RO 145
no FYP

CAMBRIA

November 22, 2005

Mr. Jerry Wickham
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: **Feasibility Study Work Plan**
Former Shell Service Station
2703 Martin Luther King Jr. Way
Oakland, California
SAP Code 129449
Incident No. 97093397

Dear Mr. Wickham:

Cambria Environmental Technology, Inc. (Cambria) prepared this *Feasibility Study Work Plan* on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell). This work plan is being submitted, as proposed in Cambria's November 15, 2005 *Site Investigation Report,* to conduct a dual-phase extraction (DPE) feasibility study.

SITE LOCATION AND DESCRIPTION

The site is a former service station located on the northwest corner of Martin Luther King Jr. Way and 27th Street in a commercial and residential area of Oakland, California (Figure 1). The site layout consisted of a service station building, two dispenser islands, three underground fuel storage tanks (USTs), associated product piping, and a waste oil UST (Figure 2). The station building is currently being used as a repair shop and has two service bays.

SITE BACKGROUND

Site Use: A Shell service station operated on the property from approximately 1959 to 1979. Three fuel underground storage tanks (USTs) associated with the former Shell service station were removed after Shell terminated operations at the site.

In 1979, Acme West Ambulance Company (Acme) purchased the site and installed a 2,000-gallon UST for gasoline storage. Acme sold the property to Auto-Tech West (ATW) in 1986. According to an August 25, 1986 ACHCSA inspector's report, ATW reportedly never used the UST, although a 150-gallon aboveground waste oil tank, a 15-gallon carburetor cleaner tank, and a parts cleaning tank with solvent were reportedly in use.

Cambria Environmental Technology, Inc.

270 Perkins Street
Sonoma, CA 95476
Tel (707) 935-4850
Fax (707) 935-6649

Currently, the site is occupied by ATW and is utilized as an automotive repair shop. The current site operator uses the northwest corner of the property and the wooden car port for storage of such things as non-operational automobiles, portable gasoline containers, tires, and drums which are possibly used for waste oil collection and storage.

1994 UST Removal: The 2,000-gallon UST was removed on October 11, 1994 by KTW & Associates on behalf of ATW. Two soil samples (TP-1-N and TP-2-S) were collected from beneath the tank (Figure 2). Chemical analysis of the soil samples identified the presence of total petroleum hydrocarbons as gasoline (TPHg) at concentrations ranging from 870 parts per million (ppm) to 18,000 ppm. Benzene concentrations in these samples ranged from 2.9 ppm to 100 ppm. The tank pit remained open until March 19, 1996 when the excavation was back-filled subsequent to over-excavation by a Shell contractor.

1995 Phase I Environmental Site Assessment (ESA): In August and September 1995, Enviros Inc. (Enviros) performed a Phase I ESA for this site. Available information collected during this ESA indicates that the subject property was occupied by residential housing prior to approximately 1959. A building permit to erect a building was obtained for Shell Oil Company in February 1959. A building permit to "close lube bays with sheet metal panels" was secured for Shell Oil Company in July 1976.

In 1979, several building permits were secured for Acme to modify existing site structures. Two building permits were secured in 1979 related to the installation of a fuel pump at the site.

During a site survey in conjunction with the Phase I ESA, an excavation was observed near the southwest corner of the service building. The excavation was covered by a blue tarp. This excavation's location is consistent with that of the 2,000-gallon UST removed in 1994 by ATW, and with a large concrete slab observed in aerial photographs taken in 1971 and 1973, and a smaller concrete slab observed in aerial photographs taken in 1981 and 1985. The larger concrete slab observed in the aerial photographs was likely covering the USTs operated by Shell, and the smaller slab was likely covering the UST operated by Acme, confirming that the same location was used for both UST complexes.

1995 Subsurface Investigation: A site assessment was performed by ACC Environmental Consultants on May 23, 1995. This included drilling nine soil borings (B-1 through B-9) using a pneumatic sampling tool in the vicinity of the excavation (which formerly housed both Shell's and Acme's USTs) and the product dispenser islands, and collecting soil and groundwater samples for chemical analysis (Figure 2). TPHg concentrations in soil samples ranged from <20.0 ppm to 830 ppm. Benzene concentrations ranged from <1.0 ppm to 1.8 ppm. Separate phase hydrocarbons (SPH) were identified in water samples collected from four of the soil

borings (B-1, B-5, B-6 and B-9). TPHg concentrations in the non-SPH grab groundwater samples submitted for chemical analysis ranged from <50 parts per billion (ppb) to 89,000 ppb. Benzene concentrations in the grab groundwater samples ranged from <0.5 ppb to 21,000 ppb.

Over-excavation and back-filling of Acme's former UST excavation were performed on March 19, 1996. The excavation, originally left open to 9 fbg, was over-excavated to approximately 11 fbg. Two soil samples (TP-3-W and TP-4-E) were collected from the bottom of the over-excavated former UST area. Soil sample TP-3-W, collected from the western end of the excavation, contained 560 ppm TPHg and 3.1 ppm benzene. Soil sample TP-4-E, collected from the eastern end of the excavation, contained 2,700 ppm TPHg and <3.0 ppm benzene. The excavation was back-filled with clean imported fill material. Soil sampling and back-filling activities are documented in Enviros' May 10, 1996 correspondence.

1996 Subsurface Investigation: In July 1996, Enviros performed additional site assessment activities. Six exploratory borings (B-10, B-11, B-12, B-13, V-1, and V-2) were drilled and sampled on July 17 and 19, 1996 using a hollow-stem auger drill rig (Figure 2). Borings B-11 and B-12 were completed as groundwater monitoring wells MW-1 and MW-2, and borings V-1 and V-2 were completed as soil vapor extraction wells V-1 and V-2, respectively. Soil sampling was not performed in boring V-1 due to the fact that it was installed into the back-fill material within the former UST excavation. A soil sample from below the saturated zone in boring V-2 was submitted for physical parameter analyses (porosity, permeability, fractional organic carbon content, and dry bulk density).

TPHg and benzene were not detected in soil samples collected from MW-1 (B-11), MW-2 (B-12), and B-13. TPHg was detected in soil samples collected from B-10 and V-2 at concentrations of 1.7 ppm and 110 ppm, respectively. Benzene concentrations in soil samples from B-10 and V-2 were <0.0050 ppm and 0.29 ppm, respectively.

Grab groundwater samples were collected from borings B-10, B-12 (MW-2), and B-13 at the depth of first encountered groundwater (approximately 8 to 11 fbg) for chemical analysis. Boring B-11 (MW-1) did not yield sufficient groundwater for grab groundwater sample collection. Monitoring wells MW-1 and MW-2 were developed and sampled on August 2, 1999 by Blaine Tech Services (Blaine) of San Jose, CA. TPHg concentrations in the groundwater samples ranged from <50 ppb to 290,000 ppb. Benzene concentrations ranged from <0.50 ppb to 34,000 ppb.

1997 Modified Phase I ESA: In February 1997, Enviros performed a modified Phase I ESA for the subject facility. A review of aerial photographs (1952 to 1994), city directories (1967 to 1993) and Sanborn maps (1912 to 1970) did not reveal evidence of an off-site source of

petroleum hydrocarbons which would have impacted groundwater onsite. The properties located north and west of the subject facility appear to have been occupied by residential houses from at least 1912 to the present. The nearest gasoline stations identified in the vicinity of the subject facility were a former Chevron station (740 27th Street at West) approximately 450 feet to the west, a former station (26th Street and Martin Luther King, Jr. Way) approximately 300 feet to the south, and a former Mobil station (554 27th Street) approximately 950 feet to the east.

2000 Sensitive Receptor Survey: In late 2000, Cambria performed a sensitive receptor survey which attempted to identify wells and underground utility conduits. Cambria obtained utility conduit maps from the City of Oakland Engineering Department to locate and map underground utility conduits which may act as preferential pathways for contaminant migration from the site. These conduit trenches are typically back-filled with materials which are more permeable than the surrounding native soils, therefore providing a path of least resistance for petroleum hydrocarbon migration within the local groundwater. Using these maps, Cambria identified the sanitary and storm sewer systems as the only utility conduits in the site vicinity which may act as preferential pathways. All other utilities are typically buried at depths which are shallower than those of the sewer systems. Conduits identified in the area are located at depths of approximately 3.5 to 9 fbg. Therefore, the potential does exist for groundwater to flow within these conduit trenches. Groundwater depth onsite historically ranges from approximately 4.5 to 10 fbg. However, since the typical groundwater flow direction onsite has generally been to the south, it is likely that any contaminant migration within the utility conduits would be limited, since the utility conduits located to the south of the site are the shallowest of all the conduits identified adjacent to the site at depths of 3.5 to 5.5 fbg. Cambria obtained well installation and destruction records from the California Department of Water Resources (DWR) in order to identify any active water producing wells in the vicinity of the site which may be at risk to petroleum hydrocarbon impact due to contaminant migration from the subsurface of the site. DWR records did not identify any existing wells within a ½-mile radius of the site.

2000 Subsurface Investigation: In November 2000, Cambria installed three soil borings (B-17, B-18 and B-19) and three groundwater monitoring wells (MW-3, MW-4 and MW-5) (Figure 2). Up to 2,100 ppm TPHg and 3.3 ppm benzene were reported in soil samples collected. No TPHg or benzene was detected in soil samples collected from well MW-3. Except for 0.0070 ppm detected in soil sample B-18-7.0, no methyl tertiary butyl ether (MTBE) was detected in any of the analyzed soil samples. Tertiary butyl alcohol (TBA) was detected in soil samples MW-4-5.0 and B-19-5.0 at concentrations of 0.0079 and 0.0059 ppm, respectively.

Grab groundwater samples were collected from borings B-17 through B-19 at first encountered groundwater for analyses during the investigation. TPHg concentrations in grab water samples

collected from the borings ranged from 58,000 to 190,000 micrograms per liter (µg/l or ppb). Benzene concentrations ranged from 4,400 to 13,000 ppb. MTBE was detected in groundwater at concentrations of 16 ppb and 300 ppb from B-19 and B-17, respectively, and TBA was detected at 240 ppb in B-19 only. No SPH was observed during the investigation.

2001 Oxygen Releasing Compound (ORC) Installation: As approved by the (ACHCSA), Blaine installed ORCs in wells V-1 and V-2 during the second quarter monitoring event on May 2, 2001. ORCs were removed during the fourth quarter 2001 monitoring event. MTBE has not been detected in these two wells since the ORCs were installed.

2002 Site Investigation: In April 2002, Cambria installed borings B-20 through B-22. Groundwater was first encountered in the borings between 8.0 fbg (B-20) and 8.8 fbg (B-21 and B-22). The maximum TPHg and benzene concentrations detected in soil were 380 ppm and 0.17 ppm, respectively, in the soil sample collected from 8.0 fbg in boring B-22, located behind the station building. No TPHg was detected in soil samples collected from boring B-21. No MTBE was detected in any of the analyzed soil samples collected from borings B-20, B-21, or B-22. Up to 160,000 ppb TPHg and 18,000 ppb benzene were reported in grab groundwater samples collected from borings B-20, B-21, and B-22. No MTBE was detected in grab groundwater samples collected from the borings. The complete report of findings was included in Cambria's June 21, 2002 *Site Investigation Report*. This document included recommendations for additional activities; however, a response from ACHCSA was never received.

2003 - 2005 Oxygen Releasing Compound (ORC) Installation: Although agency approval was not received, Shell proactively installed ORC in wells MW-5 and V-2 during first quarter of 2003. The ORCs were replaced on a semi-annual basis. The use of ORC was discontinued during the first quarter 2005, at Shell's request.

2005 Soil Vapor Investigation: Since no agency response was received to the June 2002 *Site Investigation Report* that contained recommendations for additional investigation, and since monitoring continued to indicate elevated concentrations of volatile constituents in groundwater, Shell authorized Cambria to prepare a work plan to investigate subsurface soil, groundwater, and soil vapor conditions along the property boundaries, and at select locations on site. Following a meeting with the Alameda County Health Care Services Agency (ACHCSA), technical comments and work plan approval were received in correspondence dated June 6, 2005. On August 15, 2005, Cambria submitted correspondence providing responses to the technical comments, and notification of field work, and a request for extension for the report of findings. In correspondence dated August 19, 2005, ACHCSA granted the extension.

From August 28 through 31, 2005, Cambria installed ten soil borings (GP-1 through GP-10). Boring specifications are described in Table 1 and their locations are shown on Figure 3. TPHg was detected in soil samples collected from borings GP-1 at 10.0 fbg, GP-2 at 4.5 fbg, GP-3 at 5.0 and 8.5 fbg, GP-6 at 9.5 fbg, and GP-7 at 9.5 fbg at concentrations ranging from 1.5 to 3,300 parts per million (ppm). Benzene was detected in soil samples collected from borings GP-2 at 4.5 fbg, and GP-3 at 5.0 and 8.5 fbg at concentrations ranging from 0.027 to 15 ppm. The soil analytical results are presented on Table 2 and the TPHg and benzene concentrations are presented on Figure 2.

TPHg was detected in all four groundwater samples collected from borings GP-1, GP-3, GP-6, and GP-7 at concentrations ranging from 9,100 to 140,000 parts per billion (ppb). Benzene was also detected in all four groundwater samples at concentrations ranging from 320 to 17,000 parts per billion (ppb). The groundwater analytical data are presented on Table 3 and TPHg and benzene results are depicted on Figure 2.

TPHg was detected in soil vapor samples collected from borings GP-1 through GP-10 at concentrations ranging from 350 to 71,000,000 micrograms per cubic meter (ug/m^3). Benzene was detected in soil samples collected from borings GP-1 through GP-3 and GP-5 through GP-10 at concentrations ranging from <4.1 to 170,000 ug/m^3. The laboratory results are presented on Table 4 and the TPHg and benzene results are presented on Figure 3.

1996 to Present - Groundwater Monitoring: Quarterly groundwater monitoring has been ongoing at the site since August 1996. No TPHg or benzene has been reported in groundwater samples collected from monitoring wells MW-1 and MW-2 since monitoring began. Although these wells are used for determining gradient, they have not been sampled since January 2004. Well V-1, installed within the former UST excavation, has had decreasing TPHg and benzene concentrations since 1997. Well V-2, located downgradient of the former UST excavation, has had concentrations of up to 90,000 ppb TPHg and 10,200 ppb benzene.

Wells MW-3, MW-4, and MW-5 were added to the quarterly monitoring program in May 2001. No TPHg or benzene has been reported in well MW-3 since monitoring began and it has not been sampled since January 2004. Up to 16,000 ppb TPHg and 4,100 ppb benzene have been reported in well MW-4, and up to 160,000 ppb TPHg and 12,000 ppb benzene have been reported in well MW-5.

MTBE has not been detected in any samples collected from the site wells that were analyzed by EPA Method 8260. No MTBE has been reported in samples collected from well MW-1 since monitoring began, except for 2.36 ppb by EPA Method 8020 on January 18, 1999. MTBE has been reported in well MW-2 at 6.3 ppb on January 9, 1998 and at 2.47 ppb on January 18, 1999

(by EPA method 8020) only. Several samples from well V-1 have had reported MTBE concentrations when analyzed by EPA Method 8020, while results have been below detection limits when analyzed by EPA Method 8260. This includes a sample with a reported MTBE concentration of 1,900 ppb (by EPA Method 8020) on October 24, 1997, which had a result of <200 ppb when confirmed by EPA Method 8260 analysis. During two sampling events (July 2, 1997 and October 24, 1997), well V-2 samples had MTBE results reported as 530 ppb and 120 ppb, respectively, when analyzed by EPA Method 8020; however, both were found to be below detection limits when the samples were analyzed by EPA Method 8260. No MTBE has been reported in samples from wells MW-3, MW-4 or MW-5 since monitoring began. Wells MW-4 and MW-5 are sampled for fuel oxygenates on an annual basis.

FEASIBILITY STUDY

The objectives of the August 2005 investigation were to further assess the conditions along the property boundaries, to assess groundwater conditions at additional locations, and to evaluate whether volatile petroleum constituents are present in the soil gas in the subsurface. To meet these objectives, borings were drilled and soil, soil vapor, and (at four locations) grab groundwater samples were collected. Based on the data collected from these borings, there is not significant residual impact in the unsaturated soils, significant concentrations of petroleum constituents exist in groundwater along the northern and western property boundaries, and significant concentrations of petroleum constituents are present as vapors in the shallow soils. The distribution of petroleum constituents in soil vapors correlates with the impacted groundwater, not necessarily residual impacted soil. Vapors are at higher concentrations in sandy lenses, although the silty soils contain elevated soil gas concentrations.

Based on the results of assessment activities conducted to date, Cambria recommends the installation of DPE wells to conduct a DPE feasibility study. DPE has been one of the common remediation technologies used to remediate volatile organic compounds present in soil and groundwater at service stations. DPE involves applying a vacuum to a well to dewater the formation to a target elevation and extract hydrocarbon-bearing vapors from the vadose and dewatered zone. A dedicated extraction "stinger" installed through an airtight well seal allows DPE at target elevations. A final determination of the most appropriate remedial option will be based on the results of the feasibility study.

The scope of work to install the DPE wells and conduct the DPE feasibility study is presented below.

DPE Well Installation

DPE Well Specifications: Cambria proposes to install two, 4-inch-diameter DPE wells to target the impacted groundwater and soil vapors and provide radius of influence monitoring points. The proposed DPE wells will be installed to depths of approximately 20 fbg (Figure 4). Well construction specifications will be determined in the field based on the nature of subsurface material encountered, but it is anticipated that perforated intervals of the proposed DPE wells will extend from 5 to 20 fbg using 0.020-inch circumslot screen. The appropriate sand pack will be installed from approximately 2 feet above the perforated well casing interval to the total depth of the borings. Approximately 2 feet of bentonite will be installed above the sand pack, and a neat cement surface seal will be installed to near the ground surface.

Soil samples will be collected at 5-foot intervals, until groundwater is encountered, from the borings for MW-6 and MW-7 well installations. Soil samples will be retained in brass or Teflon sleeves capped with Teflon sheets and tight fitting end caps. Upon completion of the boring, a groundwater sample will be collected and retained in laboratory-supplied 40-milliliter glass vials containing the appropriate preservatives for the desired analyses. Each sample will be labeled, logged onto a chain-of-custody form, and placed in a chilled ice-chest until delivery to a state-certified laboratory for chemical analyses.

Utility Location: Cambria will notify Underground Service Alert (USA) of our drilling activities. USA will have the utilities in the vicinity identified. Additionally, a private utility locator will be used to identify subsurface obstacles to drilling.

Permits: We will obtain necessary well installation permits from the Alameda County Public Works Agency (ACPWA).

Site Health and Safety Plan: We will prepare a comprehensive site safety plan to protect site workers. The plan will be reviewed and signed by each site worker and kept on site during field activities.

Chemical Analyses: Soil and groundwater samples will be analyzed by a State-certified laboratory for TPHg and BTEX by EPA Method 8021B.

Wellhead Survey Activities: Following DPE well installation, a licensed surveyor will survey the latitude and longitude to NAD83, and well head elevation to mean sea level in compliance with AB2886 (Geotracker) requirements.

Report Preparation: Following the receipt of analytical results from the laboratory, Cambria will prepare a written report, which will include field procedures, laboratory results, boring logs, and conclusions.

DPE Feasibility Study

Permits: Cambria will contact the Bay Area Air Quality Management District (BAAQMD) regarding the proposed DPE test, and will provide them with the required notification. A permit is not required for a 5-day test. DPE operations can not be performed longer than 5 days because the subject site is located within 1,000 feet of a school.

Site Health and Safety Plan: We will prepare a comprehensive site safety plan to protect site workers. The plan will be reviewed and signed by each site worker and kept on site during field activities.

DPE Feasibility Study: The DPE study objective will be to confirm the feasibility of DPE as a remedial alternative, to obtain site specific groundwater and vapor extraction data for use in a DPE system design, and to provide source area remediation of residual petroleum hydrocarbons and oxygenates. Separate DPE tests will target proposed wells MW-6 and MW-7. Once the target well has been dewatered to the target elevation (approximately 20 fbg), Cambria will incrementally increase the applied vacuum setting to determine the optimal extraction rate (maximum air flow rate). Once determined, Cambria will set DPE operation at the optimal extraction rate and collect data to assess groundwater yield, hydraulic radius of influence from distance–drawdown data, vacuum radius of influence, and the concentration trend of hydrocarbon vapors. Cambria anticipates conducting DPE from well MW-6 for three continuous days and well MW-7 for two continuous days. The duration of DPE from these wells may alter depending on the data produced.

A mobile DPE unit (Solleco 300 cfm ECAT(LR) or equivalent) will be used for testing. It is equipped with a liquid-ring pump as a vacuum source and catalytic oxidizer to treat the extracted soil vapor. Camrbia will measure groundwater drawdown, using an electric water level meter, in the extraction well all other site wells. A Kent C700 flow totalizing meter will continuously measure extracted groundwater. Cambria will measure the vapor extraction flow rate, the applied vacuum at the wellhead, concentrations in the vapor stream, and the vacuum influence in nearby wells periodically during each test.

A Horiba HEXA J-series hydrocarbon analyzer, calibrated to iso-butylene, will be used to field measure hydrocarbon concentrations in the extracted vapor stream. A TSI model 8330 air velocity meter will be used to measure vapor extraction velocity rates and temperature. A Thomas Industries vacuum pump will be used to collect the vapor samples. Vapor samples for laboratory analysis will be collected in 1-liter Tedlar bags. Magnehelic differential pressure gauges will be used to measure the vacuum applied at the wellhead and induced in nearby wells.

Chemical Analyses: Selected vapor samples will be analyzed for TPHg and BTEX by EPA Method 8260B.

Report Preparation: Following the receipt of analytical results from the laboratory, Cambria will prepare a written report, which will include field procedures, DPE study data including laboratory analytical results, conclusions, and recommendations.

SCHEDULE

Cambria will proceed with submitting drilling permit applications to ACPWA. The DPE well installations are scheduled for the first week of January 2006. Once the DPE wells are installed, Cambria will schedule the DPE study, which will be dependant on equipment availability. At this time, however, we anticipate that the DPE study will be performed during January 2006. Both the DPE well installation report and DPE feasibility study report will be submitted 60 days after completing field work.

The scope of work described in this work plan will be performed under the supervision of a professional geologist or professional engineer.

CLOSING

If you have any questions regarding the contents of this document, please call Ana Friel at (707) 268-3812.

Sincerely,
Cambria Environmental Technology, Inc.

for Dan Lescure
Senior Project Engineer

Ana Friel
Senior Project Geologist
PG 6452

Attachments:

Table 1.	Well/Boring Data
Table 2.	Soil Analytical Data
Table 3.	Groundwater Analytical Data
Table 4.	Soil Vapor Analytical Data
Figure 1.	Site Vicinity/Receptor Survey Map
Figure 2.	Soil and Groundwater Chemical Concentration Map
Figure 3.	Soil Vapor Chemical Concentration Map
Figure 4.	Proposed DPE Well Location Map

cc: Denis Brown, Shell
Rodney & Janet Kwan, property owners

Table 1. Well/Boring Data, Former Shell Service Station, 2703 Martin Luther King Jr. way, Oakland, California

Name	Type	Date Installed	TOC Elev (ft msl)	Total Depth (ft)	Soil Sample (ft) Incr. or	Soil Sample (ft) Depth(s)	First Encountered GW Depth (ft)	First Encountered GW Elev (ft msl)	Screen Diam. (In)	Screen Depth (ft) Top	Screen Depth (ft) Bottom	Comments
MW-1	Well (HSA)	19-Jul-96	29.53	21	5	-	9	20.53	2	6	21	Logged as B-11
MW-2	Well (HSA)	19-Jul-96	28.47	21	5	-	11	17.47	2	6	21	Logged as B-12
MW-3	Well (HSA)	19-Jul-96	28.30	20	5	-	15	13.30	4	5	20	
MW-4	Well (HSA)	21-Nov-00	28.51	20	5	-	15	13.51	4	5	20	
MW-5	Well (HSA)	21-Nov-00	29.54	20	5	-	15	14.54	4	5	20	
V-1	Well (HSA)	17-Jul-96	23.26	13	5	-	10	13.26	2	3	13	
V-2	Well (HSA)	19-Jul-96	28.80	13	5	-	8	20.80	2	3	13	
B-1	Boring (Direct push)	23-May-95	-	9	C	-	8	-	-	-	-	
B-2	Boring (Direct push)	23-May-95	-	7	C	-	7.5	-	-	-	-	
B-3	Boring (Direct push)	23-May-95	-	12	C	-	-	-	-	-	-	
B-4	Boring (Direct push)	23-May-95	-	12	C	-	-	-	-	-	-	
B-5	Boring (Direct push)	23-May-95	-	15	C	-	14.5	-	-	-	-	
B-6	Boring (Direct push)	23-May-95	-	15	C	-	10.5	-	-	-	-	
B-7	Boring (Direct push)	23-May-95	-	15	C	-	9.5	-	-	-	-	
B-8	Boring (Direct push)	23-May-95	-	15	C	-	13.5	-	-	-	-	
B-9	Boring (Direct push)	23-May-95	-	14	C	-	-	-	-	-	-	
B-10	Boring (Direct push)	19-Jul-96	-	9.5	5	-	-	-	-	-	-	
B-13	Boring (Direct push)	19-Jul-96	-	16	5	-	10	-	-	-	-	
B-17	Boring (Direct push)	22-Nov-00	-	15	C	-	13	-	-	-	-	
B-18	Boring (Direct push)	22-Nov-00	-	15	C	-	14.6	-	-	-	-	
B-19	Boring (Direct push)	22-Nov-00	-	20	C	-	15	-	-	-	-	
GP-1	**Boring (Hand auger)**	**29-Aug-05**	**-**	**12**	**C**	**-**	**10.5**	**-**	**-**	**-**	**-**	
GP-2	**Boring (Hand auger)**	**29-Aug-05**	**-**	**4.5**	**C**	**-**	**-**	**-**	**-**	**-**	**-**	
GP-3	**Boring (Hand auger)**	**29-Aug-05**	**-**	**12**	**C**	**-**	**9**	**-**	**-**	**-**	**-**	
GP-4	**Boring (Hand auger)**	**31-Aug-05**	**-**	**4.5**	**C**	**-**	**-**	**-**	**-**	**-**	**-**	
GP-5	**Boring (Hand auger)**	**30-Aug-05**	**-**	**4.5**	**C**	**-**	**-**	**-**	**-**	**-**	**-**	

Table 1. Well/Boring Data, Former Shell Service Station, 2703 Martin Luther King Jr. way, Oakland, California

Name	Type	Date Installed	TOC Elev (ft msl)	Total Depth (ft)	Soil Sample (ft) Incr. or	Soil Sample (ft) Depth(s)	First Encountered GW Depth (ft)	First Encountered GW Elev (ft msl)	Screen Diam. (In)	Screen Depth (ft) Top	Screen Depth (ft) Bottom	Comments
GP-6	**Boring (Hand auger)**	**30-Aug-05**	-	**20**	**C**	-	**20**	-	-	-	-	
GP-7	**Boring (Hand auger)**	**30-Aug-05**	-	**10**	**C**	-	**10**	-	-	-	-	
GP-8	**Boring (Hand auger)**	**30-Aug-05**	-	**4.5**	**C**	-	-	-	-	-	-	
GP-9	**Boring (Hand auger)**	**31-Aug-05**	-	**4.5**	**C**	-	-	-	-	-	-	
GP-10	**Boring (Hand auger)**	**31-Aug-05**	-	**4.5**	**C**	-	-	-	-	-	-	

Abbreviations:

C = Continuous

TOC = Top of Casing referenced to mean sea level

HSA = Hollow-stem auger

Table 2. Soil Analytical Data, Former Shell Service Station, 2703 Martin Luther King Jr. Way, Oakland, California

Sample	Depth (fbg)	Date Sampled	TPHg (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)
GP-1-5.0'	5.0	29-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-1-10.0'	10.0	29-Aug-05	**190***	<0.50	<0.50	<0.50	<0.50
GP-2-4.5'	4.5	29-Aug-05	**1.5**	**0.035**	<0.0050	**0.0063**	<0.0050
GP-3-5.0'	5.0	29-Aug-05	**7.5**	**0.027**	<0.0050	**0.085**	**0.11**
GP-3-8.5'	8.5	29-Aug-05	**3,300**	**15**	**2.7**	**91**	**230**
GP-4-4.5'	4.5	31-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-5-4.5'	4.5	30-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-6-5.0'	5.0	29-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-6-9.5'	9.5	29-Aug-05	**260**	<0.50	<0.50	**2.1**	**6.8**
GP-7-5.0'	5.0	30-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-7-9.5'	9.5	30-Aug-05	**440**	<0.50	**1.8**	**10**	**59**
GP-8-4.5'	4.5	30-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-9-4.5'	4.5	31-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
GP-10-4.5'	4.5	31-Aug-05	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

Abbreviations:

fbg = Feet below grade

mg/kg = Milligrams per kilogram (parts per million)

<x = Not detected at reporting limit x.

* = Quantity of unknown hydrocarbons in sample based on gasoline

The following constituents were analyzed by EPA Method 8260B:

TPHg = Total petroleum hydrocarbons as gasoline

BTEX = Benzene, toluene, ethylbenzene, and xylenes

Table 3. Groundwater Analytical Data, Former Shell Service Station, 2800 Telegraph Avenue, Oakland, California

Sample	Depth (fbg)	Date Sampled	TPHg (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
GP-1-10.5'W	10.5	29-Aug-05	**47,000**	**330**	<50	**680**	**140**
GP-3-10'W	10	29-Aug-05	**79,000**	**5,200**	**13,000**	**1,400**	**7,800**
GP-6-20'W	20	29-Aug-05	**9,100**	**320**	**34**	**380**	**750**
GP-7-10'W	10	30-Aug-05	**140,000**	**17,000**	**4,600**	**7,600**	**45,000**

Abbreviations:

fbg = Feet below grade

µg/L = Micrograms per liter (parts per billion)

<x = Not detected at reporting limit x.

The following constituents were analyzed by EPA Method 8260B:

TPHg = Total petroleum hydrocarbons as gasoline

BTEX = Benzene, toluene, ethylbenzene, and xylenes

Table 4. Soil Vapor Analytical Data, Former Shell Service Station, 2703 Martin Luther King Jr. Way, Oakland, California

Sample ID	Sample Depth (fbg)	Date Sampled	TPHg (μg/L)	TPHg (μg/m^3)	B (μg/m^3)	T (μg/m^3)	E (μg/m^3)	X (μg/m^3)
GP-1-4.0	4.0	29-Aug-05	1.2	1,200	12	5.1	<5.5	9.8
GP-2-4.0	4.0	29-Aug-05	180	**180,000**	**2,900**	<22	<26	<26
GP-3-4.0	4.0	29-Aug-05	**71,000**	**71,000,000**	**170,000**	<2,100	<2,400	<2,400
GP-4-4.0	4.0	31-Aug-05	0.35	350	<4.1	8.9	<5.6	6.2
GP-5-4.0	4.0	30-Aug-05	3.1	3,100	5.4	5.4	<5.6	8.4
GP-6-4.0	4.0	29-Aug-05	**340**	**340,000**	**780**	<22	<25	<25
GP-7-4.0	4.0	30-Aug-05	**37**	**37,000**	**340**	1,100	200	452
GP-8-4.0	4.0	30-Aug-05	1.6	1,600	8.4	5.0	<5.6	<5.6
GP-9-4.0	4.0	31-Aug-05	3.7	3,700	4.6	5.6	<6.0	6.9
GP-10-4.0	4.0	31-Aug-05	99	**99,000**	32	22	6.4	22
Environmental Screening Levels SFBRWQCB, February 2005		**Commercial**	**72**	**72,000**	**290**	**180,000**	**1,200,000**	**410,000**
		Residential	**26**	**26,000**	**85**	**63,000**	**420,000**	**150,000**

Abbreviations and Notes:

Results in **bold** exceed Environmental Screening Level

fbg = Feet below grade

μg/L = micrograms per liter

μg/m^3 = micrograms per cubic meter

<x = Not detected at reporting limit x

TPHg = Total petroleum hydrocarbons as gasoline by Modified EPA Method TO-3 GC/FID

BTEX = Benzene, toluene, ethylbenzene, and xylenes by Modified EPA Method TO-14A

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12/11/03

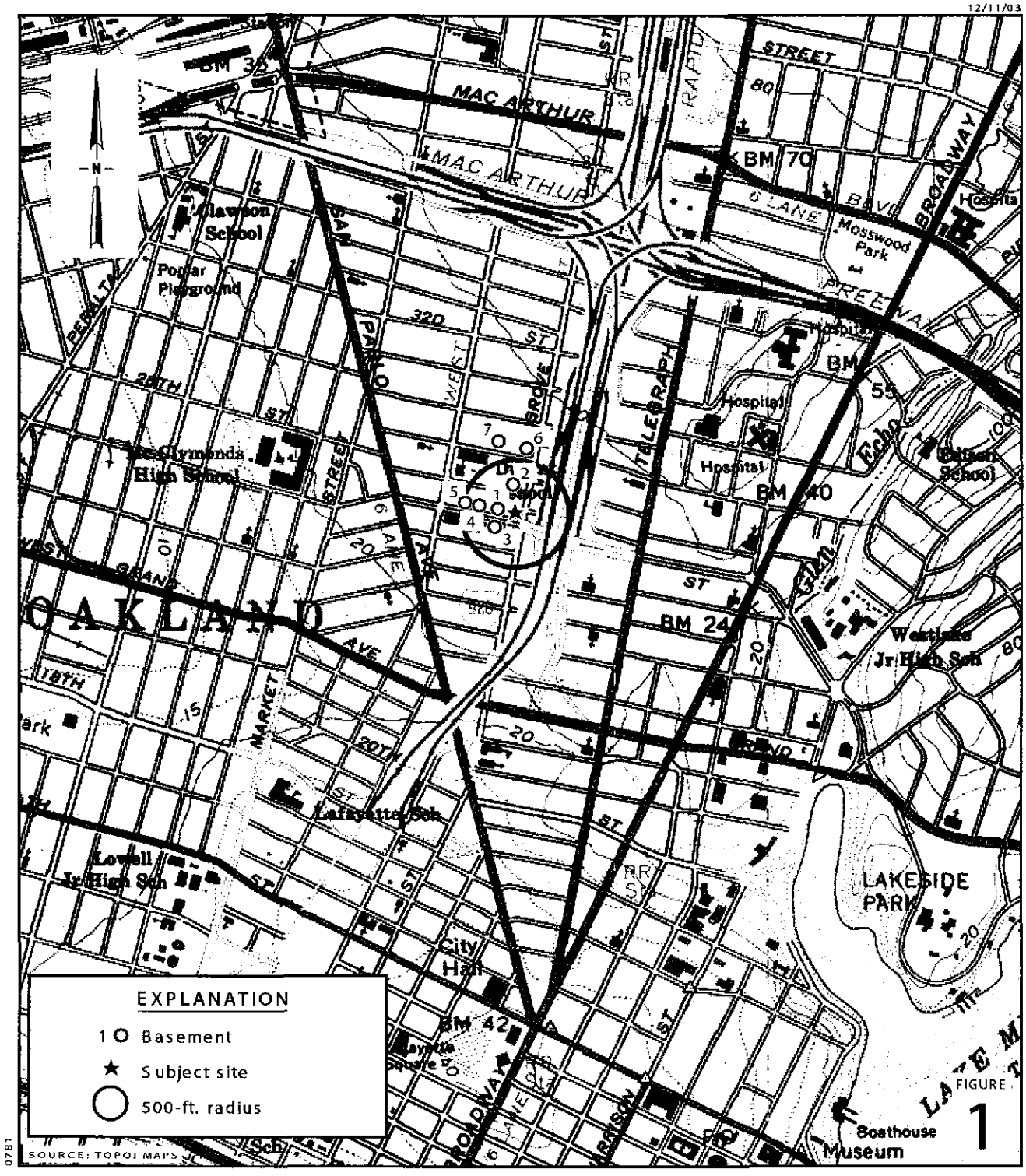

FIGURE 1

0 1/8 1/4 1/2 1

SCALE (MILES)

Former Shell Service Station
2703 Martin Luther King Jr. Way
Oakland, California

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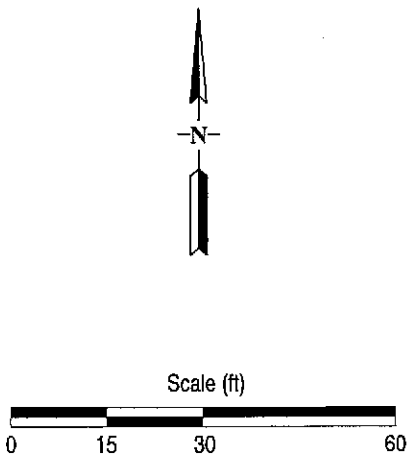
Site Vicinity/Receptor Survey Map



EXPLANATION

◉	Soil boring
◉	Monitoring well
◉	Soil vapor well
<1.0/<0.0050/5.0'	TPHg/Benzene concentrations in soil in parts per million/Depth in feet
9,100/320/20'	TPHg/Benzene concentrations in groundwater in parts per billion/Depth in feet
<x	Not detected at reporting limit x
*	Quantity of unknown hydrocarbons in sample.

Yard/ driveway
Residential 679 28th Street
Yard/ driveway
Residential 673 28th Street
Yard/ driveway
Residential 669 28th Street
Residential 663 28th Street
Vacant lot 2727-2729 MLK
Residential 665 28th Street
Residential 2719-2723 MLK
Water Meters
MARTIN LUTHER KING JR. WAY
Driveway
Residential 670 27th Street
Residential 668 27th Street
Yard
Residential 664 27th Street
Driveway
27th STREET

GP-6 <1.0/<0.0050/5.0' **260**/<0.50/9.5' ***9,100/320/20'***
GP-7 <1.0/<0.0050/5.0' **440**/<0.50/9.5' ***140,000/17,000/10'***
GP-5 <1.0/<0.0050/4.5'
GP-8 <1.0/<0.0050/4.5'
GP-4 <1.0/<0.0050/4.5'
GP-9 <1.0/<0.0050/4.5'
GP-10 <1.0/<0.0050/4.5'
GP-3 **7.5/0.027**/5.0' **3,300/15**/8.5' ***79,000/5,200/10'***
GP-2 **1.5/0.035**/4.5'
GP-1 <1.0/<0.0050/5.0' **190***/<0.50/10.0' ***47,000/330/10.5'***

Car port
Service bays
Former Shell Station
Office
Former USTs
Former dispenser islands
G ?
E

B-1, B-3, B-4, B-5, B-6, B-7, B-8, B-9, B-10, B-13, B-17, B-18, B-19, B-20, B-21, B-22
MW-1, MW-2, MW-3, MW-4, MW-5
V-1, V-2

FIGURE **2**

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Former Shell Service Station
2703 Martin Luther King Jr. Way
Oakland, California

CAMBRIA

Soil and Groundwater Chemical Concentration Map

August 28-31, 2005

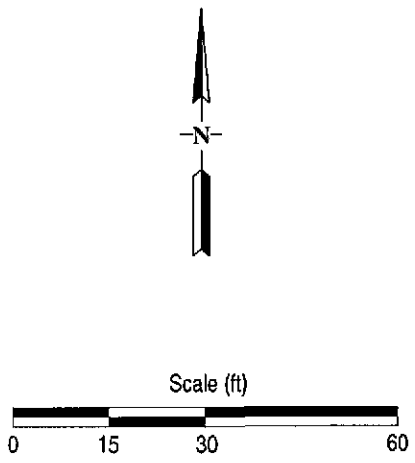

FIGURE
3

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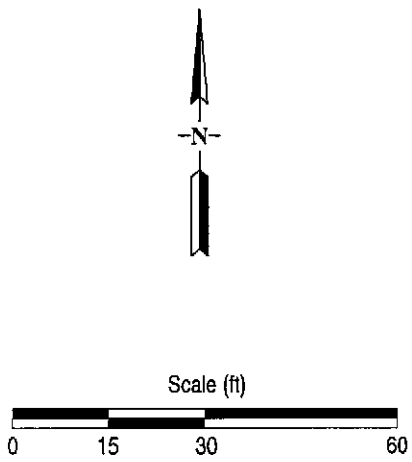
Former Shell Service Station
2703 Martin Luther King Jr. Way
Oakland, California

CAMBRIA

Soil Vapor Chemical Concentration Map

August 28-31, 2005

15-Nov-05



EXPLANATION

- Soil boring
- Monitoring well
- Soil vapor well
- MW-6 — Proposed dual-phase extraction well

Yard/ driveway
Yard/ driveway
Yard/ driveway
Residential 679 28th Street
Residential 673 28th Street
Residential 669 28th Street
Residential 663 28th Street
Vacant lot 2727-2729 MLK
Residential 665 28th Street
Residential 2719-2723 MLK
Water Meters
MARTIN LUTHER KING JR. WAY
Driveway
Residential 670 27th Street
Residential 668 27th Street
Yard
Driveway
Residential 664 27th Street
Car port
Office
Service bays
Former Shell Station
Former USTs
Former dispenser islands
GP-6
GP-7
MW-7
GP-5
B-21
B-22
GP-8
B-13
GP-4
MW-5
GP-9
GP-10
B-5
B-17
V-1
GP-3
B-20
MW-6
B-1
V-2
B-18
GP-2
MW-4
B-10
GP-1
E
MW-3
MW-1
B-8
B-6
B-9
B-19
B-7
B-3
B-4
MW-2

27th STREET

FIGURE
4

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Former Shell Service Station
2703 Martin Luther King Jr. Way
Oakland, California

CAMBRIA

Proposed Dual-Phase Extraction Well Location Map

November 15, 2005