CAMBRIA

November 26, 2001

Mr. Barney Chan
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

295

Re: **Monitoring Well Installation Report**
Former Shell Service Station
1230 14th St.
Oakland, California
Incident #: 97088250
Cambria Project #: 243-0233

NOV 29 2001

Dear Mr. Chan,

Cambria Environmental Technology, Inc. (Cambria) is submitting this *Monitoring Well Installation Report* on behalf of Equiva Services LLC. The well installation was conducted in accordance with our August 23, 2001 *Revised Subsurface Investigation Work Plan* that was approved by the Alameda County Health Care Services Agency (ACHCSA) in a letter dated August 30, 2001. The objective of this project is to further define the lateral extent of the dissolved gasoline plume downgradient of the site, to assess the extent of residual hydrocarbons in the former underground storage tank (UST) area, and to provide data for further study of plume attenuation and stability. Presented below are summaries of the site background, investigation procedures, investigation results, and conclusions.

SITE BACKGROUND

Site Location: This former Shell-branded service station is located at northeast corner of the intersection of 14th Street and Union Street in Oakland. There is an abandoned station building and a pump island canopy on the site, and much of the property is unpaved. Gas station operations at the site ceased in 1993. The surrounding area is primarily residential.

February 1991 Soil Borings: On February 2, 1991, Tank Protect Engineering (TPE) of Northern California advanced soil borings SB-1, SB-2, and SB-3. Maximum concentrations of 1,600 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPHg) and 18 ppm benzene were detected in the soil sample collected at 10.5 feet below grade (fbg) in boring SB-3, located immediately downgradient of the gasoline USTs.

Oakland, CA
San Ramon, CA
Sonoma, CA

Cambria Environmental Technology, Inc.

1144 65th Street
Suite B
Oakland, CA 94608
Tel (510) 420-0700
Fax (510) 420-9170

August 1993 Tank Removal and Sampling: On August 24, 1993, TPE supervised the removal of two 7,500-gallon unleaded UST's, one 7,500-gallon leaded UST, one 8,000-gallon leaded UST, and one 550-gallon waste-oil tank from the site. Soil samples were collected at depths ranging from 8.5 to 12.0 fbg from the floor of the excavation and from beneath the fill end of the waste oil tank. TPHg and benzene were detected at concentrations ranging from 1.3 milligrams per kilogram (mg/kg) to 18,000 mg/kg and from <5.0 mg/kg to 11,000 mg/kg, respectively. Total petroleum hydrocarbons as diesel (TPHd) and oil and grease were detected in the waste-oil tank pit at 1,200 ppm and 7,700 ppm, respectively. Maximum concentrations of 13 ppm TPHg and 0.007 ppm benzene were detected in soil samples collected beneath the product dispensers. On September 17, 1993, a UST Unauthorized Release Form was filed by TPE.

November 1995 Piping Removal and Tank Pit Re-Sampling: On November 27, 1995, Cambria collected eight soil samples from the open tank pit at the ends of the former USTs and six soil samples beneath the former product piping. TPHg was detected in all tank pit samples at concentrations ranging from 570 mg/kg to 5,600 mg/kg. Benzene was detected in the tank pit samples at concentrations ranging from <0.5 mg/kg to 72 mg/kg. TPHg was detected in two product piping samples at concentrations of 46 mg/kg and 3,100 mg/kg, and benzene was detected at concentrations ranging from <0.005 mg/kg to 30 mg/kg.

March 1996 Subsurface Investigation: On March 6 - 8, 1996, Cambria advanced 11 soil borings at the site. Four borings were converted to groundwater monitoring wells (MW-1 through MW-4), two borings were converted to combined air sparge and soil-vapor-extraction (SVE) wells (VW/AS-1, VW/AS-3), and two borings were converted to combined SVE and groundwater monitoring wells (VW/MW-2, VW/MW-4). The remaining borings were backfilled with neat cement.

1997 Oxygen Releasing Compound (ORC) Installation: Cambria installed ORCs in wells MW-1, VW/MW-2, and VW/MW-4 on March 25, 1997.

October 2000 SVE Testing: On October 16, 2000, Cambria performed SVE testing to determine the viability of SVE at the site. Although groundwater interfered with the SVE testing, Cambria concluded that SVE may be an effective method to remove hydrocarbons from soils above the groundwater table. The lack of detectable vacuum in observation wells during the SVE testing may be the result of short-circuiting through the former tank complex. Because of this, a radius of influence for SVE was not estimated. To more accurately determine whether SVE is a viable remedial alternative at the site, additional testing with a more appropriately constructed well or wells would be required.

December 2000 Subsurface Investigation: On December 11, 2000, Cambria advanced five soil borings (GP-1 through GP-5) to depths ranging from 16 to 20.5 fbg. Soil samples were collected

from each boring at 5-foot intervals, and groundwater samples were collected when groundwater was encountered. No TPHg, benzene, or methyl tertiary butyl ether (MTBE) was ~~collected~~ detected in any of the soil samples. TPHg was detected in groundwater samples from GP-1 and GP-3 at concentrations of 11 and 4,400 parts per billion (ppb), respectively. Benzene was detected in groundwater from GP-1 and GP-3 at concentrations of 11 and 4,400 ppb, respectively. MTBE was only detected in groundwater collected from boring GP-1 at 0.067 ppb.

INVESTIGATION PROCEDURES

On September 27, 2001, Cambria advanced three soil borings at the site: one in the former tank pit (MW-5), one along the eastern property boundary (MW-6), and one along the northern property boundary (MW-7). Soil samples were collected from all borings for lithologic description at 5-foot intervals. In addition, soil samples were collected from the tank pit boring (MW-5) for chemical analysis. The three soil borings were converted to 4-inch-diameter groundwater monitoring wells.

Specific procedures for this investigation, described in Cambria's approved work plan, are summarized below. Soil analytical results are summarized in Table 1, and laboratory analytical reports are included as Attachment A. Well permits and boring logs are included as Attachments B and C, respectively. Cambria's "Standard Field Procedures for Installation of Monitoring Wells" are included as Attachment E.

Drilling Date: September 27, 2001.

Drilling Company: Gregg Drilling of Martinez, California (C-57 License #485165).

Personnel Present:

Name:	***Title:***	***Company:***
Sue Landsittel	Staff Geologist	Cambria
Bobby Deason	Driller	Gregg Drilling

Permits: Alameda County Public Works Agency Drill Permits #WO1-855, WO1-856, and WO1-857. (Attachment B)

Drilling Method: 10-inch hollow-stem auger.

Number of Wells: Three (MW-5, MW-6, and MW-7). (Figure 1).

Well Depths: All wells were installed to a depth of 20.0 fbg.

Soil Sampling Method: Soil samples were collected at 5-foot intervals using a split-spoon sampler with brass sample tubes.

Sediment Lithology: Soil encountered in the borings consisted predominantly of sand and silty sand to the total explored depth of 20 fbg. Approximately 9-10 feet of fill consisting of gravelly sand was encountered in the tank pit boring (MW-5). (Attachment C).

Groundwater Depths: Groundwater was encountered at approximately 10-12 fbg during drilling activities. Static groundwater depth in the new wells will be measured by Blaine Tech Services (Blaine) of San Jose, California during the next quarterly monitoring event.

Well Materials: MW-5, MW-6, and MW-7 were constructed using 4-inch diameter Schedule 40 PVC casing with 0.010-inch slotted screen. The filter pack consisted of Monterey 2x12 sand from 20 to 3.5 fbg, the casing was sealed with bentonite from 3.5 to 2 fbg, and Portland Type I cement was placed from 2 to 1 fbg. A traffic-rated well box was installed to protect the well and complete the well to grade (Attachment C).

Well Screen Interval: 5 to 20 fbg (Attachment C).

Well Elevation Survey The top of casing elevations were surveyed by Virgil Chavez Land Surveying of Vallejo, California on November 1, 2001. (Attachment D).

Well Development: Blaine will develop the wells using surge-block agitation and pump evacuation. Wells will be developed at least 72 hours prior to sampling.

Chemical Analyses: Soil samples collected from boring MW-5 and selected for chemical analysis were analyzed by a State-certified laboratory for TPHg, benzene, toluene, ethylbenzene, and xylenes (BTEX), and MTBE using EPA Method 8260B.

To characterize stockpiled soil cuttings from the boring for disposal, four brass tubes of soil were collected, then composited and analyzed by the analytical laboratory for TPHg, BTEX and MTBE by Method 8260B; and total threshold limit concentration lead.

Soil Handling: Soil cuttings produced from the boring were stockpiled on the site and were transported by Manley Trucking of Sacramento, California for disposal at Forward Landfill in Manteca, California. Soil disposal confirmation will be included in the fourth quarter 2001 monitoring report.

INVESTIGATION RESULTS

Hydrocarbon Distribution in Soil: During the current investigation, TPHg was detected in boring MW-5 at a concentrations of 3.9 ppm and 790 ppm at depths of 9.5 and 14.5 feet, ppm. No MTBE was detected in any of the samples. Analytical results for the recent soil samples and those collected over the last five years are summarized in Table 1. The certified laboratory analytical report is included as Attachment A.

CONCLUSIONS AND RECOMMENDATIONS

Samples collected from boring MW-5 in the former tank pit indicate lower residual hydrocarbon concentrations in the eastern portion of the tank pit than were encountered during either the August 1993 or November 1995 soil sampling events. The aeration and oxygenation of impacted soils that occurred when the tank pit remained open for over two years following UST removal, likely contributed to the remediation of these soils.

The site has recently been fenced and locked by the City of Oakland. Cambria will require access to the site in order to remove the stockpile of material generated during monitoring well installation. As soon as the site becomes accessible, Cambria will also sample the three new wells along with other site wells as part of the semiannual monitoring program. It is our understanding that the ACHCSA will provide access to the site in the near future.

not ACHCSA problem

Groundwater analytical results for the wells installed during this investigation will be used in conjunction with historical groundwater results to determine the next course of action at this site. Once these results are available, further recommendations will be made.

CLOSING

Please call Melody Munz at (510) 420-3324 if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.

Sue Landsitter
Staff Geologist

Stephan Bork, C.E.G., C.HG.
Associate Hydrogeologist

REGISTERED GEOLOGIST
STEPHAN A. BORK
No. EG 2058
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

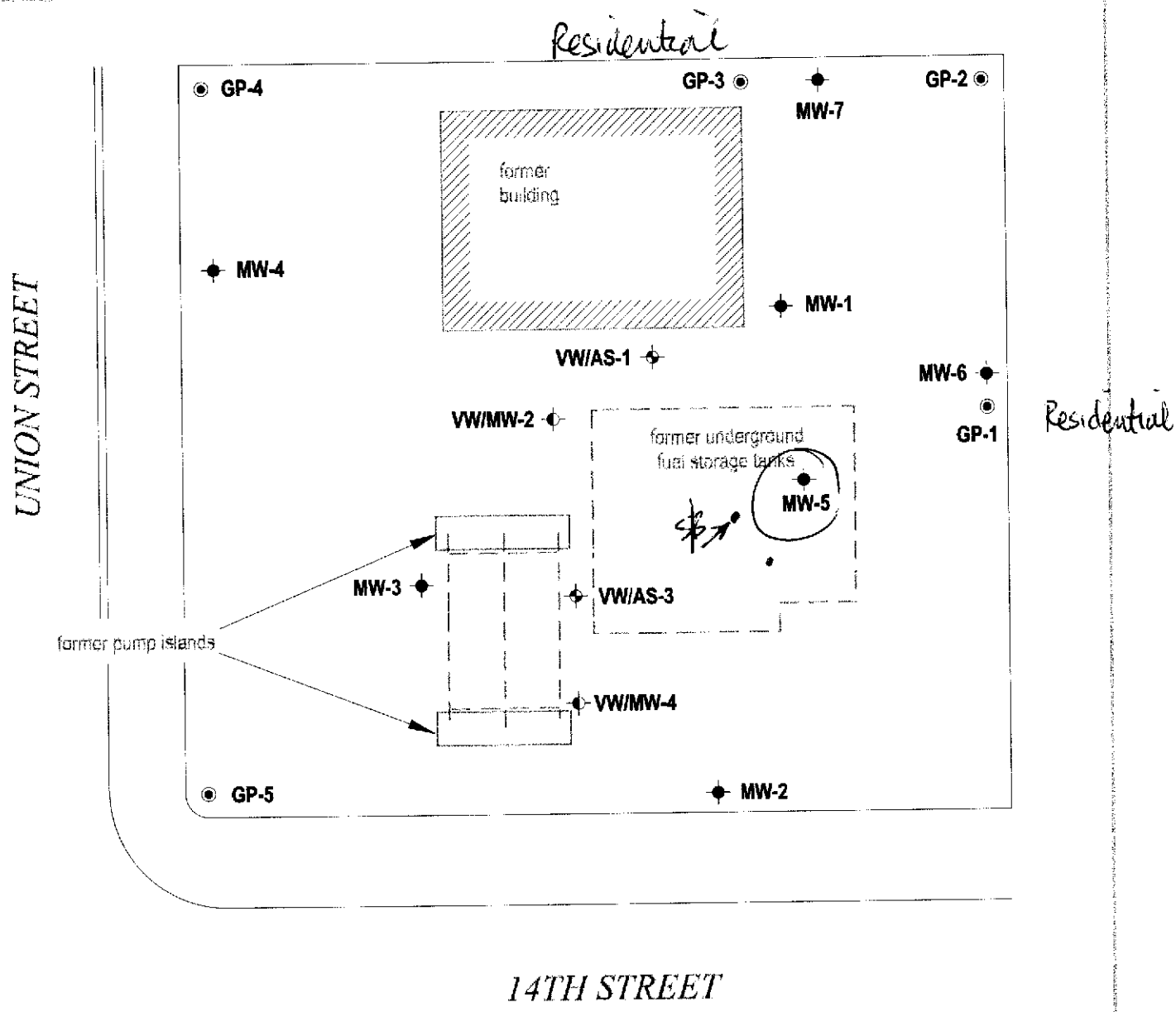
Figure: 1- Monitoring Well Location Map

Table: 1 - Soil Analytical Results

Attachments: A - Laboratory Analytical Reports
B - Well Permits
C - Boring Logs
D - Monitoring Well Survey
E - Standard Field Procedures for Installation of Monitoring Wells

cc: Karen Petryna, Equiva Services LLC, P.O. Box 7869, Burbank, CA 91510-7869
Tom Saberi, 1045 Airport Boulevard, Suite 12, South San Francisco, CA 94080
Matthew Dudley, Sedgwick, Detert, Moran, & Arnold, 1 Embarcadero Center, 16th Floor, San Francisco, CA 94111-3628

G:\Oakland 1230 14th\2001 Site Investigation\1230 14th MWInstall report 11-01.doc



EXPLANATION

MW-1 ⊕	Monitoring well location
VW/AS-1 ⊕	Combination air sparge/soil vapor extraction well
VW/MW-2 ⊕	Combination soil vapor extraction well/monitoring well
GP-1 ◉	Soil boring location (12/11/00)

N

0 10 20

Scale (ft)

FIGURE

1

G:\OAKLAND\1230-14TH\FIGURES\WELL-LOC.DWG

Former Shell Service Station
1230 14th Street
Oakland, California
Incident #97088250

CAMBRIA

Monitoring Well Location Map

Table 1 Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California - Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Petroleum Oil and Grease
			←			(ppm)		→	
MW-5-9.5	9/27/01	9.5	**3.9**	<0.0050	<0.0050	**0.0069**	**0.019**	<0.50	--
MW-5-14.0	9/27/01	14.5	**790**	**2.7**	**30**	**11**	**67**	<1.0	--
GP-1-5	12/11/00	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-1-10	12/11/00	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-1-15	12/11/00	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-1-20	12/11/00	20.0	**120**	<0.020	**0.022**	**0.64**	**1.1**	<0.020	--
GP-2-5	12/11/00	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-2-10.5	12/11/00	10.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-2-15	12/11/00	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-3-5	12/11/00	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-3-10.0	12/11/00	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-3-15.0	12/11/00	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-4-5	12/11/00	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-4-10	12/11/00	10.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-4-15	12/11/00	15.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--
GP-5-5	12/11/00	5.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--

Table 1 Soil Analytical Results - Former Shell-branded Service Station, 1230 14th St., Oakland, California - Incident #97088250

Sample ID	Date	Depth (fbg)	TPHg	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Petroleum Oil and Grease
			←			(ppm)		→	
SB-E-16.0	03/06/96	16.0	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	200
SB-F(VW/AS)-1-5.5	03/07/96	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--
SB-F(VW/AS-1)-10.5	03/07/96	10.5	62	0.97	4.2	1.4	8.0	--	--
SB-F(VW/AS-1)-15.5	03/07/96	15.5	7.4	1.7	0.44	0.2	0.6	--	--
SB-F(VW/AS-1)-20.5	03/07/96	20.5	20	2.6	1.7	0.5	2.0	--	--
SB-G(VW/MW-2)-8.5	03/07/96	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--
SB-G(VW/MW-2)-10.5	03/07/96	10.5	<1.0	0.0032	<0.0025	<0.0025	<0.0025	--	--
SB-G(VW/MW-2)-20.5	03/07/96	20.5	2.9	0.47	0.34	0.15	0.57	--	--
SB-H(VW/AS-3)-8.5	03/07/96	8.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--
SB-H(VW/AS-3)-10.5	03/07/96	10.5	<1.0	0.018	<0.0025	<0.0025	0.014	--	--
SB-H(VW/AS-3)-21.0	03/07/96	21.0	1.0	0.047	0.016	0.0037	0.017	--	--
SB-I(VW/MW-4)-5.5	03/08/96	5.5	<1.0	<0.0025	<0.0025	<0.0025	<0.0025	--	--
SB-I(VW/MW-4)-8.5	03/08/96	8.5	80	0.14	0.33	1.3	5.2	--	--

ATTACHMENT A

Laboratory Analytical Reports

KIFF ANALYTICAL LLC

Report Number : 22698
Date : 10/17/2001

Melody Munz
Cambria Environmental Technology, Inc.
1144 65th Street, Suite B
Oakland, CA 94608

Subject : 2 Soil Samples
Project Name : 1230 14th St, Oakland
Project Number : 243-0233
P.O. Number : 97088250

Dear Ms. Munz,

Chemical analysis of the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. US EPA protocols for sample storage and preservation were followed.

Kiff Analytical is certified by the State of California (# 2236). If you have any questions regarding procedures or results, please call me at 530-297-4800.

Sincerely,

Joel Kiff

Joel Kiff

Report Number : 22698

Date : 10/17/2001

Project Name : **1230 14th St, Oakland**

Project Number : **243-0233**

22698 Quality Control Data - Method Blank

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	10/6/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	10/6/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	10/6/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	10/6/2001
Methyl-t-butyl ether (MTBE)	**< 0.50**	0.50	mg/Kg	EPA 8260B	10/6/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	10/6/2001
Toluene - d8 (Surr)	102		% Recovery	EPA 8260B	10/6/2001
4-Bromofluorobenzene (Surr)	105		% Recovery	EPA 8260B	10/6/2001

Approved By: Joel Kiff

Report Number : 22698

QC Report : Laboratory Control Sample (LCS)

Date : 10/17/2001

Project Name : **1230 14th St, Oakland**

Project Number : **243-0233**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Benzene	0.0401	mg/Kg	EPA 8260B	10/5/2001	99.7	70-130
Toluene	0.0401	mg/Kg	EPA 8260B	10/5/2001	100	70-130
Tert-Butanol	0.200	mg/Kg	EPA 8260B	10/5/2001	90.9	70-130
Methyl-t-Butyl Ether	0.0401	mg/Kg	EPA 8260B	10/5/2001	84.0	70-130

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

720 Olive Drive, Suite D Davis, CA 95616 530-297-4800

ATTACHMENT B

Well Permits

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 1232 14th St, OAKLAND, CA

CLIENT
Name EQUIVA SERVICES LLC
Address PO BOX 7869 Phone
City BURBANK, CA Zip [redacted]91510

APPLICANT
Name CAMBRIA ENVIRONMENTAL TECHNOLOGY
Attn SUE LANDSITTEL Fax (510) 420-9170
Address 1144 65th ST Phone (510) 420-3377
City OAKLAND, CA Zip 94608

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	0	General	0
Water Supply	0	Contamination	0
Monitoring	X	Well Destruction	0

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	0

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0	Auger	X
Cable	0	Other	0		

DRILLER'S NAME GREGG DRILLING

DRILLER'S LICENSE NO. C57 485165

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum
Casing Diameter 4 in. Depth 25 ft.
Surface Seal Depth 5 ft. Owner's Well Number MW-6

GEOTECHNICAL PROJECTS
Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

ESTIMATED STARTING DATE 9/25/01
ESTIMATED COMPLETION DATE 9/25/01

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] DATE 9/12/01

PLEASE PRINT NAME SUE LANDSITTEL

FOR OFFICE USE

PERMIT NUMBER W01-856
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 9/14/01

Rev. 6-13-00

ATTACHMENT C

Boring Logs

Cambria Environmental Technology, Inc.
1144 - 65th St.
Oakland, CA 94608
Telephone: (510) 420-0700
Fax: (510) 420-9170

BORING/WELL LOG

CLIENT NAME	Equiva Services LLC	**BORING/WELL NAME**	MW-6
JOB/SITE NAME	Shell-branded Service Station	**DRILLING STARTED**	27-Sep-01
LOCATION	1230 14th Street, Oakland, California	**DRILLING COMPLETED**	27-Sep-01
PROJECT NUMBER	243-0233	**WELL DEVELOPMENT DATE (YIELD)**	NA
DRILLER	Gregg Drilling	**GROUND SURFACE ELEVATION**	Not Surveyed
DRILLING METHOD	Hollow-stem auger	**TOP OF CASING ELEVATION**	NA
BORING DIAMETER	10"	**SCREENED INTERVAL**	5 to 20 ft bgs
LOGGED BY	S. Landsittel	**DEPTH TO WATER (First Encountered)**	11.0 ft ▽
REVIEWED BY	S. Bork, RG# 5620	**DEPTH TO WATER (Static)**	NA ▼
REMARKS	Hand augered to 5' bgs. Located along eastern property boundary.		

TPHg (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
							ASPHALT	0.3	Portland Type I/II Cement
							Silty SAND (SM); brown; damp; 5% clay, 15% silt, 80% fine to medium sand; low plasticity.		Bentonite Seal
				5					Monterey Sand #2/12
							@ 8.5' bgs - moist.		
				10	SM				
									4"-diam., 0.010" Slotted Schedule 40 PVC
				15			@ 14.5' bgs - reddish brown; wet; 8% clay, 15% silt, 77% fine to medium sand.		
							@ 19' bgs - reddish brown; 10% clay, 15% silt; 75% fine to medium sand.	20.0	Bottom of Boring @ 20 ft
				20					

WELL LOG (SHELL) G:\OAKLAN-2\GINTMOK-1230.GPJ DEFAULT.GDT 11/5/01

ATTACHMENT D

Monitoring Well Survey

ATTACHMENT E

Standard Field Procedures for Installation of Monitoring Wells

Water Sampling

Water samples, if they are collected from the boring, are either collected using a driven Hydropunch® type sampler or are collected from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Well Construction and Surveying

Ground water monitoring wells are installed to monitor ground water quality and determine the ground water elevation, flow direction and gradient. Well depths and screen lengths are based on ground water depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 ft below and 5 ft above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three ft thick.

Well casing and screen are flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two ft above the well screen. A two ft thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.