u>			
SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION		REMARKS
MW-2	4/6/92			✓	✓		2	MW	✓	2040217 AB ↓ 218 AB 219 AB 220 AB 221 AB 222 AB
MW-3	"	P.M. 1:45		✓	✓		2	"	✓	
MW-4	"	"		✓	✓		2	"	✓	
MW-5	"	"		✓	✓		2	"	✓	
MW-6	"	A.M. 10:45		✓	✓		2	"	✓	
MW-7	"	"		✓	✓		2	"	✓	
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		The following MUST BE completed by the laboratory accepting samples for analysis: 1. Have all samples received for analysis been stored in ice? <u>yes</u> 2. Will samples remain refrigerated until analyzed? <u>yes</u> 3. Did any samples received for analysis have head space? <u>NO</u> 4. Were samples in appropriate containers and properly packaged? <u>yes</u>				
<u>Joe Dennis</u>		4/6/92/1505		<u>A. N. Nguyen</u>						
<u>[Signature]</u>		4/7/1992		<u>[Signature]</u>						
<u>[Signature]</u>				<u>[Signature]</u>						
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		Signature: <u>A. N. Nguyen</u> Title: <u>Analyst</u> Date: <u>4/6/92</u>				
<u>[Signature]</u>				<u>[Signature]</u>						
<u>[Signature]</u>				<u>[Signature]</u>						
<u>[Signature]</u>				<u>[Signature]</u>						