CAMBRIA

Recd 7/20/01

July 17, 2001

Barney Chan
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

3849

Re: **Dual-phase Vacuum Extraction Test Report**
Shell-branded Service Station
105 5th Street
Oakland, California
Incident #98995757
Cambria Project #243-0472-007

Dear Mr. Chan:

On behalf of Equiva Services LLC, Cambria Environmental Technology, Inc. (Cambria) has prepared this *Dual-phase Vacuum Extraction (DVE) Test Report* for the referenced site. A DVE pilot test was conducted on March 20, 2001 to determine the effectiveness of DVE, as well as soil vapor extraction (SVE), in remediating hydrocarbons in soil and groundwater. Presented below are summaries of the site background, DVE test, and Cambria's conclusions and recommendations.

SITE BACKGROUND

Site Description: The site is an active Shell-branded service station, located on the corner of Fifth and Oak Streets in Oakland, California. The site is surrounded by commercial property (Figure 1). The site currently utilizes four underground storage tanks (USTs), and four dispenser islands. Three monitoring wells are used to evaluate site groundwater (Figure 2). & 1 offsite mw.

1996 Upgrade Activities: During November and December of 1996, Armer/Norman & Associates of Walnut Creek, California removed five gasoline dispensers, two diesel dispensers, associated piping and inactive piping to a former diesel fuel dispenser. On November 27, 1996, Cambria collected soil samples from beneath the seven dispenser locations and the inactive diesel fuel piping prior to replacement. Armer/Norman & Associates replaced the gasoline and diesel dispensers and associated piping with additional secondary containment. After receiving analytical results indicating the presence of hydrocarbons, Cambria filed an *Underground Storage Tank Unauthorized Release Site Report* with the Alameda County Health Care Services Agency.

Oakland, CA
San Ramon, CA
Sonoma, CA

Cambria Environmental Technology, Inc.

1144 65th Street
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1998 Upgrade Activities: In February 1998, Paradiso Mechanical of San Leandro, California installed secondary containment on the turbine sumps. Since secondary containment had previously been added to the dispensers, no additional dispenser upgrade activities were performed. Cambria inspected the tank pit on February 26, 1998, and no field indications of hydrocarbons, such as staining or odor, were observed.

1998 Subsurface Investigation: On July 23, 1998, Cambria advanced three borings in the assumed downgradient direction from existing dispensers and two borings in the assumed upgradient direction from the existing dispensers. The soil borings were advanced to depths of 11.0 to 12.0 feet below grade (fbg). The maximum detected hydrocarbon concentrations in soil were 15 miligrams per kilogram (mg/kg) total petroleum hydrocarbons as gasoline (TPHg) in boring SB-3 at 5.0 fbg and 0.48 mg/kg methyl tertiary-butyl ether (MTBE) in boring SB-5 at 5.0 fbg. No benzene was detected in the soil samples. The maximum detected hydrocarbon concentrations in groundwater were 90,000 micrograms per liter (µg/L) TPHg in boring SB-3, 27,000 µg/L total petroleum hydrocarbons as diesel in SB-4, 1,300 µg/L benzene in SB-3, and 4,100 µg/L MTBE (EPA Method 8020) in SB-4.

1999 Monitoring Well Installations: On May 14,1999, Cambria installed three groundwater monitoring wells to of 25 fbg. Hydrocarbons were not detected in soil samples from MW-1 or MW-3. The maximum detected hydrocarbon concentrations in soil samples collected from boring MW-2 were 1,700 mg/kg TPHg at 5.5 fbg, 0.0369 mg/kg benzene at 10.5 fbg, and 13.2 mg/kg MTBE at 5.5 fbg. Hydrocarbons were not detected in groundwater sampled from MW-1, located upgradient of the existing dispensers. The maximum detected concentrations in groundwater were 13,800 µg/L TPHg in MW-2, 1,790 µg/L benzene in MW-2, and 324,000 µg/L MTBE (by EPA Method 8260) in MW-3.

Remedial Activities: Monthly mobile DVE, using wells MW-2 and MW-3, was initiated at the site on April 21, 2000 primarily to remediate MTBE in soil and groundwater. DVE is the process of applying a high vacuum through an airtight well seal to simultaneously extract soil vapors from the vadose zone and enhance groundwater extraction from the saturated zone. A stinger is lowered into the well to draw down the water table and increase the unsaturated area available for SVE. Mobile DVE utilitizes a vacuum truck as an extraction device, moisture separator, and temporary storage tank. Extracted soil vapors pass through the vacuum truck tank, and are abated through carbon filtration.

Advanced Clean-up Technologies Inc (ACTI) of Benecia, California was retained for conducting mobile DVE at the site. Extracted groundwater was disposed at the Martinez Refinery Corporation in Martinez, California. Abatement of the extracted soil vapors through carbon filtration was determined to be inadequate. Therefore, mobile DVE was discontinued after October 26, 2000.

DUAL-PHASE VACUUM EXTRACTION TEST SUMMARY

DVE Pilot Test Objective: Quarterly monitoring and mobile DVE data suggested a DVE pilot test might achieve favorable results. The objective of the DVE pilot test was to evaluate the feasibility of DVE for source area remediation and to obtain DVE system design data. The DVE remedial approach was selected given that the well screens at this site are almost entirely submerged throughout the year.

DVE Pilot Test Procedures: On March 20, 2001, Cambria performed individual short-term DVE testing of two existing monitoring wells, MW-2 and MW-3. Each well was tested for approximately 3 hours, at two different extraction rates. An internal combustion engine (ICE) was set to operate at a constant revolutions per minute (rpm) rate to yield a constant vacuum and air flow rate. The rpm rate was then adjusted to observe the differences in operating conditions and yield of the formation. Throughout the tests, Cambria measured extracted groundwater volume, applied vacuum, air flow, vapor concentration, groundwater drawdown in nearby wells, and vacuum influence in nearby wells. For each test, groundwater and vapor samples were collected for laboratory analysis. The samples were analyzed for TPHg, MTBE, benzene, toluene, ethylbenzene, and total xylenes by EPA Method 8260. Groundwater recharge data was also collected from each well at the end of each test. Cambria notified the Bay Area Air Quality Management District of the test on March 19, 2001.

SVE Pilot Test Equipment: The test was performed by connecting a Remediation Services International model V3 ICE to a test well for extracting groundwater and soil vapor. The ICE is equipped with a separator tank to partition the liquid and vapor streams. The ICE was powered by the extracted soil vapors, supplemented with liquid propane gas. By burning the extracted soil vapors as fuel, the ICE also served as a vapor abatement device. The ICE is equipped with a Phoenix 1000 controller, which measured applied vacuum and vapor extraction flow rates.

A Horiba model MEXA554JU organic vapor analyzer was used to field measure hydrocarbon concentrations in the vapor stream. A Thomas Industries model 907CDC18F vacuum pump was used to collect vapor samples in one-liter tedlar bags. Magnehelic differential pressure gauges were used to monitor vacuum induced in nearby wells. A 12-volt transfer pump, activated by liquid level switches, variably discharged water in the separator tank to an on-site storage tank. The discharged water volume was measured using a Great Palm Industries electronic digital meter. Water samples were collected for laboratory analysis in 40-milliliter volatile organic analytes vials preserved with hydrochloric acid. A water-level indicator was used to periodically monitor groundwater drawdown in nearby wells and measure groundwater recharge in the extraction well.

DUAL-PHASE VACUUM EXTRACTION TEST RESULTS

Short-term DVE pilot testing of well MW-2 and MW-3 occurred on March 20, 2001. The test data is presented in Tables 1 and 2. Laboratory analytical results are included as Attachment A. Field data sheets are included as Attachment B.

Well MW-2 Vapor-Phase Results: TPHg, benzene, and MTBE vapor concentrations were reported as 4,300, 9.8, and 220 parts per million (ppm), respectively, in the first vapor sample collected from well MW-2 at 13:20 hours. TPHg, benzene, and MTBE concentrations were reported as 5,300, 13, and 530 ppm, respectively, in the second vapor sample collected from well MW-2 at 16:00 hours.

During the first test, vapor extraction flow rates ranged from 5 cubic feet per minute (cfm) to 13 cfm, based on an applied vacuum ranging from 192 to 227 inches of water. During the second test, vapor extraction flow rates ranged from 7 cfm to 36 cfm, based on an applied vacuum ranging from 186 to 250 inches of water. Based on these operating parameters and the vapor sample analytical results, the TPHg, benzene, and MTBE vapor-phase mass removal over both test periods was estimated at 2.26, 0.005, and 0.207 pounds, respectively.

Monitoring well MW-3 was used to measure vacuum influence. Well MW-3 is located approximately 60 feet from well MW-2. No vacuum influence was observed in well MW-3.

Well MW-2 Liquid-Phase Results: TPHg, benzene, and MTBE groundwater concentrations were reported as 2,300, 49, and 12,000 parts per billion (ppb), respectively, for the extracted groundwater sample from well MW-2. This sample was collected at 13:20 hours. Extraction flow rates ranged from 1.07 gallons per minute (gpm) to 3.07 gpm, with an average of 1.70 gpm. Based on the extracted groundwater volumes and the groundwater sample analytical results, the TPHg, benzene, and MTBE liquid-phase mass removal over the test period was estimated at 0.005, 0.000, and 0.027 pounds, respectively (Table 1). When the analytical result is below the detection limit, one half the detection limit is used to estimate the mass removed.

During equipment set-up and site inspection on the morning of the test, Cambria personnel discovered backfill wells constructed within the UST complex. The tank backfill wells are 10-inch diameter wells extending to a depth of approximately 15 feet bgs. The wells are screened from top to bottom. The backfill wells labeled T-1 and T-2 on Figure 2 were used to measure hydraulic influence. Backfill well T-1 is located approximately 50 feet from well MW-2 and T-2 is located approximately 20 feet from MW-2. Groundwater drawdown was not observed in either of these wells. Groundwater recharge data from well MW-2 was collected at the end of the test for a period of ten minutes. The water column recovered approximately 100% over that period of time.

Well MW-3 Vapor-Phase Results: TPHg, benzene, and MTBE vapor concentrations were reported as 2,600, 1.2, and 690 ppm, respectively, in the first vapor sample collected from well MW-3 at 9:15 hours. TPHg, benzene, and MTBE concentrations were reported as 2,200, 2.3, and 590 ppm, respectively, in the second vapor sample collected from MW-3 at 12:00 hours.

During the first test, vapor extraction flow rates ranged from 0 to 13 cfm, based on an applied vacuum ranging from 57 to 214 inches of water. During the second test, vapor extraction flow rates ranged from 8 to 21 cfm, based on an applied vacuum ranging from 83 to 150 inches of water,. Based on these operating parameters and the vapor sample analytical results, the TPHg, benzene, and MTBE vapor-phase mass removal over both test periods was estimated at 0.983, 0.001, and 0.269 pounds, respectively.

Monitoring well MW-2 was used to measure vacuum influence. Well MW-2 is located approximately 60 feet from well MW-3. No vacuum influence was observed in well MW-2.

Well MW-3 Liquid-Phase Results: TPHg, benzene, and MTBE groundwater concentrations were reported as <10,000, <100, and 190,000 ppb, respectively, for the extracted groundwater sample from well MW-3 collected at 9:20 hours. Extraction flow rates ranged from 0.6 to 35 gpm, with an average of 2.87 gpm. Based on the extracted groundwater volumes and the groundwater sample analytical results, the TPHg, benzene, and MTBE liquid-phase mass removal over the test period was estimated at 0.006, 0.000, and 0.22 pounds, respectively (Table 1).

Backfill wells T-1 and T-2 were used to measure hydraulic influence. Well T-1 is located approximately 10 feet from well MW-3. Well T-2 is located approximately 40 feet from well MW-2. No groundwater drawdown was observed in either of these wells.

Advanced Cleanup Technologies Inc (ACTI) was retained to off-haul and dispose the groundwater extracted during the test. On March 21, 2001, ACTI picked up the 769 gallons of groundwater generated from the DVE test. As directed by Cambria, ACTI then extracted groundwater from backfill T-1. ACTI was able to fill the remaining capacity (2,900 gallons) of the truck in approximately one hour. All groundwater off-hauled by ACTI was disposed at the Martinez Refinery Corporation in Martinez, California.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions: Vapor extraction data from the DVE pilot test indicates vapor-phase petroleum hydrocarbon recovery is possible although expected recovery rates are relatively low. Moderate airflow rates were obtained during the tests. Vacuum influence was not measurable in observation

wells, which is expected given the low estimated permeability soil. Both of the test wells yielded relatively high TPHg vapor concentrations, but only moderate MTBE vapor concentrations. Based on the test data, maximum vapor-phase mass removal is projected at 13 pounds per day (lbs/day) for TPHg and 1.9 lbs/day for MTBE.

Groundwater extraction data from the DVE pilot test suggests liquid-phase petroleum hydrocarbon recovery is feasible. A total of 769 gallons of groundwater was extracted over the six-hour test period, equating to 2.14 gallons per minute or 3,076 gallons per day. Based on the test data, maximum liquid-phase mass removal is projected at 0.007 lbs/day for TPHg and 0.988 lbs/day for MTBE. Hydraulic influence was not observed, but the close proximity of the UST complex and the volume of groundwater within the UST complex may have prevented observable drawdown. It is not readily discernible whether DVE enhanced groundwater recovery from the test wells. Previous groundwater extraction data compared with the DVE test data did not show a significant difference.

Recommendations: Although test results indicate chemical recovery by groundwater extraction and DVE is possible, recovery by DVE may be limited. The low estimated permeability soil limits the area available for vapor recovery, and limits groundwater production. Installation of a DVE system could cost as much as $100,000, contingent on permitting issues, availability of utilities, equipment fabrication, etc. Operation and maintenance of a DVE system could cost as much as $30,000 annually. Without the ability to reach significant source area or process an adequate volume, the expected recovery does not justify the cost of a DVE system.

However, field observations indicate that significant liquid phase recovery can be accomplished using the two onsite tank backfill wells. The one-hour extraction event from backfill well T-1 by ACTI removed 2,900 gallons of groundwater. Using groundwater analytical data from MW-3 (the closest proximal well), TPHg and MTBE mass removal during that event are calculated to be 0.121 and 4.6 pounds, respectively. This mass removal is projected at 2.9 lbs/day for TPHg and 110.4 lbs/day for MTBE. Additionally, dewatering of the UST complex may provide hydraulic control of the contaminants in groundwater.

Based on the test data and conclusions presented, Cambria recommends conducting semi-monthly groundwater extraction from backfill well T-1 for a period of six months. Groundwater extraction would be conducted by means of a vacuum truck. ACTI would be retained to conduct the extraction events. Extracted groundwater would be off-hauled and disposed at the Martinez Refinery Corporation in Martinez, California. Well T-1 will be added to the quarterly monitoring schedule to more accurately estimate mass removal quantities. After the six-month period, Cambria will evaluate the effectiveness of the groundwater extraction events.

- Add extraction from T-2, MW2 & MW3.
- Need a MW between dispensers + tank pit to see if another source exist.

CAMBRIA

CLOSING

Please call James Loetterle at (510) 420-3336 if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.

James Loetterle
Staff Geologist

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

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

Figures: 1 - Vicinity Map
2 - Site Plan

Tables 1 - Groundwater Extraction – Mass Removal Data
2 - Vapor Extraction – Mass Removal Data

Attachments: A - Laboratory Analytical Report
B - Field Data Sheets

cc: Karen Petryna, Equiva Services LLC, P.O. Box 7869, Burbank, CA 91510-7869

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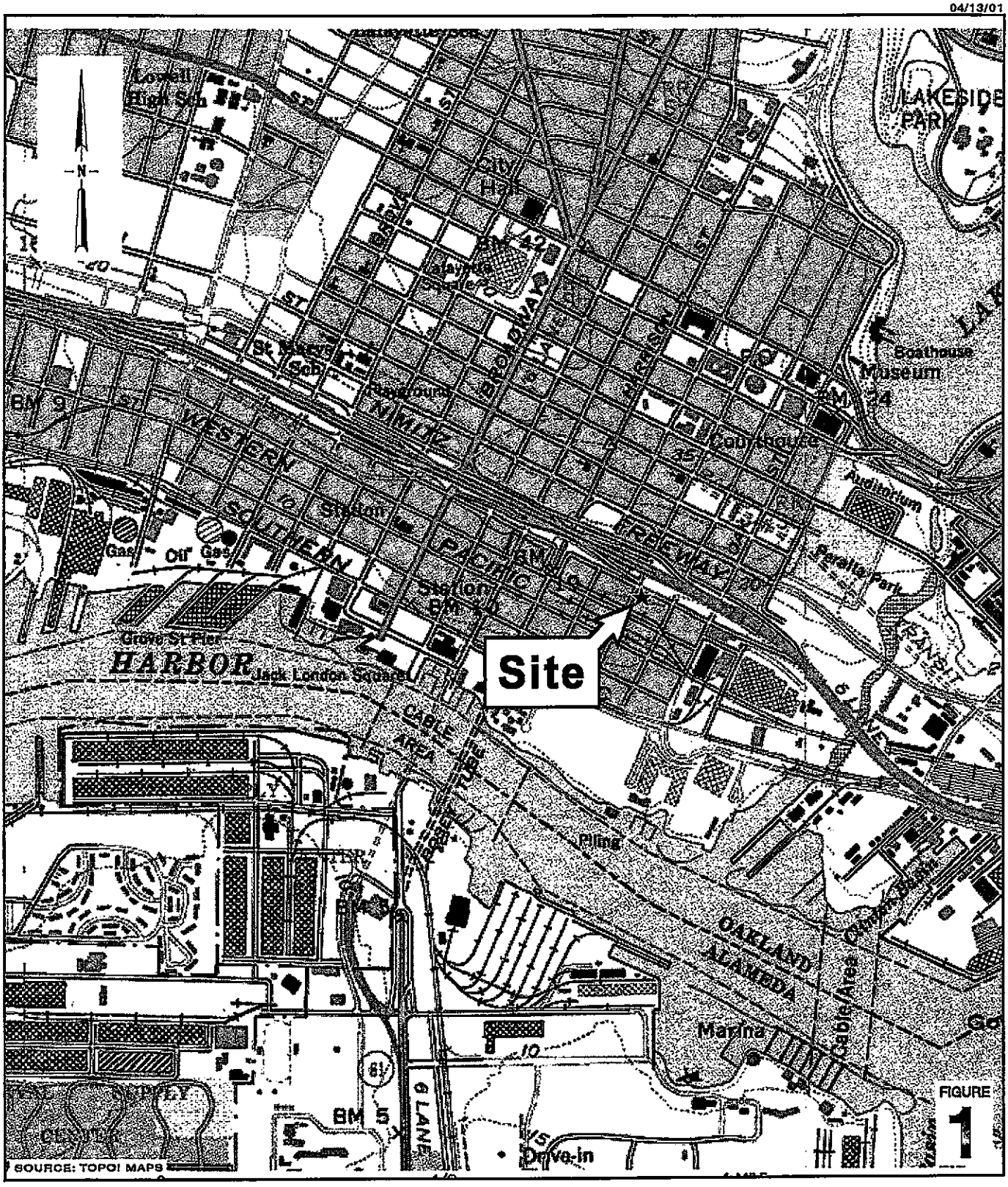

G:\OAKLAND 105 5TH\FIGURES\VICINITY-MAP.AI

0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

Shell-branded Service Station
105 Fifth Street
Oakland, California
Incident #98995757

CAMBRIA

Vicinity Map

07/17/01

EXPLANATION

- MW-1 — Monitoring Well Location
- MW-4 — Monitoring Well Location (02/12/01)
- T-1 — Tank Backfill Well Location
- SB-1 — Soil Boring Location
- SB-5 — Soil Boring Location (02/12/01)
- Sanitary Sewer Line
- Storm Drain Line
- Flow Direction
- MH — Manhole
- Storm Drain Inlet

0 20 40 80

Scale (ft)

Site Plan

(All locations are Approximate)

C A M B R I A

Shell-branded Service Station
105 Fifth Street
Oakland, California
Incident #98995757

FIGURE
2

G:\OAKLAND 105 5TH\FIGURES\WELL-BOX-LOC.DWG

Table 1: Groundwater Extraction - Mass Removal Data - Shell-branded Service Station, Incident #98995757, 105 Fifth Street, Oakland, California

Date Purged	Well ID	Volume Pumped (gal)	Cumulative Volume Pumped (gal)	Date Sampled	TPPH Concentration (ppb)	TPPH Removed (pounds)	TPPH Removed To Date (pounds)	Benzene Concentration (ppb)	Benzene Removed (pounds)	Benzene Removed To Date (pounds)	MTBE Concentration (ppb)	MTBE Removed (pounds)	MTBE Removed To Date (pounds)
					TPPH			Benzene			MTBE		
03/20/01	MW-2	Dual-phase Vacuum Extraction (DVE) Pilot Test using a RSI V3 Internal Combustion Engine with Bioslurp Tank											
13:15	RPM=2000	12	12	GPM	2,300	0.000	0.000	49	0.000	0.000	12,000	0.001	0.000
13:20					2,300			49			12,000		
13:25					2,300			49			12,000		
14:45					2,300			49			12,000		
15:00	RPM=1500	138	150	3.07	2,300	0.003	0.003	49	0.000	0.000	12,000	0.014	0.014
15:05					2,300			49			12,000		
15:10					2,300			49			12,000		
15:15					2,300			49			12,000		
15:30		82	232	2.73	2,300	0.002	0.004	49	0.000	0.000	12,000	0.008	0.022
15:45		33	265	2.20	2,300	0.001	0.005	49	0.000	0.000	12,000	0.003	0.025
16:00		16	281	1.07	2,300	0.000	0.005	49	0.000	0.000	12,000	0.002	0.027
03/20/01	MW-3	Dual-phase Vacuum Extraction (DVE) Pilot Test using a RSI V3 Internal Combustion Engine with Bioslurp Tank											
9:10	RPM=2000			GPM	<10,000			<100			190,000		
9:15					<10,000			<100			190,000		
9:20		350	350	35.0	<10,000*	0.015	0.000	<100*	0.000	0.000	190,000	0.555	0.00
9:50					<10,000			<100			190,000		
10:00		30	380	0.75	<10,000*	0.001	0.001	<100*	0.000	0.000	190,000	0.048	0.05
10:15		32	412	2.13	<10,000*	0.001	0.003	<100*	0.000	0.000	190,000	0.051	0.10
10:30	RPM=1500				<10,000			<100			190,000		
10:35					<10,000			<100			190,000		
10:40					<10,000			<100			190,000		
10:45					<10,000			<100			190,000		
11:15		36	448	0.60	<10,000*	0.002	0.004	<100*	0.000	0.000	190,000	0.057	0.16
11:30					<10,000			<100			190,000		
11:45		18	466	0.60	<10,000*	0.001	0.005	<100*	0.000	0.000	190,000	0.029	0.18
12:00		22	488	1.47	<10,000*	0.001	0.006	<100*	0.000	0.000	190,000	0.035	0.22
03/21/01	T-1	2,900	2,900	03/20/01	<10,000*	0.121	0.121	<100*	0.001	0.001	190,000	4.60	4.60
Total Gallons Extracted:			3,669		Total Pounds Removed:		0.132			0.001			4.84
					Total Gallons Removed:		0.022			0.000			0.781

Table 1: Groundwater Extraction - Mass Removal Data - Shell-branded Service Station, Incident #98995757, 105 Fifth Street, Oakland, California

Abbreviations & Notes:

TPPH = Total purgeable hydrocarbons as gasoline
MTBE = Methyl tert-butyl ether
µg/L = Micrograms per liter
ppb = Parts per billion, equivalent to µg/L
L = Liter
gal = Gallon
g = Gram
<n = Detection limit provided by analytical method
* = 1/2 the detection limit concentration is used for mass removal calculation.
Mass removed based on the formula: volume extracted (gal) x Concentration (µg/L) x (g/10^6µg) x (pound/453.6g) x (3.785 L/gal)
Volume removal data based on the formula: density (in gms/cc) x 9.339 (ccxlbs/gmsxgals)
TPPH, benzene analyzed by EPA Method 8015/8020
MTBE analyzed by EPA Method 8260 in bold font, all other MTBE analyzed by EPA Method 8020
Concentrations based on most recent groundwater monitoring results

Table 2: Vapor Extraction - Mass Removal Data - Shell-branded Service Station, Incident #98995757, 105 Fifth Street, Oakland, California

Date	Well ID	Interval Hours of Operation (hours)	System Flow Rate (CFM)	Hydrocarbon Concentrations (Concentrations in ppmv) TPHg	Benzene	MTBE	TPPH: TPHg Removal Rate (#/hour)	TPPH: Cumulative TPHg Removed (#)	Benzene: Benzene Removal Rate (#/hour)	Benzene: Cumulative Benzene Removed (#)	MTBE: MTBE Removal Rate (#/hour)	MTBE: Cumulative MTBE Removed (#)
03/20/01	MW-2	**Dual-phase Vacuum Extraction (DVE) Pilot Test using a RSI V3 Internal Combustion Engine with Bioslurp Tank**										
13:15	RPM=2000	0.000	10	10,770			0.575	0.000	0.001	0.000	0.030	0.000
13:20		0.083	13	4,300	9.8	220	0.747	0.062	0.002	0.000	0.039	0.003
13:25		0.083	7	32,400			0.402	0.095	0.001	0.000	0.021	0.005
14:45		1.33	5	13,530			0.287	0.478	0.001	0.001	0.015	0.025
15:00	RPM=1500	0.250	7	26,300			0.496	0.602	0.001	0.001	0.051	0.038
15:05		0.083	9	22,000			0.638	0.655	0.001	0.001	0.065	0.043
15:10		0.083	19	12,000			1.35	0.766	0.003	0.002	0.138	0.055
15:15		0.003	20	9,940			1.42	0.771	0.003	0.002	0.145	0.055
15:30		0.250	20	13,770			1.42	1.13	0.003	0.002	0.145	0.091
15:45		0.250	28	33,400			1.98	1.62	0.004	0.004	0.203	0.142
16:00		0.250	36	5,300	13	530	2.55	2.26	0.006	0.005	0.261	0.207
03/20/01	MW-3	**Dual-phase Vacuum Extraction (DVE) Pilot Test using a RSI V3 Internal Combustion Engine with Bioslurp Tank**										
9:10	RPM=2000	0.000	0				0.000	0.000	0.000	0.000	0.000	0.000
9:15		0.083	0	2,600	1.2	690	0.000	0.000	0.000	0.000	0.000	0.000
9:20		0.083	0				0.000	0.000	0.000	0.000	0.000	0.000
9:50		0.500	5				0.174	0.087	0.000	0.000	0.047	0.024
10:00		0.167	13	4,340			0.452	0.162	0.000	0.000	0.123	0.044
10:15		0.250	11	4,670			0.382	0.258	0.000	0.000	0.104	0.070
10:30	RPM=1500	0.250	10	23,300			0.294	0.331	0.000	0.000	0.081	0.090
10:35		0.083	13	20,570			0.382	0.363	0.000	0.000	0.105	0.099
10:40		0.083	14	22,000			0.412	0.397	0.000	0.000	0.113	0.108
10:45		0.083	17	23,000			0.500	0.439	0.000	0.000	0.137	0.120
11:15		0.500	8	20,000			0.235	0.556	0.000	0.000	0.065	0.152
11:30		0.250	16	18,700			0.471	0.674	0.000	0.001	0.129	0.184
11:45		0.250	21	20,370			0.618	0.829	0.001	0.001	0.169	0.227
12:00		0.250	21	2,200	2.3	590	0.618	0.983	0.001	0.001	0.169	0.269
Total Pounds Removed:							**TPHg =**	**3.24**	**Benzene =**	**0.006**	**MTBE =**	**0.476**

Table 2: Vapor Extraction - Mass Removal Data - Shell-branded Service Station, Incident #98995757, 105 Fifth Street, Oakland, California

Abbreviations and Notes:

CFM = Cubic feet per minute

TPHg = Total petroleum hydrocarbons as gasoline (C6-C12) by modified EPA Method 8015 in 1 liter tedlar bag samples

ppmv = Parts per million by volume

= Pounds

Bold = Lab Analytical Concentration, Grayscale = Horiba Organic Vapor Analyzer (OVA) Concentration

TPHG, Benzene, and MTBE analyzed by EPA Method 8015/8020 in 1 liter tedlar bag samples

TPHg / Benzene / MTBE removal rate = Rate based on Bay Area Air Quality Management District's Manual of Procedures for Soil Vapor Extraction dated July 17, 1991.

(Rate = Concentration (ppmv) x system flow rate (cfm) x (1lb-mole/386ft3) x molecular weight (86 lb/lb-mole for TPHg, 78 lb/lb-mole for benzene, 88 lb/lb-mole for MTBE) x 60 min/hour x 1/1,000,000)

Cumulative TPHg / Benzene / MTBE removal = Previous removal rate multiplied by the hour-interval of operation plus the previous total

ATTACHMENT A

Laboratory Analytical Report

KIFF ANALYTICAL LLC

Report Number : 19683
Date : 4/4/2001

Dan Lescure
Cambria Environmental Technology, Inc.
6262 Hollis Street
Emeryville, CA 94608

Subject : 2 Water Samples and 4 Air Samples
Project Name : 105 5th Street, Oakland
Project Number : 243-0472-007
P.O. Number : Incident #98995757

Dear Ms. Lundquist,

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

KIFF ANALYTICAL LLC

Report Number : 19683
Date : 4/4/2001

Project Name : **105 5th Street, Oakland**
Project Number : **243-0472-007**

Sample : **V2A** Matrix : Air Lab Number : 19683-01
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**9.8**	1.0	ppmv	EPA 8260B	3/22/2001
Toluene	**< 1.0**	1.0	ppmv	EPA 8260B	3/22/2001
Ethylbenzene	**8.8**	1.0	ppmv	EPA 8260B	3/22/2001
Total Xylenes	**7.5**	1.0	ppmv	EPA 8260B	3/22/2001
Methyl-t-butyl ether	**220**	2.0	ppmv	EPA 8260B	3/22/2001
TPH as Gasoline	**4300**	100	ppmv	EPA 8260B	3/22/2001
Toluene - d8 (Surr)	94.5		% Recovery	EPA 8260B	3/22/2001
4-Bromofluorobenzene (Surr)	98.0		% Recovery	EPA 8260B	3/22/2001

Sample : **V2C** Matrix : Air Lab Number : 19683-02
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**13**	2.0	ppmv	EPA 8260B	3/22/2001
Toluene	**< 2.0**	2.0	ppmv	EPA 8260B	3/22/2001
Ethylbenzene	**18**	2.0	ppmv	EPA 8260B	3/22/2001
Total Xylenes	**20**	2.0	ppmv	EPA 8260B	3/22/2001
Methyl-t-butyl ether	**530**	4.0	ppmv	EPA 8260B	3/22/2001
TPH as Gasoline	**5300**	200	ppmv	EPA 8260B	3/22/2001
Toluene - d8 (Surr)	97.5		% Recovery	EPA 8260B	3/22/2001
4-Bromofluorobenzene (Surr)	99.3		% Recovery	EPA 8260B	3/22/2001

Approved By: Joel Kiff

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KIFF ANALYTICAL LLC

Report Number : 19683
Date : 4/4/2001

Project Name : **105 5th Street, Oakland**
Project Number : **243-0472-007**

Sample : **V3A** Matrix : Air Lab Number : 19683-03
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**1.2**	1.0	ppmv	EPA 8260B	3/22/2001
Toluene	**< 1.0**	1.0	ppmv	EPA 8260B	3/22/2001
Ethylbenzene	**< 1.0**	1.0	ppmv	EPA 8260B	3/22/2001
Total Xylenes	**< 1.0**	1.0	ppmv	EPA 8260B	3/22/2001
Methyl-t-butyl ether	**690**	4.0	ppmv	EPA 8260B	3/23/2001
TPH as Gasoline	**2600**	100	ppmv	EPA 8260B	3/22/2001
Toluene - d8 (Surr)	99.6		% Recovery	EPA 8260B	3/22/2001
4-Bromofluorobenzene (Surr)	97.6		% Recovery	EPA 8260B	3/22/2001

Sample : **V3C** Matrix : Air Lab Number : 19683-04
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**2.3**	2.0	ppmv	EPA 8260B	3/22/2001
Toluene	**< 2.0**	2.0	ppmv	EPA 8260B	3/22/2001
Ethylbenzene	**< 2.0**	2.0	ppmv	EPA 8260B	3/22/2001
Total Xylenes	**< 2.0**	2.0	ppmv	EPA 8260B	3/22/2001
Methyl-t-butyl ether	**590**	4.0	ppmv	EPA 8260B	3/22/2001
TPH as Gasoline	**2200**	200	ppmv	EPA 8260B	3/22/2001
Toluene - d8 (Surr)	101		% Recovery	EPA 8260B	3/22/2001
4-Bromofluorobenzene (Surr)	98.5		% Recovery	EPA 8260B	3/22/2001

Approved By: Joel Kiff

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KIFF ANALYTICAL LLC

Report Number : 19683
Date : 4/4/2001

Project Name : **105 5th Street, Oakland**
Project Number : **243-0472-007**

Sample : **GW2** Matrix : Water Lab Number : 19683-05
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**49**	10	ug/L	EPA 8260B	3/25/2001
Toluene	**< 10**	10	ug/L	EPA 8260B	3/25/2001
Ethylbenzene	**73**	10	ug/L	EPA 8260B	3/25/2001
Total Xylenes	**69**	10	ug/L	EPA 8260B	3/25/2001
Methyl-t-butyl ether	**12000**	500	ug/L	EPA 8260B	3/27/2001
TPH as Gasoline	**2300**	1000	ug/L	EPA 8260B	3/25/2001
Toluene - d8 (Surr)	100		% Recovery	EPA 8260B	3/25/2001
4-Bromofluorobenzene (Surr)	101		% Recovery	EPA 8260B	3/25/2001

Sample : **GW3** Matrix : Water Lab Number : 19683-06
Sample Date :3/20/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 100**	100	ug/L	EPA 8260B	3/27/2001
Toluene	**< 100**	100	ug/L	EPA 8260B	3/27/2001
Ethylbenzene	**< 100**	100	ug/L	EPA 8260B	3/27/2001
Total Xylenes	**< 100**	100	ug/L	EPA 8260B	3/27/2001
Methyl-t-butyl ether	**190000**	5000	ug/L	EPA 8260B	3/27/2001
TPH as Gasoline	**< 10000**	10000	ug/L	EPA 8260B	3/27/2001
Toluene - d8 (Surr)	99.4		% Recovery	EPA 8260B	3/27/2001
4-Bromofluorobenzene (Surr)	96.6		% Recovery	EPA 8260B	3/27/2001

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Report Number : 19683
Date : 04/03/2001

Project Name : **105 5th Street, Oakland**
Project Number : **243-0472-007**

Quality Control Data - Method Blank

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.50**	0.50	ug/L	EPA 8260B	03/24/2001
Toluene	**< 0.50**	0.50	ug/L	EPA 8260B	03/24/2001
Ethylbenzene	**< 0.50**	0.50	ug/L	EPA 8260B	03/24/2001
Total Xylenes	**< 0.50**	0.50	ug/L	EPA 8260B	03/24/2001
Methyl-t-butyl ether	**< 5.0**	5.0	ug/L	EPA 8260B	03/24/2001
TPH as Gasoline	**< 50**	50	ug/L	EPA 8260B	03/24/2001
Toluene - d8 (Surr)	98.5		% Recovery	EPA 8260B	03/24/2001
4-Bromofluorobenzene (Surr)	99.5		% Recovery	EPA 8260B	03/24/2001

Approved By: Joel Kiff

Report Number : 19683

QC Report : Matrix Spike/ Matrix Spike Duplicate

Date : 04/03/2001

Project Name : **105 5th Street, Oakland**

Project Number : **243-0472-007**

Parameter	Spiked Sample	Sample Value	Spike Level	Spike Dup. Level	Spiked Sample Value	Duplicate Spiked Sample Value	Units	Analysis Method	Date Analyzed	Spiked Sample Percent Recov.	Duplicate Spiked Sample Percent Recov.	Relative Percent Diff.	Spiked Sample Percent Recov. Limit	Relative Percent Diff. Limit
Spike Recovery Data														
Benzene	19632-03	<0.50	24.0	25.1	22.1	23.6	ug/L	EPA 8260B	03/24/2009	91.8	94.2	2.56	70-130	25
Toluene	19632-03	<0.50	24.0	25.1	22.1	23.6	ug/L	EPA 8260B	03/24/2009	91.8	93.9	2.20	70-130	25
Tert-Butanol	19632-03	<5.0	24.0	25.1	25.4	25.2	ug/L	EPA 8260B	03/24/2009	106	100	5.06	70-130	25
Methyl-t-Butyl Ether	19632-03	<0.50	24.0	25.1	27.1	28.4	ug/L	EPA 8260B	03/24/2009	113	113	0.443	70-130	25

Approved By: Joel Kiff

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Report Number : 19683

Date : 04/03/2001

QC Report : Laboratory Control Sample (LCS)

Project Name : **105 5th Street, Oakland**

Project Number : **243-0472-007**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Benzene	40.0	ug/L	EPA 8260B	03/24/200	98.5	70-130
Toluene	40.0	ug/L	EPA 8260B	03/24/200	97.2	70-130
Tert-Butanol	200	ug/L	EPA 8260B	03/24/200	98.4	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	03/24/200	99.5	70-130

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

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KIFF ANALYTICAL

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Davis, CA 95616

(530) 297-4800 (530) 297-4803 fax

EQUIVA Services LLC Chain Of Custody Record 19683

Equiva Project Manager to be invoiced: Karen Petryna

☑ SCIENCE & ENGINEERING ☐ TECHNICAL SERVICES ☐ CRMT HOUSTON

INCIDENT NUMBER (S&E ONLY): 98995757

SAP or CRMT NUMBER (TS/CRMT): [redacted]13570O

DATE: 3/20/01

PAGE: 1 of 1

CONSULTANT COMPANY: Cambria Environmental Technology Inc

ADDRESS: 6262 Hollis Street

CITY: Emeryville

TELEPHONE: (510)450-1988 FAX: (510)450-8295 E-MAIL: dlescure@cambria-env.com

SITE ADDRESS (Street and City): 105 5th Street, Oakland

PROJECT CONTACT (Report to): Dan Lescure

CONSULTANT PROJECT NO.: 243-0472-007

SAMPLER NAME(S) (Print): Greg Bentley

LAB USE ONLY

TURNAROUND TIME (BUSINESS DAYS): ☐ 10 DAYS ☐ 5 DAYS ☐ 72 HOURS ☐ 48 HOURS ☐ 24 HOURS ☐ LESS THAN 24 HOURS

☐ LA - RWQCB REPORT FORMAT ☑ UST AGENCY: _____

GC/MS MTBE CONFIRMATION: HIGHEST _____ HIGHEST per BORING _____ ALL _____

SPECIAL INSTRUCTIONS OR NOTES: TEMPERATURE ON RECEIPT C°

Standard TAT, noting 72-hour hold time on air samples.

REQUESTED ANALYSIS

LAB USE ONLY	Field Sample Identification	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH - Purgeable (8015m)	TPH - Extractable (8015m)	BTEX / MTBE (8021B)	BTEX / MTBE + Oxygenates (8260B)	VOCs Full List + Oxygenates (8260B)	MTBE (8260B) Confirmation, See Note	EPA 5035 Extraction for Volatiles	VOCs Halogenated/Aromatic (8021B)	Ethanol, Methanol (8015B)	Metals (Specify)	TRPH (418.1)	Vapor VOCs BTEX / MTBE (TO-15)	Vapor VOCs Full List (TO-15)	Vapor TPH (ASTM 3416m)	Vapor Fixed Gases (ASTM D1946)	Test for Disposal (4B-)	TPHg/BTEX/MTBE (8260B)				FIELD NOTES: Container/Preservative or PID Readings or Laboratory Notes	
	V2A	3/20/01	910	Air	1												X		X							Tedlar Bag	-01
	~~V2B~~	~~3/20/01~~		~~Air~~	~~1~~												~~X~~		~~X~~							~~Tedlar Bag~~	
	V2C	3/20/01	400	Air	1												X		X							Tedlar Bag	-02
	V3A	3/20/01	910	Air	1												X		X							Tedlar Bag	-03
	~~V3B~~	~~3/20/01~~		~~Air~~	~~1~~												~~X~~		~~X~~							~~Tedlar Bag~~	
	V3C	3/20/01	1200	Air	1												X		X							Tedlar Bag	-04
	GW2	3/20/01	120	H2O	3																	X				VOA W/HCL	-05
	GW3	3/20/01	910	H2O	3																	X				VOA W/HCL	-06

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	John Cuttle / Kiff Analytical	032101	1030

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.

10/23/00 Revision

ATTACHMENT B

Field Data Sheets

CAMBRIA

VAPOR EXTRACTION TEST DATA FORM

Project Name: 105 5th St, Oakland
Project Number:
Technicians: GB/PR

Date: 3-20-01
Project Address: 105 5th St, Oakland
Equipment: RSI Inc V3 Internal Combustion Engine

Well Notes:
MW2 = 4"dia, 4'TOS, 20' screen interval
MW3 = 4"dia, 5'TOS, 20' screen interval

Extraction Well	Time Interval (min)	Stinger Depth (fbg)	Vacuum (in H2O)	Air Flow (cfm)	PID (ppm)	Lab Bag (ID)	Ext H2O Volume (gal)	DTW (fbg) (voas)	Influence Pt 1 (DTW)	Influence Pt 2 (in H2O)	Influence Pt 3 (in H2O)	Recharge (Time)	Recharge (DTW)
STARTING TIME:									1" H2O	DTW	DTW		-.30
MW2	2000	RPM					142,728	6.60	MW3(65')	T1	T2	0:00	15.32
1:15	0	15"	200	10	10,770		142,740	6.60	Ø	7	6.55	:30	14.95
1:20	5	16"	192	13	32,000	V2A		GW2				:45	14.70
1:25	10	18"	220	7	32,400							1:00	14.50
2:45	15	16"	194	5	13,530							1:30	14.15
3:00	30	20"	227	7	26,300		142,878		Ø	7	6.55	2:00	13.80
	45											2:30	13.40
	60											3:00	13.20
	90											3:30	12.90
												4:00	12.60
MW2	1500	RPM										4:30	12.30
3:00	0	20"	227	7					Ø	7	6.55	5:00	12.10
3:05	5	21"	230	9	22,000	V2B						5:30	11.85
3:10	10	21"	236	19	13,000							6:00	11.65
3:15	15	21"	250	20	9940							6:30	11.40
3:30	30	22"	250	20	13770		142,960					7:00	11.20
3:45	45	20	220	28	33,400		142,993					7:30	11.00
4:00	60	15	186	36	34,900	V2C	143009		Ø	7	6.55	8:00	10.85
	90											8:30	10.65
												9:00	10.50
												10:00	10.20

NOTES: 1:30 Fuel truck arrival
2:45 - Restart test

4:14pm PR

CAMBRIA

VAPOR EXTRACTION TEST DATA FORM

Project Name: 105 5th St, Oakland
Project Number:
Technicians: GB/PR

Date: 3-28-01
Project Address: 105 5th St, Oakland
Equipment: RSI Inc V3 Internal Combustion Engine

Well Notes:
MW2 = 4"dia, 4'TOS, 20' screen interval
MW3 = 4"dia, 5'TOS, 20' screen interval

Extraction Well	Time Interval (min)	Stinger depth (fbg)	Vacuum (in H2O)	Air Flow (cfm)	PID (ppm)	Lab Bag (ID)	Ext H2O Volume (gal)	DTW (fbg) (voss)	Influence Pt 1 (DTW)	Influence Pt 2 (in H2O)	Influence Pt 3 (in H2O)	Recharge (Time)	Recharge (DTW)
STARTING TIME:							142240		IN H20	DTW	DTW		
MW3	2000 RPM						240	7.25	MW2(65')	T1	T2		
910	0							7.25		7'	6.55'		
915	5	15	208	0		V3A		GW3	0	7.0	6.55		
920	10	18	214	0			142590		0	7.0	6.55		
950	15	18	57	5		✓		✓	0	7.0	6.55		
1000	30	18	84	13	4340		142620		0	7.0	6.55		
1015	45	18	100	11	4670		142652		0	7.0	6.55		
	60												
	90												
MW3	1500 RPM												
1030	0	10	83	10	23,300		142,652		0	7.0	6.55		
1035	5	10	112	13	20,510	V3B			0	7.0	6.55		
1040	10	10	125	14	22,000				0	7.0	6.55		
1045	15	10	136	17	23,000				0	7.0	6.55		
1115	30	10	96	8	20,000		142,688		0	7.0	6.55		
1130	45	10	130	16	18,700		142,686		0	7.0	6.55		
1145	60	10	138	21	20,370		142,706		0	7.0	6.55		
1200	90	10	150	21	18,710	V3C	142,728		0	7.0	6.55		

NOTES:
9:25 - s/o HH H2O : 935 RESTART
V3A sample - 33,700 ppmv H2O Stmples @ 142590
10:15 - s/o ? High concentration/Low Oxygen Shut down Restart @11:00

Vacuum Truck Purging (TFE)

Site: 55 5th STREET, OAKLAND
Date: 03/21/01
Operator: John W. Bonner
Consultant: CAMBRIA
Consultant Contact: DAN LECOURS
Fax #: 510 450 [redacted] 8795

Well I.D.	Diameter (Inches)	Time Start	Time Stop	Volume (gallons)	Notes:
TRAILER	—	0745	0755	500	~500 GALLONS
MWS	—	0800	0810	60	
T-1 [redacted]	8"	0810	0920	2,900	

Additional Information

Time Onsite: 0720
Time Offsite: 0930

Refinery Weight In: 62740
Refinery Weight Out: 35860