RECEIVED

10:21 am, Apr 23, 2009

Alameda County
Environmental Health

KAPREALIAN ENGINEERING
INCORPORATED

KEI-P89-1106.R10
December 21, 1992

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

Attention: Ms. Penny Silzer

FILE # 3072 SS X BP
RPT X QM TRANSMITTAL
1 2 3 4 5 6

RE: Site Closure Report
Unocal Service Station #3072
2445 Castro Valley Boulevard
Castro Valley, California

Dear Ms. Silzer:

INTRODUCTION

This report presents a comprehensive summary of all of the soil sampling, ground water monitoring, ground water sampling, and remediation activities at the referenced site that were conducted by Kaprealian Engineering, Inc. (KEI) from November 1989 through June 1992. Based on the analytical results of all of the ground water samples collected and evaluated to date, no significant ground water contamination appears to be present at the site. Therefore, it is KEI's opinion that no further ground water monitoring and sampling is warranted at the Unocal site, unless required by the regulatory agencies.

I. SITE DESCRIPTION AND BACKGROUND

The subject site contains a Unocal service station and auto care facility. The subject site is situated on gently sloping, northeast trending topography, and is located near the base of the northeast flank of a series of low lying, northwest trending foothills separating Castro Valley from Hayward. The site is located at the southern corner of the intersection of Castro Valley Boulevard with Strobridge Avenue, and is situated approximately 1,200 feet southwest of an unnamed drainage.

A petroleum hydrocarbon release was first discovered at the site on November 14, 1989, during routine underground tank replacement activities. As documented below, two small holes were observed in the regular unleaded gasoline tank at the time of removal. The volume and duration of the release is unknown to KEI.

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

KEI's initial work at the site began on November 14, 1989, when soil samples were collected following the removal of three fuel storage tanks (each tank had a capacity of 10,000 gallons and contained regular unleaded gasoline, super unleaded gasoline, and diesel fuel, respectively) and one 550 gallon waste oil tank at the referenced site. All of the tanks were made of steel. Two small holes were observed in the regular unleaded gasoline tank. Extensive pitting, but no holes, was observed in the super unleaded gasoline tank. The diesel tank had been treated and wrapped prior to installation, and therefore it was not possible to assess the condition of the tank at the time of removal. No apparent holes or cracks were observed in the waste oil tank. Six soil samples (designated as A1, A2, B1, B2, C1, and C2) were collected from beneath the fuel storage tanks at depths of 13.5 feet below grade. A soil sample (WO1) was collected from beneath the waste oil tank at a depth of 10.5 feet below grade.

All soil samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California. The samples collected beneath the fuel storage tanks were analyzed for total petroleum hydrocarbons (TPH) as gasoline, and benzene, toluene, xylenes, and ethylbenzene (BTX&E). In addition, the two samples collected from beneath the diesel tank were analyzed for TPH as diesel. The soil sample collected from beneath the waste oil tank was analyzed for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), EPA method 8010 compounds, EPA method 8270 compounds, and the metals cadmium, chromium, lead, and zinc.

The analytical results for the soil samples collected from beneath the fuel tanks showed levels of TPH as gasoline ranging from non-detectable to 11 ppm, with non-detectable BTX&E concentrations in each case. TPH as diesel concentrations were non-detectable for the two samples collected beneath the diesel tank. The analytical results of the soil sample collected from beneath the waste oil tank showed TPH as gasoline at 5.9 ppm, metals ranging from non-detectable to 45 ppm, 55 ppb of 1,1-dichloroethene, and non-detectable levels of all other constituents analyzed. The analytical results of the soil samples are summarized in Table 8. The sample point locations are as shown on the attached Figure 2.

On November 16, 1989, KEI collected six sidewall soil samples (designated as SW1 through SW6) and a water sample (designated as W1) from the fuel tank pit. The tank pit water level was measured to be 11.5 feet below the ground surface. The sidewall soil samples were collected at approximately 6

to 12-inches above the tank pit water level. All samples were analyzed for TPH as gasoline and BTX&E. Three of the six sidewall soil samples (labeled SW2, SW3, and SW4) and the water sample (labeled W1) were also analyzed for TPH as diesel. Analytical results of the soil samples collected from the fuel tank pit showed TPH as gasoline ranging from non-detectable to 29 ppm for four of the six samples, with samples SW1 and SW4 showing 140 ppm and 160 ppm, respectively. TPH as diesel levels were non-detectable for two of the sidewall samples, with sample SW4 showing 24 ppm. Analytical results of the water sample collected from the fuel tank pit showed 11,000 ppb of TPH as diesel, 26,000 ppb of TPH as gasoline, and 670 ppb of benzene. The analytical results of the soil samples are summarized in Table 8, and the analytical results of the water sample are summarized in Table 9. The sample point locations are as shown on the attached Figure 2.

On November 28, 1989, KEI returned to the site to meet with a representative of the Alameda County Health Care Services Agency (ACHCS), in order to clarify the ACHCS' guidelines as applied to the subject site for fuel tank pit excavation and sampling. In response to the meeting, KEI submitted a Phase I work plan (KEI-P89-1106.P1) dated November 30, 1989, to define the extent of contamination in the vicinity of the tank pit. The work plan was approved by the ACHCS in a letter dated December 8, 1989.

On December 22, 1989, KEI returned to the site to collect additional sidewall soil samples from the fuel tank pit after further excavation. Soil was excavated from the north, east, and south sides of the pit. Sidewall soil samples, designated as SW1(17), SW2(17), SW7, SW8, SW9, SW10, SW11, and SW3(13), were collected at depths of approximately 9 or 11 feet below grade, and analyzed on-site by Mobile Chem Labs, Inc., of Lafayette, California (a State certified mobile laboratory). After excavation, TPH as gasoline was detected at concentrations of 1,500 ppm and 1,900 ppm on the northerly wall of the pit, at concentrations ranging from 3.0 ppm to 1,700 ppm on the easterly wall, and at 410 ppm on the southerly wall. The analytical results of the soil samples are summarized in Table 7. The sample point locations are as shown on the attached Figure 3.

Based on the analytical results, KEI recommended the installation of exploratory borings to further define the extent of the soil contamination. Documentation of soil sample collection techniques and the analytical results are presented in KEI's work plan/proposal (KEI-P89-1106.P2) dated January 8, 1990.

On January 18 and 19, 1990, three two-inch diameter monitoring wells (designated as MW1, MW2, and MW3 on the attached Figure 1) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 22 to 30 feet below grade. Ground water was encountered at depths ranging from 9 to 20.5 feet beneath the surface during drilling. The wells were developed on January 22 and 23, 1990, and were initially sampled on March 22, 1990.

Water and selected soil samples were analyzed for TPH as gasoline and BTX&E. Analytical results of the soil samples collected from the borings for monitoring wells MW1, MW2, and MW3 indicated non-detectable levels of TPH as gasoline and BTX&E in all soil samples, except for sample MW1(5), which showed 2.8 ppm of TPH as gasoline, 0.051 ppm of benzene, and 0.11 ppm of ethylbenzene. Analytical results of the ground water samples collected from monitoring wells MW2 and MW3 indicated non-detectable levels of TPH as gasoline and BTX&E. In well MW1, TPH as gasoline and benzene were detected at 32 ppb and 4.2 ppb, respectively. The analytical results of the soil samples are summarized in Table 3, and the analytical results of the water samples 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-J89-1106.R7) dated April 12, 1990.

On February 14, 1990, three soil samples, labeled P1, P2, and P3, were collected from the product pipe trenches at depths ranging from 2.5 to 4 feet below grade. The soil samples were analyzed for TPH as gasoline and BTX&E. Analytical results of samples collected from the pipe trench indicated levels of TPH as gasoline ranging from 6.0 ppm to 87 ppm, and benzene levels ranging from 0.23 ppm to 0.47 ppm. The analytical results of the soil samples are summarized in Table 6. The soil sample point locations are shown on the attached Figure 4. Documentation of sample collection techniques and analytical results are presented in KEI's report (KEI-J89-1106.R5) dated March 6, 1990.

KEI returned to the site on March 9, 1990, when three sidewall soil samples, labeled SWB, SWC, and SWD, were

collected from the sidewalls of the waste oil tank pit excavation at depths of 8 to 9 feet below grade. The waste oil tank pit had been excavated to a depth of 11 to 12 feet below grade. The soil samples were analyzed for TPH as gasoline, BTX&E, TPH as diesel, TOG, and EPA method 8010 compounds. Analytical results of the soil samples (SWB, SWC and SWD) collected from sidewalls of the waste oil tank pit indicated non-detectable levels of TOG and all EPA method 8010 constituents for each of the three samples. The analytical results indicated non-detectable levels of TPH as gasoline and BTX&E for samples SWC and SWD, while SWB showed 37 ppm of TPH as gasoline, with 0.10 ppm of benzene. TPH as diesel levels were non-detectable for sample SWC, and both SWB and SWD showed less than 10 ppm of TPH as diesel. The analytical results of the soil samples are summarized in Table 5. The soil sample point locations are as shown on the attached Figure 5. Documentation of sample collection techniques and the analytical results are presented in KEI's report (KEI-J89-1106.R6) dated April 13, 1990.

On April 24 and 25, 1990, the previously recommended exploratory borings (designated as EB1 through EB8 on the attached Figure 6) were drilled at the site. The eight borings were drilled and/or sampled to depths of 10.5 to 15 feet below grade. Ground water was encountered at depths of approximately 10 to 14 feet beneath the surface in each boring, except EB4, where ground water was not encountered. Drilling was generally stopped about 1 to 2 feet after intersecting the first water table, except for EB4, which was terminated at a depth of 14.5 feet below grade when ground water was not encountered. A water sample was collected from boring EB5 only. All borings were backfilled to the surface with neat cement.

Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California. Soil samples from all borings, and the water sample from EB5, were analyzed for TPH as gasoline and BTX&E. The analytical results of the soil samples are summarized in Table 4, and the analytical results of the water samples are summarized in Table 9.

Analytical results of the soil samples collected from the eight exploratory borings (EB1 through EB8) indicated non-detectable levels of TPH as gasoline in all samples, except EB1(9.5), EB4(14), EB6(5), EB7(5), and EB8(5), in which the levels ranged from 1.7 ppm to 5.0 ppm. Benzene was detected in all soil samples at levels ranging from 0.0053 ppm to 0.023 ppm. The analytical results of the water sample

collected from boring EB5, immediately after drilling, indicated a level of TPH as gasoline at 5,900 ppb, with a level of benzene at 840 ppb.

Based on the analytical results, KEI recommended the installation of two additional monitoring wells to further define the extent of ground water contamination. In addition, KEI recommended the implementation of monthly monitoring and quarterly sampling of the existing monitoring wells. Documentation of the exploratory boring installation protocol, sample collection techniques, and the analytical results are presented in KEI's report (KEI-J89-1106.R8) dated June 11, 1990.

On August 13, 1990, two additional two-inch diameter monitoring wells (designated as MW4 and MW5 on the attached Figure 1) were installed at the site. The two wells were drilled and completed to total depths ranging from 23.5 to 24 feet below grade. Ground water was encountered at depths ranging from 10 to 14.5 feet beneath the surface during drilling. The new wells (MW4 and MW5) were developed on August 20, 1990, and all of the wells were sampled on August 27, 1990.

Water samples from all of the wells (MW1 through MW5), and selected soil samples from the borings for wells MW4 and MW5, were analyzed at Sequoia Analytical Laboratory in Redwood City, California. The samples were analyzed for TPH as gasoline and BTX&E.

Analytical results of the soil samples collected from the borings for monitoring wells MW4 and MW5 indicated non-detectable levels of TPH as gasoline and BTX&E in all analyzed samples. The analytical results of the water samples collected from all of the wells showed non-detectable levels of TPH as gasoline in all wells. Benzene was detected in wells MW1, MW3, and MW4 at levels of 3.2 ppb, 1.1 ppb and 0.34 ppb, respectively. The analytical results of the soil samples are summarized in Table 3, and the analytical results of the water samples 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-P89-1106.R9) dated September 28, 1990. Based on the analytical results, KEI recommended the continuation of the monthly monitoring and quarterly sampling program.

RECENT FIELD ACTIVITIES

The five wells (MW1 through MW5) were monitored three times and were sampled once during the most recent semi-annual

monitoring and sampling period. During monitoring, the wells were checked for depth to water and the presence of free product. At the time of 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 reporting period. The monitoring data collected during the most recent semi-annual reporting period are summarized in Table 1.

Water samples were collected from the wells on June 18, 1992. Prior to sampling, the wells were each purged of between 10 and 12 gallons of water by the use of a surface pump. Water samples were collected by the use of a clean Teflon bailer. The samples were decanted into clean VOA vials and/or one-liter amber bottles, as appropriate, which were then sealed with Teflon-lined screw caps and stored in a cooler, on ice, until delivery to a state-certified laboratory.

ANALYTICAL RESULTS

The most recent 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/modified 8015, and BTX&E by EPA method 8020. In addition, the ground water samples collected from wells MW4 and MW5 were analyzed for TPH as diesel by EPA method 3510/modified 8015.

The analytical results for the ground water samples collected from monitoring wells MW1 through MW5 indicated non-detectable concentrations of TPH as gasoline and BTX&E. Also, in monitoring wells MW4 and MW5, TPH as diesel was non-detectable. The ground water sample analytical results are summarized in Table 2.

II. INVESTIGATIVE METHODS

a. Soil Sampling Methodology

The specific soil sampling methods used for each phase of work conducted to date are presented in various technical reports that have been previously submitted (see the attached report reference list). A general description of the soil sampling methods are described in Appendix A.

b. Ground Water Monitoring Well Design, Installation, and Development

The specific monitoring well design, installation, and development techniques that have been used to install monitoring wells at the site are presented in various technical reports that have been previously submitted (see the attached report reference list). A general description of the ground water monitoring well design, installation, and development methods are described in Appendix B.

c. Ground Water Sampling Methodology

The specific ground water sampling methods used for each phase of work conducted to date are presented in various technical reports that have been previously submitted (see the attached report reference list). A general description of the ground water sampling methods are described in Appendix C.

d. Certified Laboratory, Chain of Custody Procedures, Sample Preservation, Sample Holding Times, Sample Preservation Methods, and Acceptable Detection Limits

All of the soil and ground water samples collected were analyzed by state-certified laboratories (Sequoia Analytical Laboratory and Mobile Chem Labs, Inc.), and were accompanied by properly executed Chain of Custody documentation. A sample Chain of Custody form is included in Appendix C. The sample preservation, appropriate holding time, analytical method, sample container, and detection limits are shown on Table 1 of Appendix C.

e. Soil and/or Ground Water Analysis Performed in Accordance to Table 2 of Regional Board Staff Recommendations

All of the soil and ground water samples collected were analyzed in accordance with Table 2 of the "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites." As described in the Background section of this report, three underground fuel storage tanks and one waste oil tank were removed from the site in November of 1989. The tanks consisted of one 10,000 gallon super unleaded gasoline tank, one 10,000 gallon regular unleaded gasoline tank, one 10,000 gallon diesel tank, and one 550 gallon waste oil tank. In accordance with the Tri-

Regional Board's guidelines, the following analyses have been performed on the samples collected at the site:

Tank Type	Soil Analysis	Water Analysis
Regular and Super Unleaded Gasoline	TPH as gasoline by EPA method 5030/ modified 8015	TPH as gasoline by EPA method 5030/ modified 8015
	BTX&E by EPA method 8020	BTX&E by EPA method 8020
Tank Type	**Soil Analysis**	**Water Analysis**
Diesel	TPH as diesel by EPA method 3550/ modified 8015	TPH as diesel by EPA method 3510/ modified 8015
Waste Oil	TPH as gasoline by EPA method 5030/ modified 8015	TPH as gasoline by EPA method 5030/ modified 8015
	BTX&E by EPA method 8020	BTX&E by EPA method 8020
	TPH as diesel by EPA method 3550/modified 8015	TPH as diesel by EPA method 3510/ modified 8015
	TOG by EPA method 418.1 (I.R. with cleanup)	
	Halogenated Volatile Organic Compounds (chlorinated solvents) by EPA method 8010	
	Semi-volatile Organics by EPA method 8270, including the "open scan"	
	Cadmium, chromium, lead, nickel, and zinc by ICP (EPA method 6010)	

f. Method Used to Measure Free Product Thickness

Monitoring well reference elevations are measured to the center of the protective Christy box lid. When the lid is removed and depth to free product measurements are desired, a rigid instrument, such as a ruler, is placed across the top of the now open Christy box. Free product thickness measurements are accomplished in one of several ways.

Depth measurement to the top of the free product layer may be performed using an electric petroleum hydrocarbon indicator. Alternatively, a steel or aluminum yardstick covered with product finding paste is attached to a steel tape and lowered until part of the yardstick encounters the free product layer. The measured length of the steel tape is added to the unaffected length of the yardstick as measured from the top of the yardstick to the point where discoloration of the product finding paste begins.

The total product thickness is determined by finding the difference between the measured depth to product and the measured depth to water.

In most instances, it is possible to place both water finding paste and product finding paste on the yardstick and directly measure the thickness of the discolored product finding paste from the yardstick. Depth to free product or free product thickness measurements are made to the nearest 0.01 feet.

g. Method Used to Measure Ground Water Elevations

Monitoring well reference elevations are measured to the center of the protective Christy box lid. When the lid is removed and depth to water measurements are desired, a rigid instrument, such as a ruler, is placed across the top of the now open Christy box. Depth to water is measured using an electric water level indicator and referenced to the middle and bottom edge of the rigid instrument spanning the top of the Christy box. Alternatively, a steel or aluminum yardstick covered with water finding paste is attached to a steel tape and lowered until part of the yardstick encounters the water layer. The measured length of the steel tape is added to the unaffected length of the yardstick as measured from the top of the yardstick to the point where the discoloration of the water finding paste begins. Depth to water level measurements are made to the nearest 0.01 feet.

Water levels are measured prior to development, purging or sampling.

III. EXTENT OF SOIL AND GROUND WATER POLLUTION:

a. Vertical and Lateral Extent of Soil Contamination

Three underground fuel storage tanks and one waste oil tank were removed from the site in November of 1989. Subsequent to tank removal, six soil samples were collected from beneath the fuel storage tanks (at depths of 13.5 feet below grade) and one soil sample was collected from beneath the waste oil tank (at a depth of 10.5 feet below grade). All of the soil samples collected from beneath the fuel storage tanks and the waste oil tank showed non-detectable concentrations of BTX&E and TPH as gasoline concentrations less than or equal to 11 ppm. In addition, the soil samples collected from beneath the diesel tank showed non-detectable concentrations of TPH as diesel. The soil sample collected from beneath the waste oil tank also showed non-detectable concentrations of TPH as diesel, TOG, EPA method 8270 constituents, and EPA method 8010 constituents, except for 55 ppb of 1,1-dichloroethane.

Following the removal of the fuel tanks, ground water was encountered in the fuel tank pit (at a depth of approximately 11.5 feet below grade); therefore, six sidewall soil samples (SW1 through SW6) were also collected from the fuel tank pit. The samples were each collected approximately 6 to 12 inches above the water level encountered in the fuel tank pit. The analytical results of the soil samples collected from the sidewalls of fuel tank pit showed concentrations of TPH as gasoline ranging from non-detectable to 160 ppm, and benzene concentrations ranging from non-detectable to 0.33 ppm.

Based on the analytical results of the initial sidewall soil samples collected from the fuel tank pit, KEI recommended overexcavation of the north, east, and south sidewalls of the tank pit. Soil was overexcavated laterally from the three sidewalls until on-site conditions precluded further soil excavation. Further excavation was precluded in the northerly and easterly sidewalls due to the close proximity of the public sidewalks, and further excavation was precluded in the southerly direction due to potential damage to the pump island canopy. After overexcavation of contaminated soil, the analytical results of the sidewall soil samples

collected from the fuel tank pit (at depths of 9 to 11 feet below grade) showed TPH as gasoline at concentrations ranging from 3 ppm to 1,900 ppm. Based on the historical water levels (4.5 to 10 feet below grade) encountered in the five on-site monitoring wells at the Unocal site, it appears that all of the sidewall soil samples were collected from below the water table (saturated soil).

In order to further define the lateral extent of soil contamination detected in the fuel tank pit, eight exploratory borings (EB1 through EB8) were drilled at and in the vicinity of the site. The analytical results of all the soil samples collected from the exploratory borings showed TPH as gasoline at concentrations less than or equal to 5 ppm, and benzene concentrations less than 0.07 ppm.

b. Vertical and Lateral Definition of Free Product and Dissolved Constituents

As shown in Table 2, the ground water samples collected from all five monitoring wells during the past five sampling events (March 1991 through June 1992) have shown benzene concentrations less than 1 ppb, which is the State of California drinking water standard for benzene. In addition, no detectable concentrations of BTX&E were detected in any well during the past three sampling events. In addition, the ground water samples collected from all five wells during the past seven sampling events (August 1990 through June 1992) have shown no detectable concentrations of TPH as gasoline, except for 44 ppb detected in well MW4 on March 11, 1991, and 34 ppb detected in well MW1 on December 12, 1990. Lastly, the ground water samples collected from wells MW4 and MW5 (located adjacent to the fuel tank pit) have shown no detectable concentrations of TPH as diesel.

Based on the analytical results of all the ground water samples collected to date, KEI recommends no further monitoring and sampling of the existing wells at the subject site, unless required by the regulatory agencies. KEI will submit a work plan/proposal to destroy all of the wells once approval is granted from the regulatory agencies.

IV. LOCAL AND REGIONAL HYDROGEOLOGY

Based on the water level data gathered on June 18, 1992, the ground water flow direction appeared to be predominantly toward the east-northeast (varying from the north to southeast), as shown on the attached Figure 1. The predominant east-northeasterly ground water flow direction reported this past monitoring period is similar to the flow direction reported during five of the six previous monitoring periods (August 1990 through December 1991). The average hydraulic gradient at the site on June 18, 1992, was approximately 0.016. The water levels have fluctuated during the most recent six month period, showing net increases of 0.24 and 1.46 feet in wells MW1 and MW2, respectively, and net decreases of 0.03 and 0.25 feet in wells MW3 through MW5 since December 20, 1991. The measured depth to ground water at the site on June 18, 1992, ranged between 6.35 and 9.36 feet below grade.

Based on review of regional geologic maps (U.S. Geological Survey Open-File Report 80-540 "Preliminary Geologic Map of the Hayward Quadrangle, Alameda and Contra Costs Counties, California" by T.W. Dibblee, Jr., 1980), the subject site is underlain by Quaternary-age alluvium. Mapped bedrock outcrops adjacent to the site include the marine Panoche Formation (Kpc), which is described as a conglomerate generally composed of granite, diorite, quartzite and black chert cobbles in a sandstone matrix, and the Knoxville Formation (JKk), which is described as consisting of dark micaceous shale with minor thinly bedded sandstone.

In addition, the site is situated approximately 3,000 feet northeast of the mapped trace of the active Hayward Fault; 1,900 feet southwest of the concealed mapped trace of the East Chabot Fault; and 1,800 feet northeast of the mapped trace (northern terminous?) of the West Chabot Fault.

As exposed in the underground tank pit excavation, the soil materials at the subject site consist of artificial fill to a depth of 1 to 2 feet below grade, and locally extending to a maximum of about 9 feet at the original east wall of the pit excavation (prior to additional excavation). These fill materials are in turn underlain by dark gray, silty clay, which is about 2.5 feet thick. The silty clay is underlain by greenish-brown to yellowish-brown, highly weathered to slightly weathered shale, which varies from soft to moderately hard with abundant fractures.

The results of the drilling activities at the site indicated that bedrock materials underlying the site are composed of brown and gray shale, which is slightly to highly weathered. The depth to the bedrock materials appears to vary considerably at the site, from about 5 to 6 feet below grade in the vicinity of well MW1 and boring EB2, to about 21.5 feet below grade in the vicinity of well MW2, to greater than 22 feet below grade in the vicinity of well MW3 (the maximum depth explored). However, bedrock generally underlies the site at a depth of about 8 to 10 feet below grade, as encountered in the majority of the borings at the site, and as exposed in the old tank pit excavation.

V. BENEFICIAL USES

a. Existing and Potential Beneficial Uses

The Unocal service station site is located approximately 1,200 feet southwest of an unnamed tributary to San Lorenzo Creek. Based on the December 1986 Water Quality Control Plan for the RWQCB, San Francisco Bay Basin (Basin Plan), the existing and potential beneficial uses of San Lorenzo Creek are as follows:

- Municipal and Domestic Supply
- Ground Water Recharge
- Fresh Water Replenishment
- Water Contact Recreation
- Non-contact Water Recreation
- Warm Fresh Water Habitat
- Cold Fresh Water Habitat
- Wildlife Habitat
- Fish Migration
- Fish Spawning

There are no known discharges (past and present) to surface waters (San Lorenzo Creek and/or its tributaries, including storm drains) at the subject Unocal site.

The RWQCB's Basin Plan also contains beneficial uses applicable to ground water underlying the site. The existing and potential beneficial uses of ground water at and in the vicinity of the Unocal site are as follows:

- Municipal Supply
- Industrial Process Water Supply
- Industrial Service Supply
- Agricultural Supply

b. Well Surveys (Municipal, Agricultural, and Domestic)

In November of 1992, KEI completed a survey of water wells located within a 1/2-mile radius of the subject site. The survey indicated the presence of three sites (13 wells) that contain water wells within the study area. The well locations were determined by a review of the California Department of Water Resources (CDWR) records. The Thrifty Oil Company site contains seven monitoring wells, the Shell Oil Company site contains five monitoring wells, and the Eden Township Hospital site contains one domestic well. A summary of the water wells identified in the study are listed in Table 10. The approximate site locations for the water wells are shown on the attached Figure 7.

Based on the north to southeasterly ground water flow directions determine at the Unocal site, the above three sites are located at least partially downgradient of the Unocal site. KEI assumes that the 12 monitoring wells installed at the Thrifty and Shell Oil Company sites have been installed as part of subsurface investigations conducted to determine the extent of ground water contamination at these respective sites. The ground water flow direction and extent of any ground water contamination detected at these two sites is unknown to KEI at this time. The water well at the Eden Township Hospital site is located approximately 1/3 mile to the north of the Unocal site. The status (active or inactive) of the hospital well and pumping rate is unknown to KEI at this time.

c. Summary of Factors Affecting Long-Term Fate of Contaminants

- The ground water flow direction of the subject site has historically (six of seven monitoring periods) been predominantly to the east-northeast (varying from north to southeast).

- As shown in Table 2, the highest concentrations of TPH as gasoline detected in any Unocal well to date was 44 ppb detected in well MW4 on March 11, 1991, and the highest concentration of benzene detected in any Unocal well to date was 3.2 ppb detected in well MW1 on August 27, 1990. The three most recent sampling events conducted at the site (September 1991 through June 1992) have shown non-detectable concentrations of TPH as gasoline and BTX&E in all five of the wells,

and non-detectable concentrations of TPH as diesel in wells MW4 and MW5. Assuming the highest concentration of benzene detected in the ground water monitoring wells at the site to date (3.2 ppb) were to migrate off site, it is unlikely that detectable concentrations of benzene would reach the unnamed tributary to San Lorenzo Creek located over 1,200 feet from the former Unocal site due to natural attenuation (dispersion, adsorption, biodegradation, aeration, etc). Similarly, other gasoline constituents would likely be greatly attenuated within the shallow aquifer by dispersion, adsorption, biodegradation, and aeration, and therefore would not significantly impact San Lorenzo Creek or its tributaries.

VI. REMEDIATION ACTIVITIES

a. Rationale for Selected Remediation Option

Based on visual observation by KEI's field personnel at the time of the tank removals in November of 1989, contaminated soil was observed in the sidewalls of the fuel tank pit. Therefore, KEI recommended that overexcavation of the tank pit sidewalls be conducted at that time in order to remove as much contaminated soil as possible.

b. Soil Remediation Method and Effectiveness

Based on the analytical results of the initial sidewall soil samples collected from the fuel tank pit, KEI recommended overexcavation of the north, east, and south sidewalls of the tank pit. Soil was overexcavated laterally from the three sidewalls until on-site conditions precluded further soil excavation. Further excavation was precluded in the northerly and easterly sidewalls due to the close proximity of the public sidewalks, and further excavation was precluded in the southerly direction due to potential damage to the pump island canopy. After overexcavation of contaminated soil, the analytical results of the sidewall soil samples collected from the fuel tank pit (at depths of 9 to 11 feet below grade) showed TPH as gasoline at concentrations ranging from 3 ppm to 1,900 ppm. Based on the historical water levels (4.5 to 10 feet below grade) encountered in the five on-site monitoring wells at the Unocal site, it appears that all of the sidewall soil samples were collected from below the water table (saturated soil).

Approximately 2,400 cubic yards of soil were excavated from the site.

c. Ground Water Remediation Method(s)

As shown in Table 2, the ground water samples collected from all five monitoring wells during the past five sampling events (March 1991 through June 1992) have shown benzene concentrations less than 1 ppb, which is the State of California drinking water standard for benzene. In addition, no detectable concentrations of BTX&E were detected in any well during the past three sampling events. The ground water samples collected from all five wells during the past seven sampling events (August 1990 through June 1992) have shown no detectable concentrations of TPH as gasoline, except for 44 ppb detected in well MW4 on March 11, 1991, and 34 ppb detected in well MW1 on December 12, 1990. Lastly, the ground water samples collected from wells MW4 and MW5 (located adjacent to the fuel tank pit) have shown no detectable concentrations of TPH as diesel. Based on the analytical results of all the ground water samples collected to date, ground water remediation does not appear to be warranted at this site.

d. Interim Remediation Actions Undertaken

As stated previously in this report, approximately 2,400 cubic yards of contaminated soil were overexcavated from the fuel tank pit in November and December of 1989. No other interim remediation actions have been performed at the site.

e. Impact of Remedial Actions on Beneficial Uses

As stated previously in Section V.c. of this report, the highest concentrations of TPH as gasoline detected in any Unocal well to date was 44 ppb detected in well MW4 on March 11, 1991, and the highest concentration of benzene detected in any Unocal well to date was 3.2 ppb detected in well MW1 on August 27, 1990. The three most recent sampling events conducted at the site (September 1991 through June 1992) have shown non-detectable concentrations of TPH as gasoline and BTX&E in all five of the wells, and non-detectable concentrations of TPH as diesel in wells MW4 and MW5. Assuming the highest concentration of benzene detected in the ground water monitoring wells at the site to date (3.2 ppb) were to migrate off site, it is unlikely that detectable concentrations of benzene

would reach the unnamed tributary to San Lorenzo Creek (located over 1,200 feet from the Unocal site) due to natural attenuation (dispersion, adsorption, biodegradation, aeration, etc). Similarly, other gasoline constituents would likely be greatly attenuated within the shallow aquifer by dispersion, adsorption, biodegradation, and aeration, and therefore would not significantly impact San Lorenzo Creek or its tributaries. Therefore, it appears that the soil excavation work conducted at the site in November and December of 1989 was effective in minimizing any degradation to potential and/or existing beneficial uses of ground water beneath the Unocal site.

VII. REMEDIATION EFFECTIVENESS

a. Final Cleanup Levels Consistent with State Water Resources Control Board (SWRCB) Resolution 68-16.

As stated previously in Section VI.c. of this report, the ground water samples collected from all five monitoring wells during the past five sampling events (March 1991 through June 1992) have shown benzene concentrations less than 1 ppb, which is the State of California drinking water standard for benzene. In addition, the maximum concentrations of toluene (0.50 ppb), xylenes (1.1 ppb), and ethylbenzene (3.2 ppb) that have been detected in any well during the eight quarters of sampling (March 1990 through June 1992) have been well below the Federal and State primary and secondary drinking water standards for these contaminants. Furthermore, the ground water samples collected from all five of the wells during the past three quarters of sampling (September 1991 - June 1992) have shown no detectable concentrations of TPH as gasoline and BTX&E. Based on the above discussion, it appears that the current concentrations (non-detectable for all contaminants) detected in ground water beneath the site are consistent with SRWCB Resolution 68-16.

b. Verification Monitoring Program and Criteria, Rationale, Sampling Number, Frequency, and Duration

The verification monitoring program has consisted of monthly monitoring (water level measurements and presence of free product) of all the wells for 16 consecutive months (October 1990 through January 1992). The wells were monitored on a quarterly basis between January 1992 and June 1992. The verification monitoring program has also consisted of a quarterly ground water sampling

program of all the wells for six consecutive quarters (August 1990 through December 1991). The wells were sampled on a semi-annual basis in 1992 (June 18, 1992). A summary of all the ground water sample analytical results are presented in Table 2.

c. Impact (Potential and/or Existing) of Residual Pollutants on Beneficial Uses

Based on the current non-detectable concentrations of petroleum hydrocarbons in ground water (see Sections VI.c. and VII.a.) beneath the site, and the extensive soil excavation work (2,400 cubic yards) conducted at the site, the impact of residual pollutants on beneficial uses appears to be minimal.

DISTRIBUTION

A copy of this report should be sent to the ACHCS, 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 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.

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

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins

Thomas J. Berkins
Senior Environmental Engineer

Joel G. Greger

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

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

Timothy R. Ross

Timothy R. Ross
Project Manager

\bp

Attachments: Tables 1 through 10
Report Reference List
Location Map
Potentiometric Surface Map - Figure 1
Soil Sample Point Location Maps - Figures 2 through 5
Exploratory Boring Locations - Figure 6
Water Well Locations - Figure 7
Appendices A, B & C

KEI-P89-1106.R10
December 21, 1992

TABLE 1

SUMMARY OF MONITORING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (gallons)
(Monitored and Sampled on June 18, 1992)					
MW1	172.32	8.81	0	No	11
MW2	174.05	9.36	0	No	11
MW3	172.27	6.35	0	No	10
MW4	172.53	6.84	0	No	10
MW5	172.16	6.97	0	No	12
(Monitored on March 19, 1992)					
MW1	174.22	6.91	0	--	0
MW2	175.88	6.53	0	--	0
MW3	174.06	4.56	0	--	0
MW4	174.45	4.92	0	--	0
MW5	173.38	5.75	0	--	0
(Monitored on January 20, 1992)					
MW1	172.36	8.77	0	--	0
MW2	174.01	8.40	0	--	0
MW3	172.52	6.10	0	--	0
MW4	172.76	6.61	0	--	0
MW5	171.98	7.15	0	--	0

Well #	Surface Elevation* (feet)
MW1	181.13
MW2	182.41
MW3	178.62
MW4	179.37
MW5	179.13

-- Sheen determination was not performed.

* The elevations of the top of the well covers have been surveyed to Mean Sea Level, per Caltrans Monument "Stro-Nor" PK Nail.

KEI-P89-1106.R10
December 21, 1992

TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
6/18/92	MW1	--	ND	ND	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND	ND
	MW5	ND	ND	ND	ND	ND	ND
12/20/91	MW1	--	ND	ND	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND	ND
	MW5	ND	ND	ND	ND	ND	ND
9/25/91	MW1	--	ND	ND	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND	ND
	MW5	ND	ND	ND	ND	ND	ND
6/12/91	MW1	--	ND	0.66	ND	ND	ND
	MW2	--	ND	ND	0.46	0.44	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	ND	ND	ND	0.48	ND
	MW5	--	ND	ND	ND	0.32	ND
3/11/91	MW1	--	ND	0.90	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	44	0.74	ND	0.15	3.2
	MW5	--	ND	ND	ND	ND	ND
12/12/90	MW1	--	34	1.6	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	ND	0.73	ND	ND	ND
	MW5	--	ND	ND	ND	ND	ND
8/27/90	MW1	--	ND	3.2	ND	ND	ND
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	1.1	0.50	0.89	0.54
	MW4	--	ND	0.34	ND	ND	ND
	MW5	--	ND	ND	ND	ND	ND

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
3/22/90	MW1	--	32	4.2	ND	1.1	0.36
	MW2	--	ND	ND	ND	ND	ND
	MW3	--	ND	ND	ND	ND	ND
	MW4*	--	ND	ND	ND	ND	ND

-- Indicates analysis was not performed.

ND = Non-detectable.

* Sample MW4 is a duplicate of sample MW2 (only on the date indicated).

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

KEI-P89-1106.R10
December 21, 1992

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
1/18/90	MW1(5)	5.0	2.8	0.051	ND	ND	0.11
	MW1(6.5)	6.5	ND	ND	ND	ND	ND
	MW1(10.0)	10.0	ND	ND	ND	ND	ND
	MW2(5)	5.0	ND	ND	ND	ND	ND
	MW2(6.5)	6.5	ND	ND	ND	ND	ND
	MW2(9.0)	9.0	ND	ND	ND	ND	ND
	MW2(10)	10.0	ND	ND	ND	ND	ND
	MW2(15)	15.0	ND	ND	ND	ND	ND
	MW2(16.5)	16.5	ND	ND	ND	ND	ND
	MW2(20)	20.0	ND	ND	ND	ND	ND
	MW3(5)	5.0	ND	ND	ND	ND	ND
	MW3(6.5)	6.5	ND	ND	ND	ND	ND
	MW3(9)	9.0	ND	ND	ND	ND	ND
8/13/90	MW4(5)	5.0	ND	ND	ND	ND	ND
	MW5(9.5)	9.5	ND	ND	ND	ND	ND
	MW5(13.5)	13.5	ND	ND	ND	ND	ND

ND = Non-detectable.

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

KEI-P89-1106.R10
December 21, 1992

TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
4/24/90	EB1(5)	ND	0.0063	0.042	0.011	ND
&	EB1(9.5)	4.9	0.0078	0.24	0.11	0.028
4/25/90	EB1(13.5)	ND	0.0087	0.048	ND	ND
	EB2(5)	ND	0.0053	0.020	0.013	0.0068
	EB2(10)	ND	0.0059	0.026	0.013	0.0050
	EB3(5)	ND	0.0069	0.031	0.017	ND
	EB3(9)	ND	0.0093	0.023	ND	ND
	EB4(5)	ND	0.0091	0.034	ND	ND
	EB4(10)	ND	0.0090	0.27	ND	ND
	EB4(14)	1.7	0.0079	0.43	ND	ND
	EB5(5)	ND	0.0095	0.015	ND	ND
	EB6(5)	5.0	0.066	0.021	0.11	0.032
	EB6(10)	ND	0.0086	0.060	0.014	0.0052
	EB6(13)	ND	0.0080	0.16	0.24	0.0092
	EB7(5)	3.0	0.040	0.056	0.073	0.034
	EB7(9.5)	ND	0.0081	0.078	0.025	0.015
	EB7(13.5)	ND	0.0054	0.085	0.012	ND
	EB8(5)	2.7	0.023	0.067	0.078	0.013
	EB8(10)	ND	0.0072	0.056	0.019	0.0050
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-P89-1106.R10
December 21, 1992

TABLE 5

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
3/09/90	SWB*	8.0	<10	37	0.10	0.10	0.74	0.25
	SWC*	9.0	ND	ND	ND	ND	ND	ND
	SWD*	9.0	<10	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 constituents were non-detectable.

ND = Non-detectable.

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

KEI-P89-1106.R10
December 21, 1992

TABLE 6

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
2/14/90	P1	4.0	87	0.33	0.17	10	2.3
	P2	2.5	6.0	0.23	ND	0.33	0.11
	P3	3.0	10	0.47	0.11	1.1	0.32
Detection Limits			1.0	0.05	0.1	0.1	0.1

ND = Non-detectable.

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

KEI-P89-1106.R10
December 21, 1992

TABLE 7

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
12/22/89	SW1(17)	11	ND	1,900	14	24	120	28
	SW2(17)	11	ND	1,500	17	29	92	23
	SW7	9	ND	1,700	16	33	110	26
	SW8	9	ND	200	2.6	0.9	7.7	5.0
	SW3(13)	9	ND	690	11	11	28	11
	SW9	9	ND	3.0	0.2	0.1	0.1	ND
	SW10	9	ND	500	4.0	5.9	22	6.9
	SW4(11)	9	ND	410	2.7	3.9	19	3.8
Detection Limits			1.0	1.0	0.1	0.1	0.1	0.1

ND = Non-detectable.

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

KEI-P89-1106.R10
December 21, 1992

TABLE 8

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
11/14/89	A1	13.5	ND	2.4	ND	ND	ND	ND
&	A2	13.5	ND	ND	ND	ND	ND	ND
11/16/89	B1	13.5	--	1.9	ND	ND	ND	ND
	B2	13.5	--	11	ND	ND	ND	ND
	C1	13.5	--	1.5	ND	ND	ND	ND
	C2	13.5	--	7.5	ND	ND	ND	ND
	SW1	10.5	--	140	0.31	0.12	3.0	0.88
	SW2	10.5	ND	ND	ND	ND	ND	ND
	SW3	10.5	ND	ND	ND	ND	ND	ND
	SW4	9.5	24	160	0.33	6.4	30	9.4
	SW5	9.5	--	3.5	0.06	0.27	0.76	0.19
	SW6	10	--	29	0.12	0.21	2.0	0.58
	WO1(11)*	11	ND	5.9	ND	ND	ND	ND
Detection Limits			1.0	1.0	0.05	0.1	0.1	0.1

ND = Non-detectable.

-- Indicates analysis was not performed.

* TOG and all EPA method 8270 constituents were non-detectable. All EPA method 8010 constituents were non-detectable, except 1,1-dichloroethene at 55 ppb. Metal concentrations were as follows: cadmium was detected at 2.5 ppm, chromium at 39 ppm, lead at 1.1 ppm, and zinc at 45 ppm.

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

TABLE 9

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
11/16/89	W1	11,000	26,000	670	1,100	9,100	120
4/25/90	EB5	--	5,900	840	34	73	100
Detection Limits		50	30	0.30	0.30	0.30	0.30

-- Indicates analysis was not performed.

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

NOTE: The water sample from EB5 was collected during drilling. The results of the analyses may not be representative of formation water; they should be used for comparative informational purposes only.

KEI-P89-1106.R10
December 21, 1992

TABLE 10

LISTING OF WATER WELL LOCATIONS WITHIN A
HALF-MILE RADIUS OF UNOCAL SERVICE STATION #3072

Site #	Well Identification #	Owner	Well Location	Well Use	Well Depth (feet)	Depth to Water (feet)
1	3S/2W/4Q1	Thrifty Oil Company	2504 Castro Valley Blvd. Castro Valley	MW	26	10-15
	3S/2W/4Q2	" " "	" " " "	MW	26	10-15
	3S/2W/4Q3	" " "	" " " "	MW	26	10-15
	3S/2W/4Q4	" " "	" " " "	MW	26	10-15
	3S/2W/4Q5	" " "	" " " "	MW	26	10-15
	3S/2W/4Q6	" " "	" " " "	MW	26	10-15
	3S/2W/4Q7	" " "	" " " "	MW	26	10-15
2	3S/2W/4R1	Shell Oil Company	2724 Castro Valley Blvd. Castro Valley	MW	20	1.9-2
	3S/2W/4R2	" " "	" " " "	MW	20	1.9-2
	3S/2W/4R3	" " "	" " " "	MW	20	1.9-2
	3S/2W/4R4	" " "	" " " "	MW	20	1.9-2
	3S/2W/4R5	" " "	" " " "	MW	20	1.9-2
3	3S/2W/4K	Eden Township Hospital	20103 Lake Chabot Road Castro Valley	DOM	150	110

MW = Monitoring Well
DOM = Domestic Well

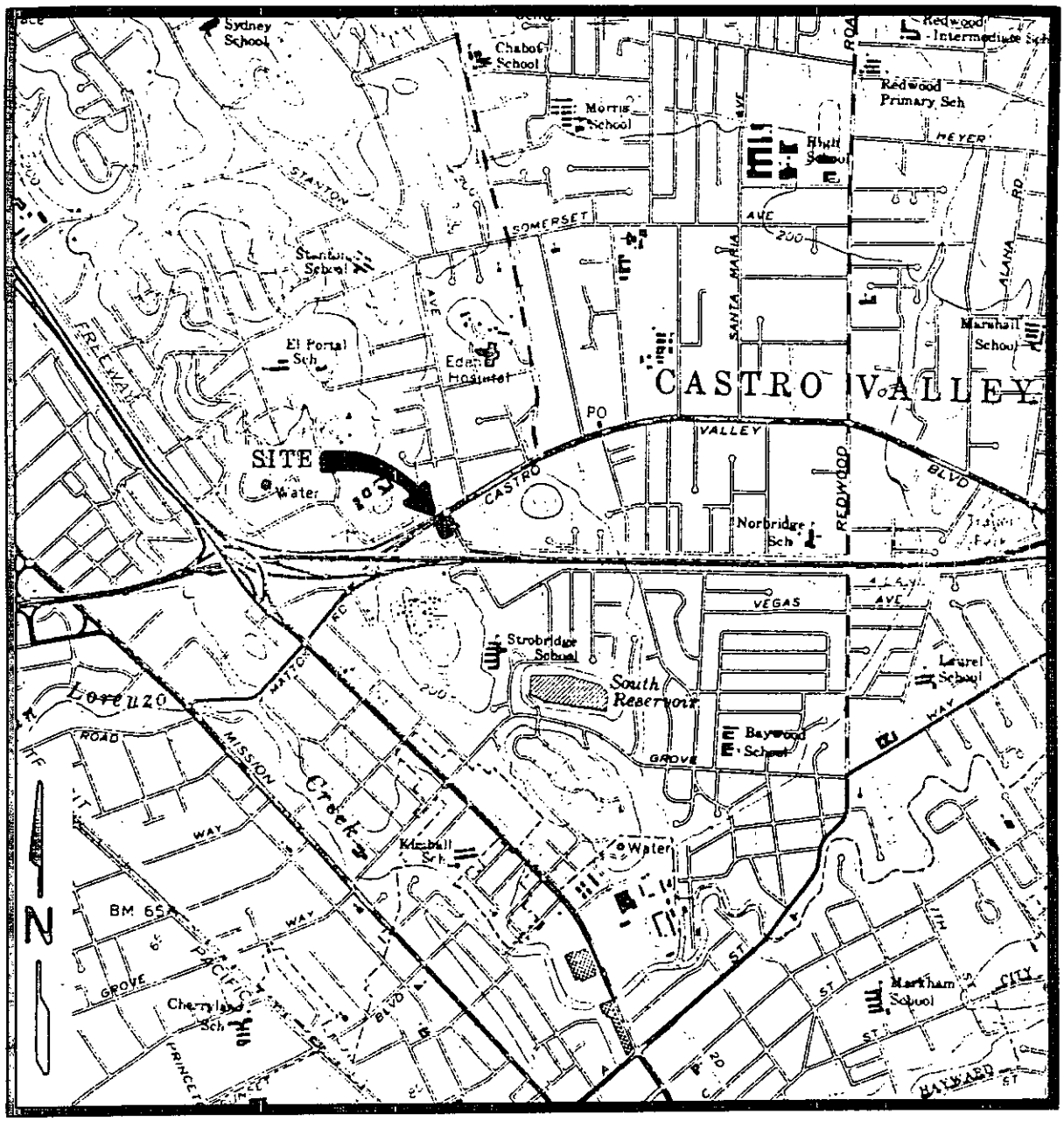
REPORT REFERENCE LIST

The following is a chronological listing of all the technical reports and proposals that have been prepared by KEI and submitted to Unocal Corporation and the regulatory agencies:

REPORT TITLE	REPORT DESCRIPTION	KEI REPORT NUMBER	REPORT DATE
Semi-Annual Report	January-June 1992 Monitoring and Sampling Results	KEI-P89-1106.QR6	7/23/92
Quarterly Report	October-December 1991 Monitoring and Sampling Results	KEI-P89-1106.QR5	1/20/92
Quarterly Report	July-September 1991 Monitoring and Sampling Results	KEI-P89-1106.QR4	10/31/91
Quarterly Report	April-June 1991 Monitoring and Sampling Results	KEI-P89-1106.QR3	7/15/91
Quarterly Report	January-March 1991 Monitoring and Sampling Results	KEI-P89-1106.QR2	4/15/91
Quarterly Report	September-December 1990 Monitoring and Sampling Results	KEI-P89-1106.QR1	1/21/91
Continuing Ground Water Investigation	Monitoring Well (MW4 and MW5) Installation	KEI-P89-1106.R9	9/28/90
Work Plan/Proposal	Proposal for the Installation of Two Monitoring Wells	KEI-P89-1106.P3	6/11/90
Continuing Subsurface Investigation	Exploratory Boring (EB1-EB8) Investigation	KEI-J89-1106.R8	6/11/90
Follow-up Soil Sampling Report	Waste Oil Tank Pit Soil Sampling	KEI-J89-1106.R6	4/13/90

REPORT REFERENCE LIST (Continued)

REPORT TITLE	REPORT DESCRIPTION	KEI REPORT NUMBER	REPORT DATE
Preliminary Ground Water Investigation	Monitoring Well (MW1-MW3) Installation	KEI-J89-1106.R7	4/12/90
Follow-up Soil Sampling Report	Product Pipe Trench Soil Sampling	KEI-J89-1106.R5	3/06/90
Stockpiled Soil Sampling Report	Fuel Tank Pit and Pipe Trench Stockpiled Soil Sampling	KEI-J89-1106.R4	2/09/90
Waste Oil Stockpiled Soil Sampling	Waste Oil Tank Pit Stockpiled Soil Sampling	KEI-J89-1106.R3	1/12/90
Stockpiled Soil Sampling	Fuel Tank Pit Stockpiled Soil Sampling	KEI-J89-1106.R2	1/12/90
Work Plan/Proposal	Fuel Tank Pit and Waste Oil Tank Pit Soil Excavation Sampling Results; Proposal for Installation of Monitoring Wells and Exploratory Borings	KEI-P89-1106.P2	1/08/90
Stockpiled Soil Sampling	Fuel Tank Pit Stockpiled Soil Sampling	KEI-J89-1106.R1	12/05/89
Work Plan/Proposal	Fuel Tank Pit and Waste Oil Tank Pit Soil Sampling; Proposal for Fuel Tank Pit Soil Excavation	KEI-J89-1106.P1	11/30/89

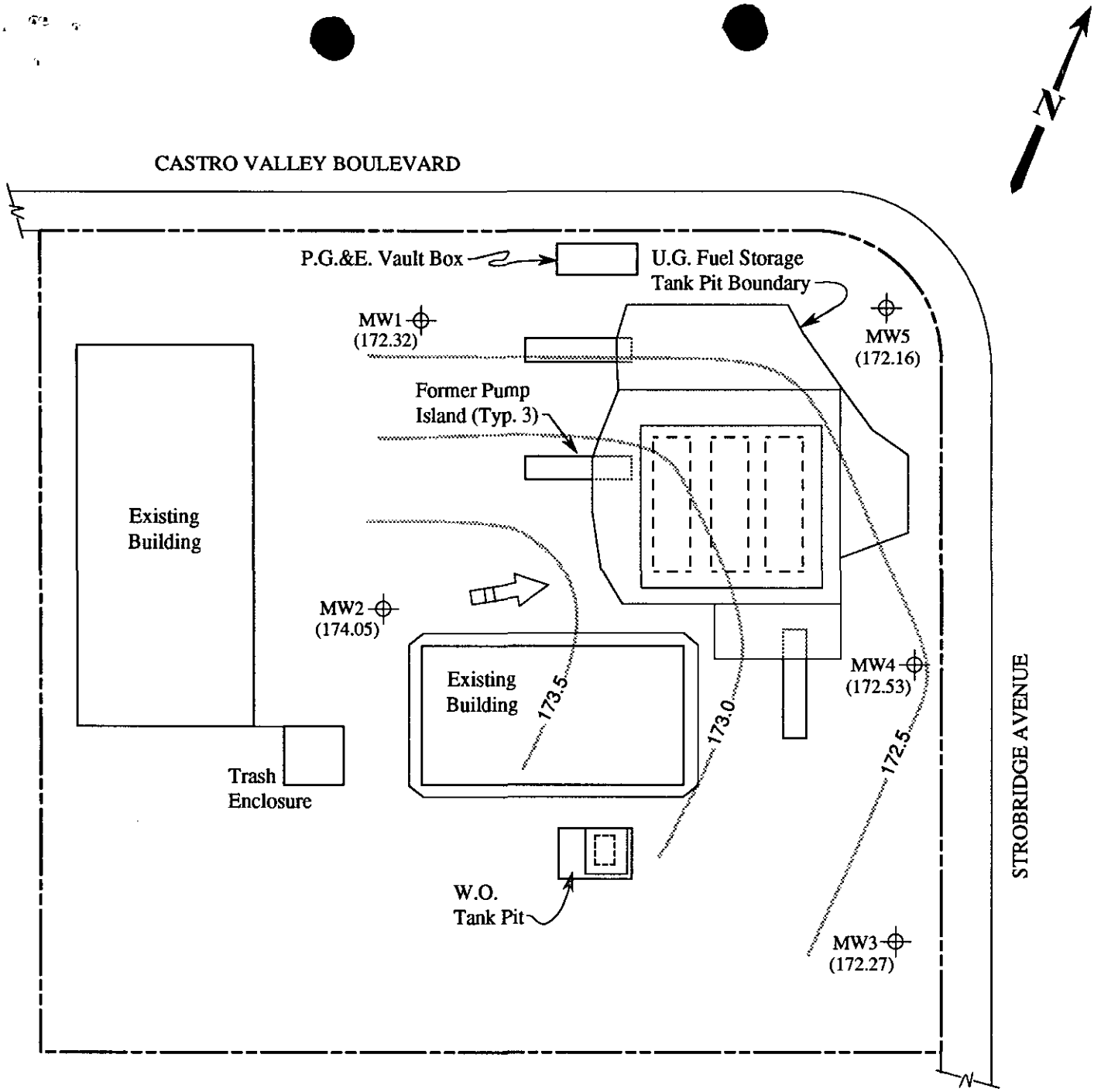


Base modified from 7.5 minute U.S.G.S. Hayward Quadrangle
(photorevised 1980)

0 2000 4000

Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	**UNOCAL SERVICE STATION #3072** **2445 CASTRO VALLEY BLVD.** **CASTRO VALLEY, CA**	**LOCATION MAP**



LEGEND

- Monitoring well
- ( ) Ground water elevation in feet above Mean Sea Level
- Direction of ground water flow
- Contours of ground water elevation

0 30 60

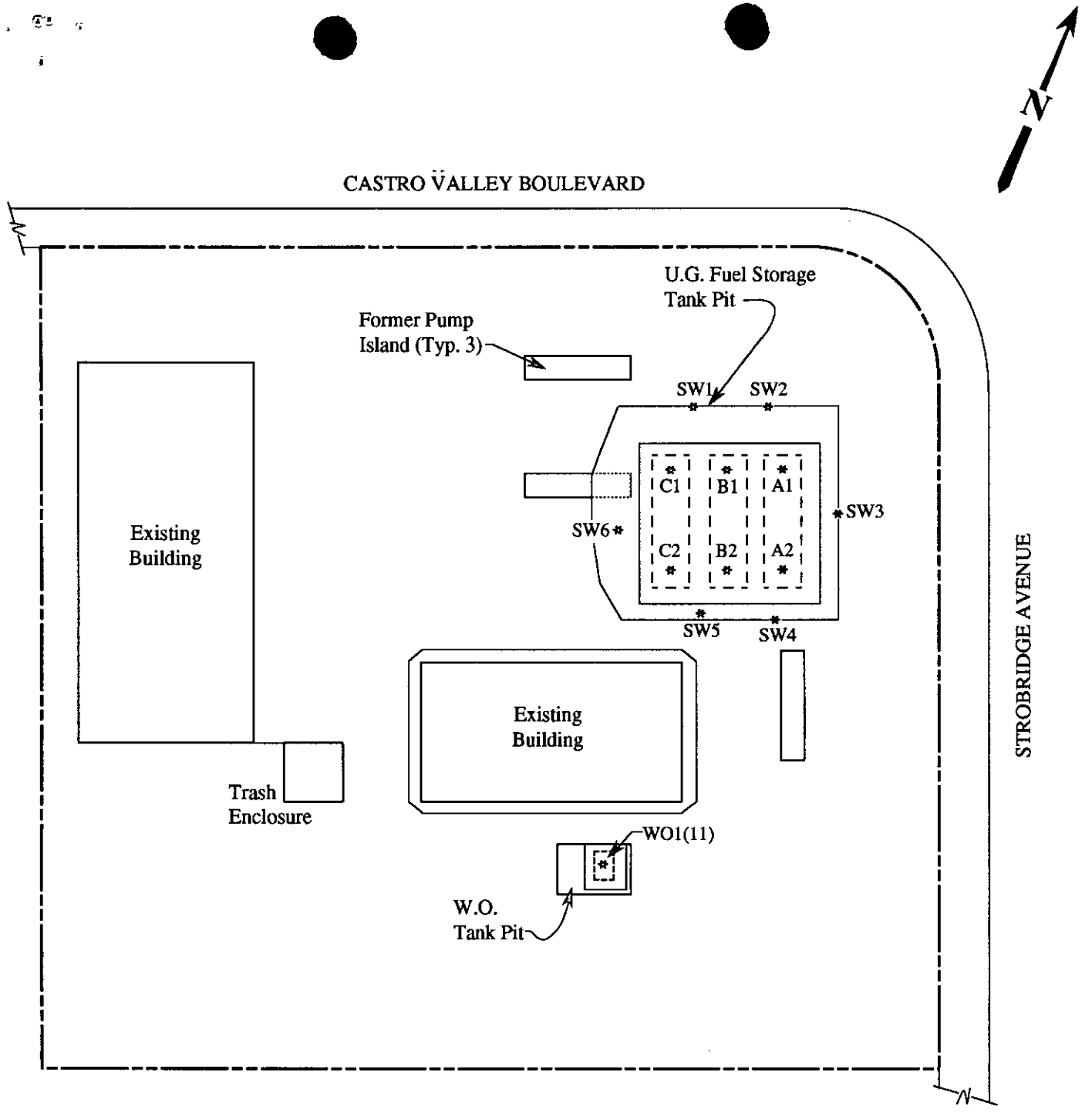
Approx. scale feet

POTENTIOMETRIC SURFACE MAP FOR THE JUNE 18, 1992 MONITORING EVENT

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
1



LEGEND

* Sample Point Location

0 30 60

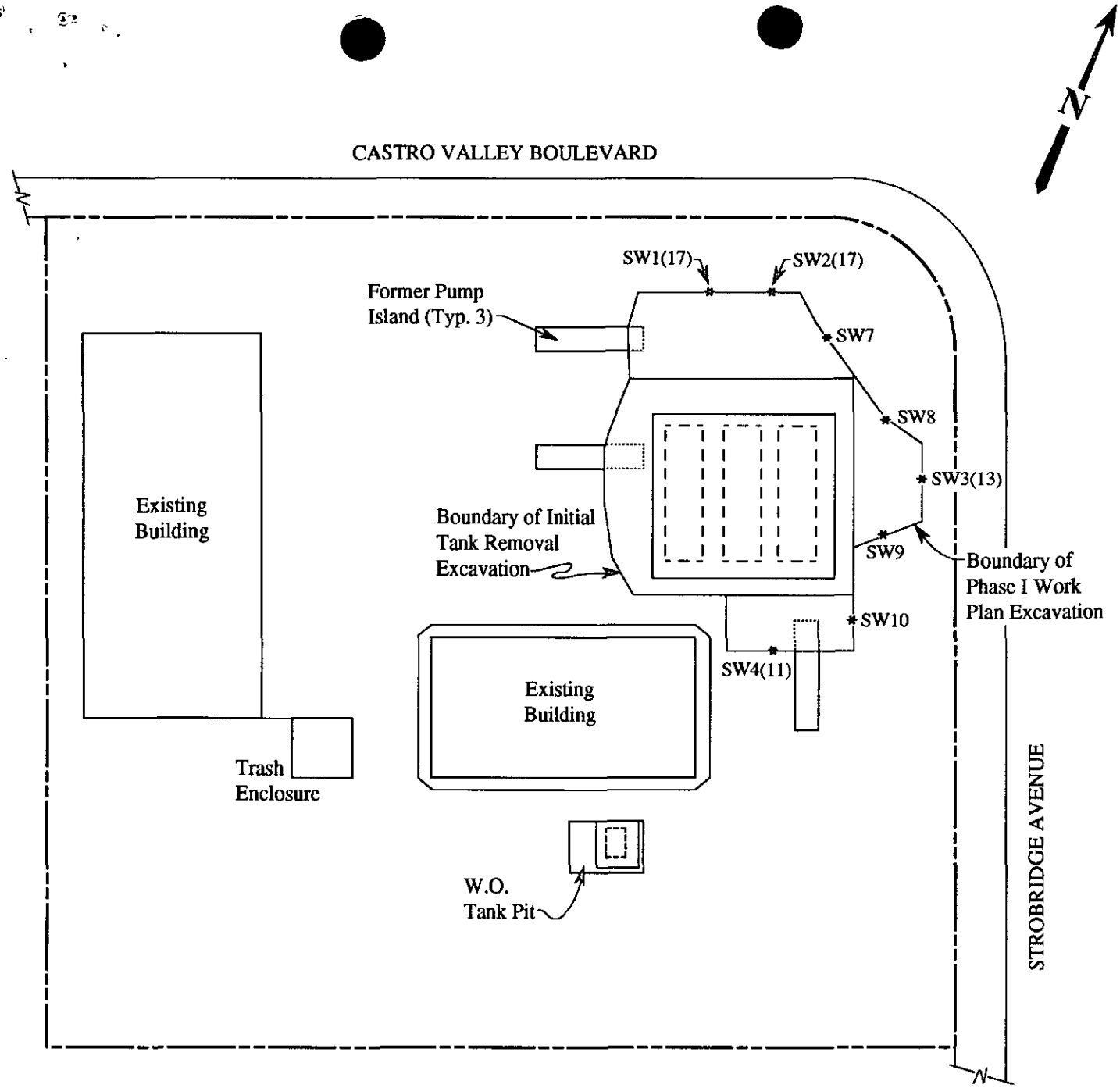
Approx. scale feet

SOIL SAMPLE POINT LOCATION MAP

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
2



LEGEND

* Sample Point Location

0 30 60

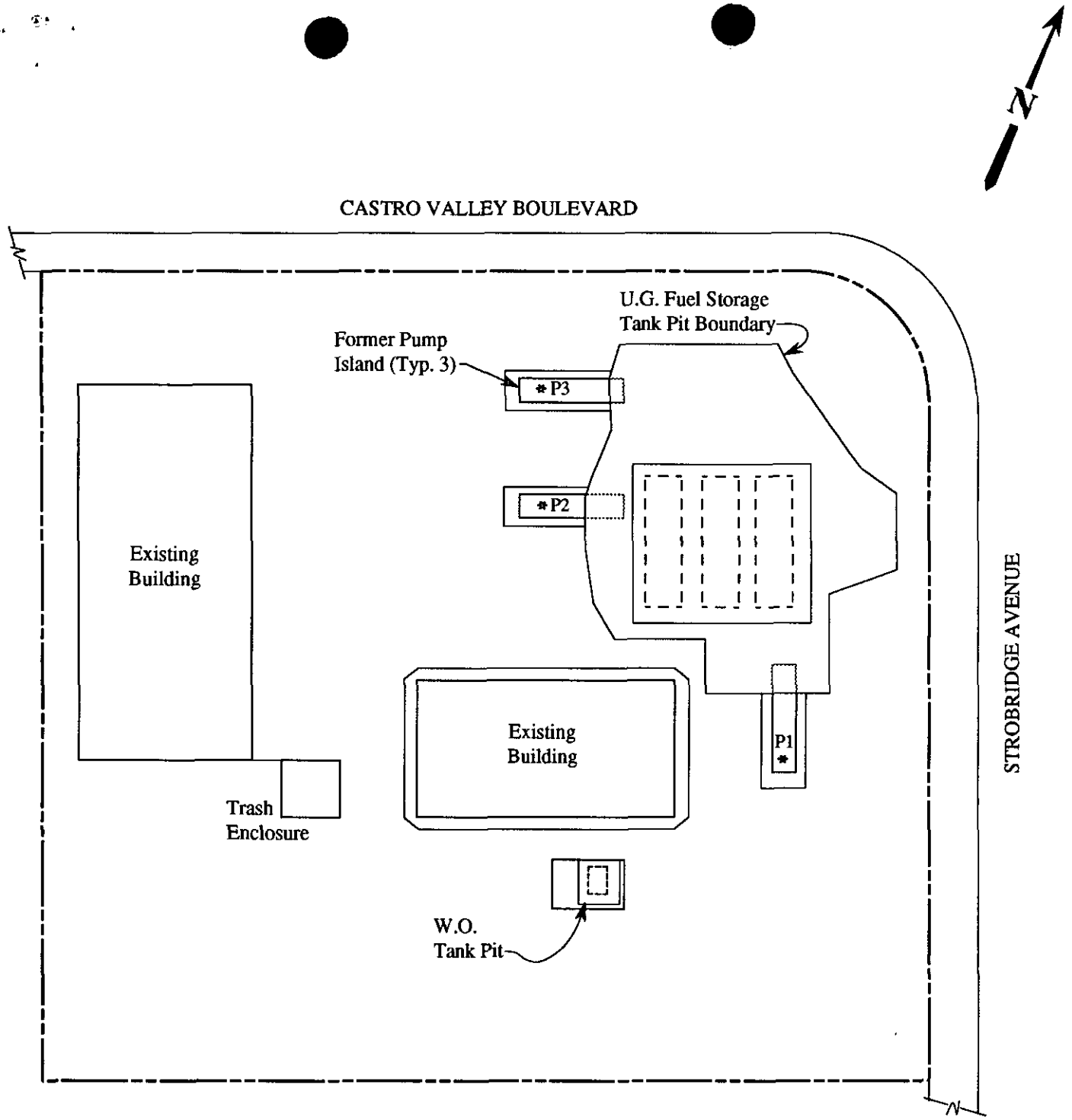
Approx. scale feet

SOIL SAMPLE POINT LOCATION MAP

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
3



LEGEND

* Sample Point Location

0 30 60

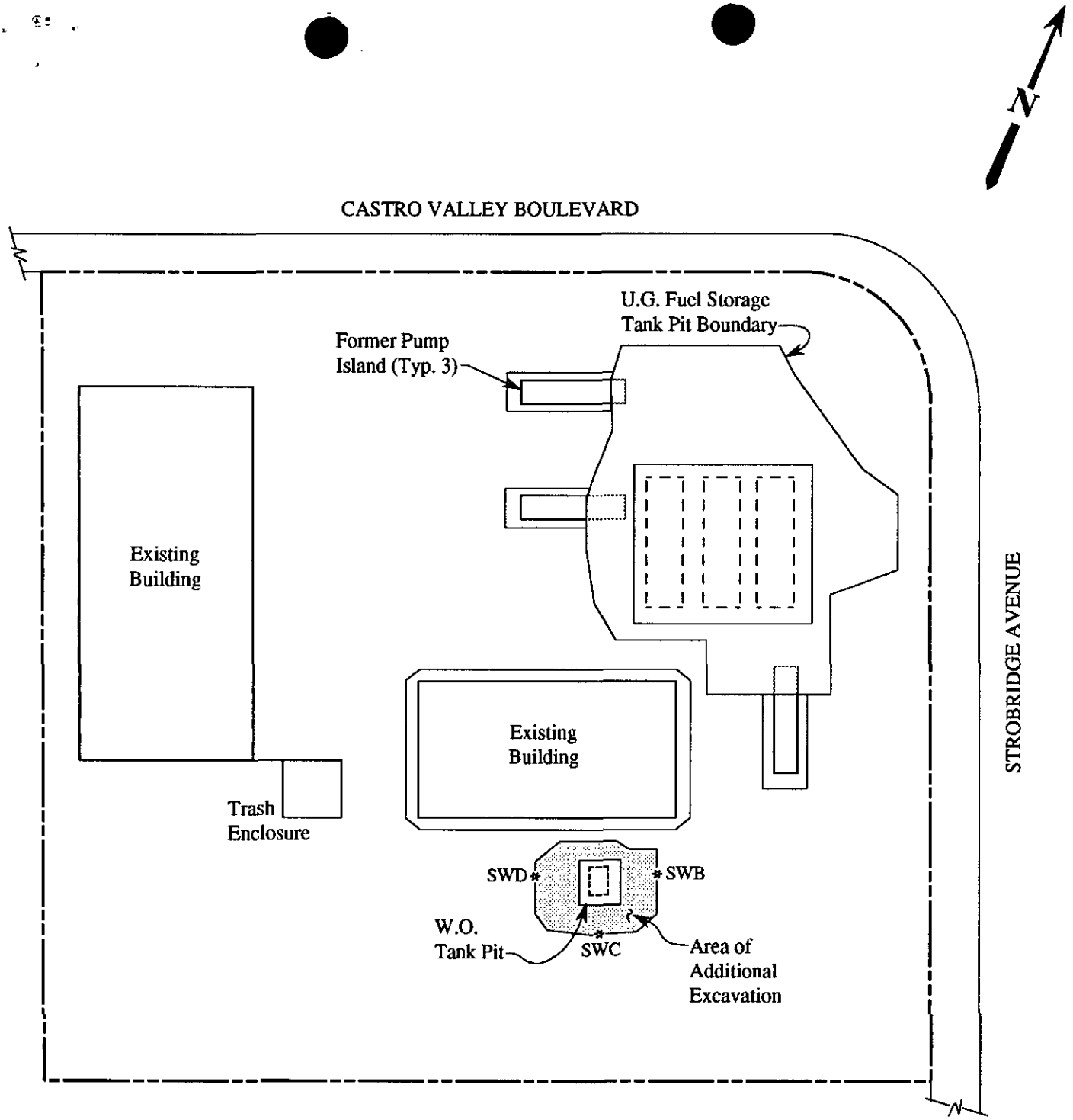
Approx. scale feet

SOIL SAMPLE POINT LOCATION MAP

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
4



LEGEND

* Sample Point Location

0 30 60

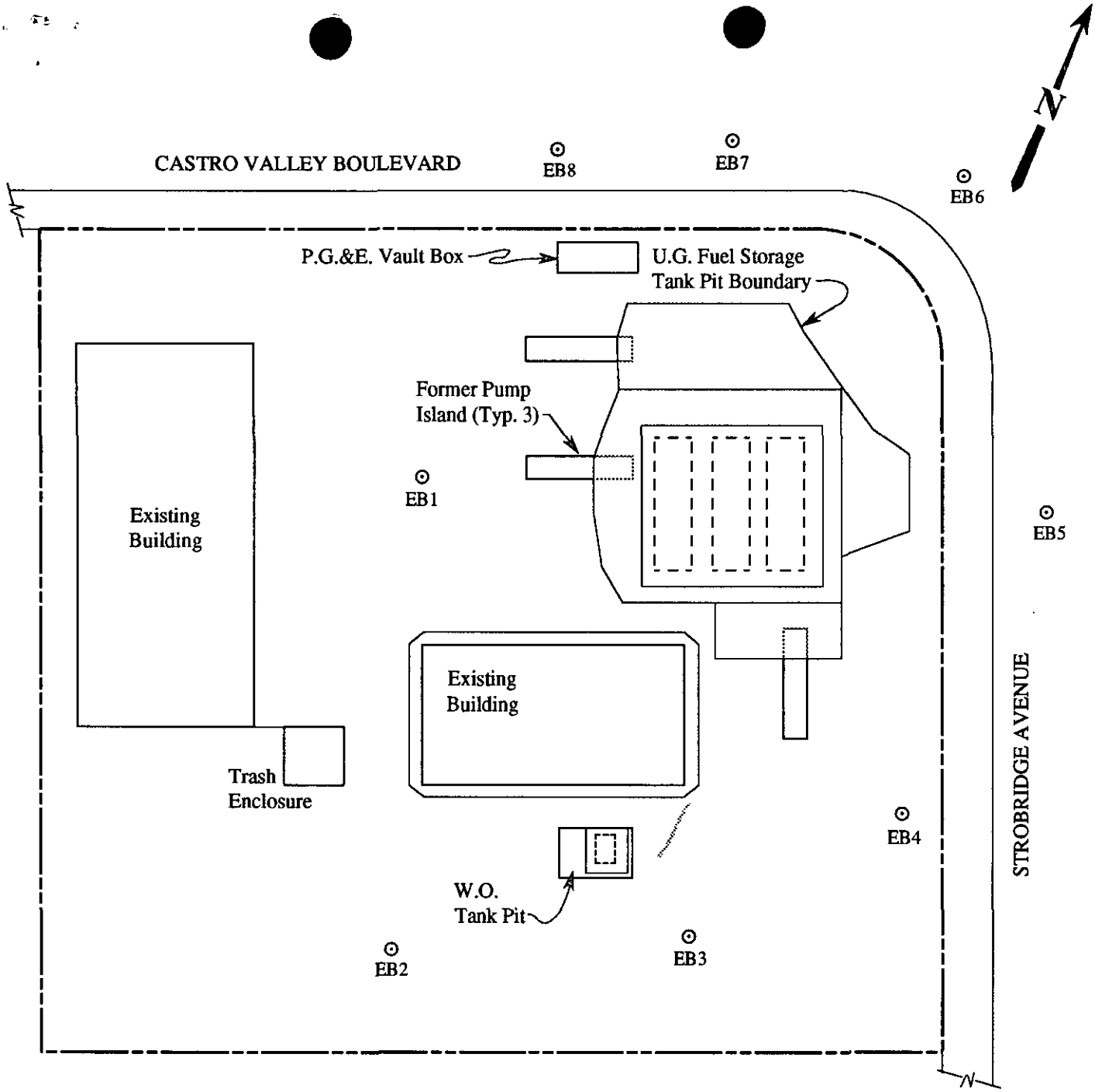
Approx. scale feet

SOIL SAMPLE POINT LOCATION MAP

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
5



LEGEND

⊙ Exploratory boring

0 30 60

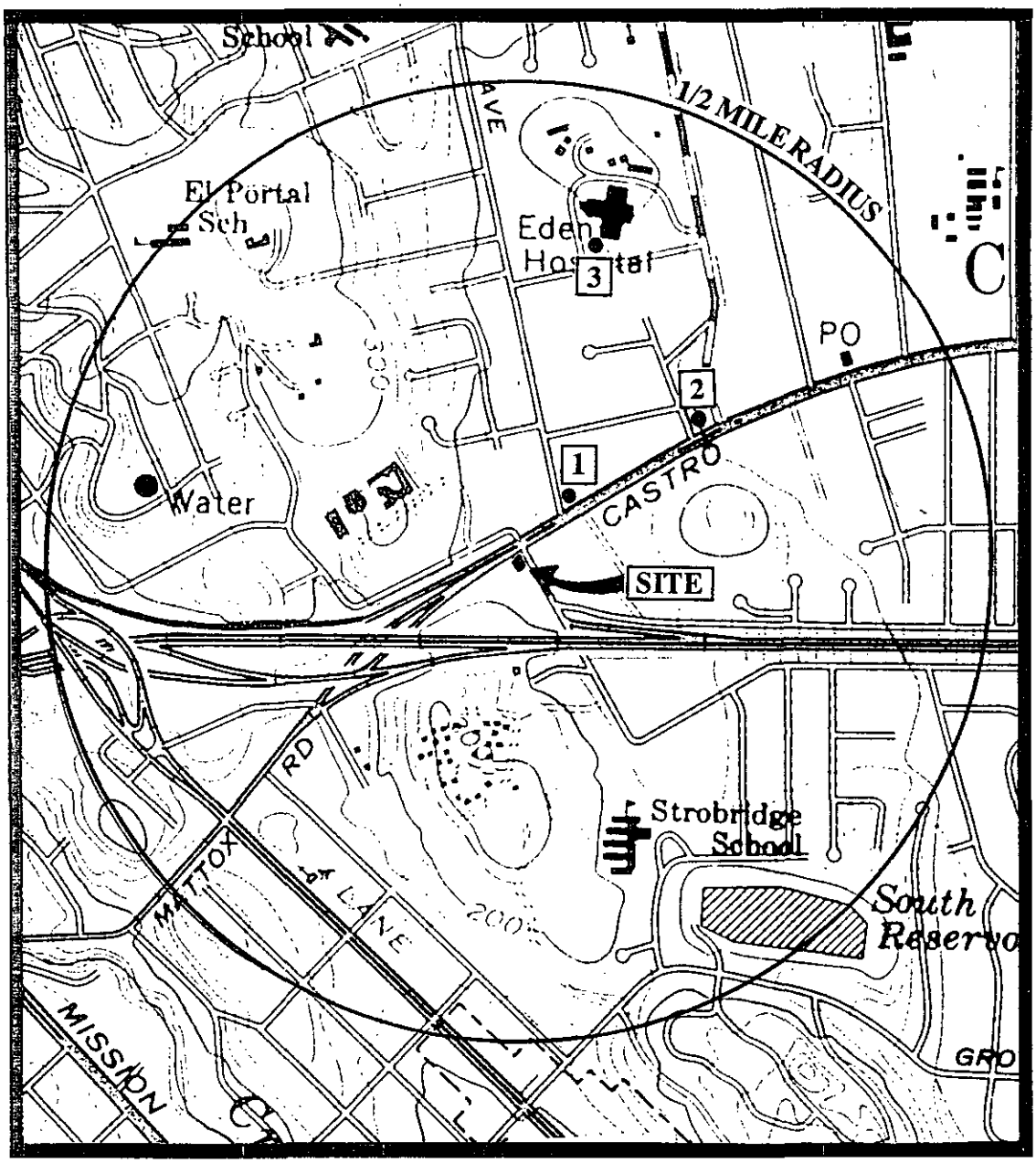
Approx. scale feet

EXPLORATORY BORING LOCATIONS

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #3072
2445 CASTRO VALLEY BLVD.
CASTRO VALLEY, CA

FIGURE
6



LEGEND

o Sites with water wells located within a 1/2 mile radius of site

0 1000 2000

Approx. scale feet

WATER WELL LOCATIONS		
KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #3072 2445 CASTRO VALLEY BLVD. CASTRO VALLEY, CA	FIGURE 7

APPENDIX A
SOIL SAMPLING METHODOLOGY

SOIL SAMPLING METHODS:

I. For Exploratory Borings

Soil samples were collected for laboratory analysis and for lithologic logging purposes at a maximum spacing of 5 foot intervals, at significant changes in lithology, at obvious areas of contamination, and at the soil-bedrock/water table interface, beginning at a depth of approximately 5 feet below grade. Sampling continued until the first water table was encountered. Classification of soil was done using the Unified Soil Classification System (USCS) by KEI's field engineer or geologist. Undisturbed soil samples were collected in a California-modified split-spoon sampler (lined with two-inch diameter brass liners). The sampler was advanced ahead of the drilling augers at designated depths by dropping a 140 pound hammer 30 inches. Blow counts were recorded. The samples were removed from the sampler, retained in the brass liners, and sealed with aluminum foil, plastic caps and tape. They were then labeled and stored in a cooler, on ice, for delivery to a state-certified laboratory. Properly executed Chain of Custody documentation accompanied all samples.

California-modified split-spoon samplers and brass tubes were decontaminated prior to each use with a trisodium phosphate solution wash followed by a water rinse. Hollow-stem augers were steam cleaned prior to each use. Water from the steam cleaning was contained and placed in DOT-approved 55-gallon drums, pending appropriate disposal.

II. For Well Installations

Soil samples were collected for laboratory analysis and for lithologic logging purposes at a maximum spacing of 5 foot intervals, at significant changes in lithology, at obvious areas of contamination, and at or within the soil/ground water interface, beginning at a depth of approximately 5 feet below grade and continuing until ground water was encountered. Soil sampling conducted below the ground water table was for lithologic logging purposes only. The undisturbed soil samples were collected by driving a California-modified split-spoon sampler (lined with brass liners) ahead of the drilling augers. The two-inch diameter brass liners holding the samples were sealed with aluminum foil, plastic caps and tape, labeled, and stored in a cooler, on ice, until delivery to a state-certified laboratory.

III. For Tank Removal

Soil samples were collected from beneath all of the tanks and from the sidewalls of the tank pits. The sidewall soil samples collected from the fuel tank pit were collected approximately 6 to 12 inches above the water level (11.5 feet below grade) encountered in the tank pit. The sidewall soil samples collected from the waste oil tank pit were collected at depths of 8 to 9 feet below grade. The undisturbed soil samples were collected from bulk material excavated by backhoe. Soil samples were placed in clean, two-inch diameter brass tubes, sealed with aluminum foil, plastic caps and tape, and then stored in a cooled ice chest for delivery to a state-certified laboratory. Properly executed Chain of Custody documentation accompanied all samples.

APPENDIX B
MONITORING WELL DESIGN, INSTALLATION, DEVELOPMENT

WELL INSTALLATION AND DEVELOPMENT

Monitoring wells were drilled by using truck mounted eight-inch outside diameter hollow-stem auger drilling equipment. Permits were obtained from the Alameda County Department of Environmental Management prior to beginning work. The wells were drilled, constructed, and completed in accordance with the guidelines of the Regional Water Quality Control Board (RWQCB) and the California Well Standards (per Bulletin 74-90). The subsurface materials penetrated and the depths at which soil samples were collected were shown on the Boring Logs attached to the well installation report.

The wells were drilled 10 to 15 feet into the saturated zone of the first encountered ground water, unless a 5 foot thick clay aquitard was encountered first, at which time drilling was terminated. Each well casing was installed with a watertight cap and padlock. A round, watertight, flush-mounted well cover was cemented in place over each well casing.

The wells were developed by the use of a surface pump approximately one week after well completion. The wells were pumped until expelled water was clear and free of turbidity. Effluent generated during well development was contained in DOT-approved drums and hauled from the site by a licensed hazardous materials hauler.

The elevations of the well covers were surveyed by a licensed land surveyor to Mean Sea Level and to a vertical accuracy of 0.01 feet.

Prior to development, the wells were checked for depth to the water table (by the use of an electronic sounder), the presence of free product (by the use of an interface probe or paste tape), and sheen.

WELL DESIGN

Casing Type: Schedule 40 PVC, flush threaded joints, 0.02 inch factory slot, two-inch diameter. Screen ran from total depth of the well to approximately 5 feet above the depth of the first encountered ground water. Monterey sand (#3) fills the annular space from total depth to 2 feet above the perforated casing interval. A 2-foot thick bentonite seal was placed in the annular space on top of the sand pack. Neat cement grout was placed on top of the bentonite seal to the surface. A typical well completion diagram is attached to this Appendix.

Drilled cuttings were stored on-site in DOT-approved, 55-gallon drums, or under visqueen, until appropriate disposal could be determined.

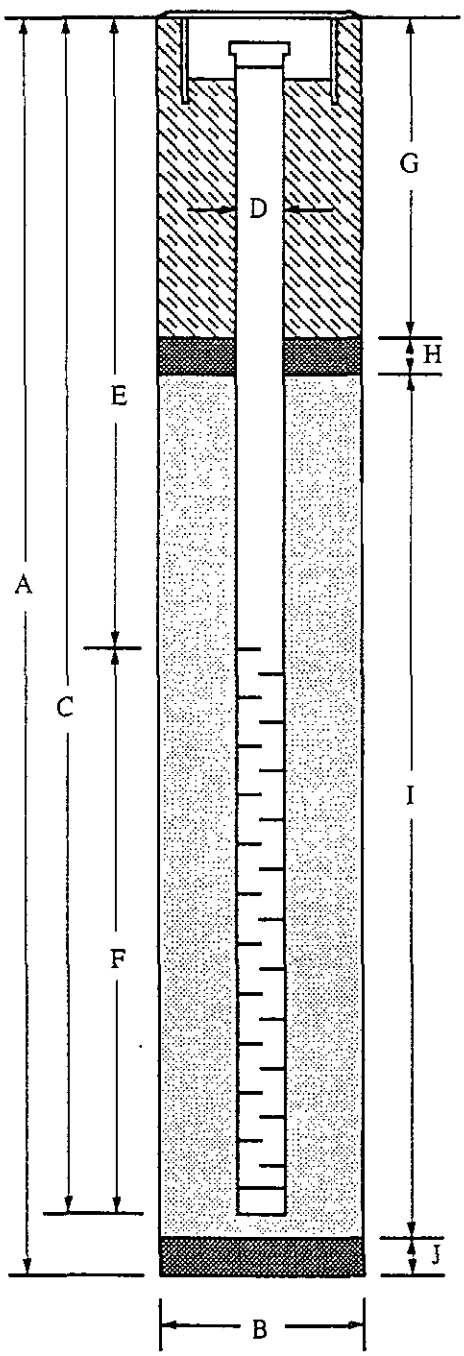
WELL COMPLETION DIAGRAM

PROJECT NAME: _____ WELL NO. _____

PROJECT NUMBER: _____

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth : _____

B. Boring Diameter: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: _____

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: _____

F. Perforated Length: _____

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: _____

Seal Material: Neat Cement

H. Seal: _____

Seal Material: Bentonite

I. Filter Pack: _____

Pack Material: RMC Lonestar Sand

Size: _____

J. Bottom Seal: None

Seal Material: N/A

APPENDIX C
GROUND WATER SAMPLING METHODOLOGY

GROUND WATER MONITORING CONDUCTED PRIOR TO SAMPLING

Wells were checked for the depth to the water table (by the use of an electronic sounder) and the presence of free product (by the use of an interface probe and/or paste tape) prior to both development and sampling. After depth to water and free product measurements were performed, a test for the presence of sheen was conducted. A transparent bailer was lowered into the well in such a manner that only part of the bailer was submerged. Water was withdrawn from the well and then transferred into a clean glass container, and the surface of the water in the container was then observed for the presence of "sheen" as determined by the presence of iridescence (rainbow effect) on the top of the water. A copy of the well monitoring/sampling form used in the field is attached.

Well Purging

In order to obtain a representative sample of the water in the aquifer being sampled, stagnant water in the well casing must be removed to permit well recharge with non-stagnant aquifer water. The removal of stagnant water is accomplished by the removal of the water to the surface where it is either disposed of or stored for future disposal.

The purging rate used at a particular monitoring well depends on the expected or known hydraulic yield of the well.

In moderate to high yield formation wells the purging device is placed near the top of the screened interval of the well, to ensure that non-stagnant formation water will move upward in the screened interval. When purging low yield formation wells, water is removed from the bottom of the screened interval.

When purging low-yield wells (wells which yield less than 3 casing volumes), the wells are purged to dryness once. As soon as the well has recovered to a volume sufficient for sampling, samples are collected. At no time are wells purged to dryness if the rate of recharge is such that formation water will cascade down the sides of the casing.

GROUND WATER SAMPLING METHODOLOGY

The wells were purged with a surface pump or bailer of a minimum of four casing volumes prior to sampling, at least 72 hours after development. A well monitoring/sampling field log is attached to this appendix. Samples were collected by the use of a clean Teflon bailer and were promptly decanted into 40 ml VOA vials and/or one-liter amber bottles (as appropriate). Vials and/or bottles were sealed with Teflon-lined screw caps, labeled, and stored in a cooler, on ice, for delivery to a state-certified laboratory. Properly executed Chain of Custody documentation accompanied all samples. A typical Chain of Custody documentation form is attached to this Appendix. The sampling bailer was cleaned with a non-phosphate soap and a clean water rinse prior to each use.

Standardization of field equipment is done at the beginning of each use, according to manufactures' specifications and consistent with methods described in EPA SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods.

All samples are collected in an order such that those parameters most sensitive to volatization will be sampled first. A general order of collection for some common ground water parameters follows:

- Volatile Organics Compounds (VOC's)
- Total Organic Halogens (TOX)
- Total Organic Carbon (TOC)
- Total Metals
- Dissolved Metals
- Phenols
- Sulfate and Chloride
- Turbidity
- Nitrate and Ammonia

All samples are collected in such a manner as to minimize the volatilization or oxidation of a sample due to agitation during transference from pump or bailer to sample container. When a bladder pump is used for the collection of volatile compounds, the flow rate are adjusted to provide a constant flow stream of approximately 100 milliliters/minute. After samples for volatile compounds have been collected, higher flow rates may be used, particularly if large volumes are necessary. The sampling flow rates never exceeds the flow rate during the purging process.

The sample preservation, holding time, analytical method, sample container, and detection limits for the various soil and ground water analyses conducted are shown on the attached Table 1.

APPENDIX C
TABLE 1

SAMPLE ANALYSIS METHODS, DETECTION LIMITS, CONTAINERS, HOLDING TIMES, AND PRESERVATION

PARAMETER	ANALYTICAL METHOD	DETECTION LIMITS	SAMPLE CONTAINER	HOLDING TIME	PRESERVATION
Total Petroleum Hydrocarbons (TPH) as gasoline	EPA method 5030/ modified 8015 (soil and water)	1.0 ppm (soil)	2-inch diameter brass liners	14 days	4°C
		30 ppb (water)	40 ml glass vial, Teflon-lined screw cap	14 days	4°C + HCL
TPH as diesel	EPA method 3550/ modified 8015 (soil)	1.0 ppm	2-inch diameter brass liners	7 days BE 40 days AE	4°C
	EPA method 3510/ modified 8015 (water)	50 ppb	1 liter amber bottle, Teflon-lined screw cap	14 days BE 40 days AE	4°C
Benzene, Toluene, Xylenes, and Ethyl-benzene (BTX&E)	EPA method 8020 (soil and water)	0.005 ppm (soil)	2-inch diameter brass liners	14 days	4°C
		0.30 ppb (water)	40 ml glass vial, Teflon-lined screw cap	14 days	4°C + HCL
Total Oil and Grease (TOG)	EPA method 418.1 (soil)	30 ppm	2-inch diameter brass liners	28 days	4°C
Halogenated Volatile Organics (chlorinated solvents)	EPA method 8010 (soil and water)	5-10 ppb (soil)	2-inch diameter brass liners	14 days	4°C
		0.5 ppb (water)	40 ml glass vial, Teflon-lined screw cap	14 days	4°C

APPENDIX C
TABLE 1 (Continued)

SAMPLE ANALYSIS METHODS, DETECTION LIMITS, CONTAINERS, HOLDING TIMES, AND PRESERVATION

PARAMETER	ANALYTICAL METHOD	DETECTION LIMITS	SAMPLE CONTAINER	HOLDING TIME	PRESERVATION
Semi-Volatile Organics by GC/MS	EPA method 8270 (soil)	100-500 ppb (soil)	2-inch diameter brass liners	14 days BE 40 days AE	4°C
Metals (cadmium, chromium, lead, nickel, and zinc)	ICP by EPA method 6010 (soil)	0.05-0.5 ppm (soil)	2-inch diameter brass liners	6 months	N/A

BE = Before extraction
AE = After extraction

KAPREALIAN ENGINEERING
INCORPORATED

WELL MONITORING/SAMPLING

NAME: _____ DATE: _____

FACILITY NAME AND ADDRESS: _____

_____

FIELD ACTIVITIES

DEVELOPING MONITORING PURGING (PUMP/BAIL) SAMPLING

WELL NO.	DEPTH TO WATER			WELL DEPTH	PRODUCT THICKNESS	SHEEN		VOLUME PURGED	
	BEFORE PURGING		AFTER PURGING			YES	NO	WATER	PRODUCT
	TIME	READING							

REMARKS: WMS1

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

KAPREALIAN ENGINEERING
INCORPORATED

CHAIN OF CUSTODY

SAMPLER	SITE NAME & ADDRESS	ANALYSES REQUESTED	TURN AROUND TIME:
WITNESSING AGENCY			REMARKS

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
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?
2. Will samples remain refrigerated until analyzed?
3. Did any samples received for analysis have head space?
4. Were samples in appropriate containers and properly packaged?

Signature _____ Title _____ Date _____

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602