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Geo Environmental Technology

Alameda County  
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Environmental Health

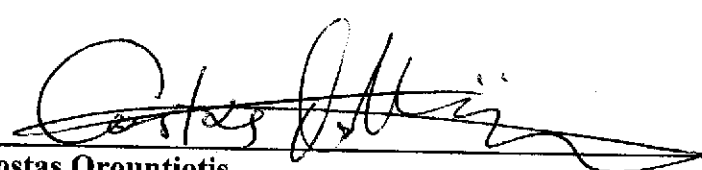
## Groundwater Monitoring Report Third Quarter 2004

For

Livermore Gas and Mini Mart  
160 Holmes Street  
Livermore, California

Prepared by

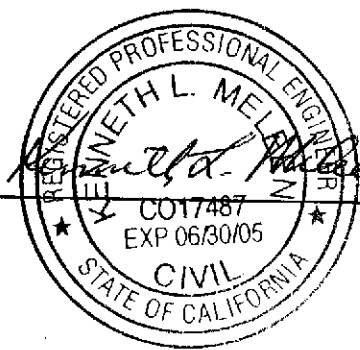
Geo Environmental Technology  
343 Soquel Avenue, #33  
Santa Cruz, CA 95062



10/29/04

Costas Orountiotis  
Project Manager

Date



Kenneth L. Meleen  
Registered Civil Engineer  
No. C17487  
Exp. 6/30/05

10-29-04

Date

October 2004

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Geo Environmental Technology

## GROUNDWATER MONITORING REPORT THIRD QUARTER 2004

**Livermore Gas and Mini Mart  
160 Holmes Street  
Livermore, California**

### 1.0 INTRODUCTION

This report documents the results of the 9/17/04 quarterly groundwater monitoring performed at the Livermore Gas and Mini Mart, located at 160 Holmes Street in Livermore, California (site). A Site Vicinity Map is presented as Figure 1 and site details are shown on the Site Plan, Figure 2.

The Livermore Gas and Mini Mart had provided fueling services using three 10,000-gallon gasoline and one 10,000-gallon diesel Underground Storage Tanks (USTs). The USTs, piping and dispensers were removed on 4/5/99 under permit from the Livermore-Pleasanton Fire Department (LFPD). Analysis of soil and groundwater samples collected at the time of the UST removal, indicated that the site has been impacted by a release of petroleum hydrocarbons and MTBE.

The Alameda County Environmental Health Services (ACEHS) has directed quarterly groundwater monitoring for this site.

### 2.0 PAST WORK ON SITE

On 2/26/99, a soil boring was advanced in the northern section of the property, about 10 feet from the edge of First Street sidewalk, to log the soil profile and determine depth to groundwater. A groundwater grab sample was collected and analyzed for Total Petroleum Hydrocarbons as gasoline (TPHg), benzene, toluene, ethyl-benzene, total xylenes (BTEX) and methyl tertiary butyl ether (MTBE). The sample was found to be impacted by petroleum hydrocarbons (TPHg: 100,000  $\mu\text{g/l}$ , Benzene: 6,100  $\mu\text{g/l}$ , MTBE: 60,000  $\mu\text{g/L}$ ). The results were communicated to the Livermore-Pleasanton Fire Department (LFPD) and a UST Unauthorized Release Report was generated.

On 4/5/99, three gasoline and one diesel USTs, associated dispensers and piping were removed, manifested and disposed, under permit by the LFPD. The pit was over-excavated and samples were collected from native soil beneath the USTs; sample analysis indicated the presence of petroleum hydrocarbons in soil. Total Petroleum

Hydrocarbons as diesel (TPHd) were detected at low levels (61 mg/kg) in the soil stockpile, but not beneath the diesel tank; Total Petroleum Hydrocarbons as gasoline (TPHg) concentrations ranged from undetectable to 80 mg/kg in all samples; MTBE concentrations ranged from 24 to 110 mg/kg.

On 5/20/99 soil samples were collected beneath the dispenser islands. TPHg was found beneath the east dispenser island in varying concentrations ranging from 32 to 6,500 mg/kg; TPHd beneath the diesel dispenser was detected at 1300 mg/kg; no MTBE was detected beneath the dispenser islands.

On 7/26/00, three soil borings were drilled onsite to an approximate depth of 30' below ground surface (bgs). Soil samples were collected for analyses. Upon completion of drilling activities, the soil borings were converted to groundwater monitoring wells (MW1, MW2 and MW3) by installing 2-inch diameter, Schedule 40, factory threaded polyvinyl chloride (PVC) slotted pipe (0.010-inch slots). The slotted interval extends from 15 to 30 feet bgs. The wells were sampled on 8/11/00 and analyzed for TPHd, TPHg, BTEX and MTBE. The sample results indicated significant hydrocarbon impact in the groundwater. Directly downgradient well MW1 had concentrations of TPHg and MTBE of 170,000  $\mu\text{g/L}$  and 320,000  $\mu\text{g/L}$ , respectively. A "Well Installation Report" was issued by ETIC Engineering on 9/22/00.

On 10/19/00 groundwater samples were collected as part of quarterly monitoring at the site. Samples were analyzed for TPHd, TPHg, BTEX and MTBE. The sample results confirmed the presence of significant hydrocarbon impact in the groundwater. Directly downgradient well MW1 had concentrations of TPHg and MTBE of 170,000  $\mu\text{g/L}$  and 200,000  $\mu\text{g/L}$ , respectively. Geo Environmental Technologies (GET) issued a "Quarterly Monitoring Report" on 1/31/01.

On 02/22/01 groundwater samples were collected and analyzed for TPHd, TPHg, BTEX and MTBE. The sample results confirmed significant hydrocarbon impact in the groundwater. Directly downgradient well MW1 had concentrations of TPHg and MTBE of 11,000  $\mu\text{g/L}$  and 190,000  $\mu\text{g/L}$ , respectively. GET issued a "Quarterly Monitoring Report" on 3/31/01.

In May and August 2001 all three monitoring wells were found to be dry.

On 11/14/01 groundwater samples were collected following the installation of an onsite extraction well and three off-site monitoring wells. Monitoring wells MW1, MW2 and MW3 were all dry. Groundwater samples collected from the four newly installed wells were analyzed for TPHd, TPHg, BTEX and MTBE. The sample results confirmed the presence of significant hydrocarbon concentrations offsite and an areal impact to the groundwater. Directly downgradient extraction well EX1 contained concentrations of TPHg and MTBE of 2,000  $\mu\text{g/L}$  and 2,200  $\mu\text{g/L}$ , respectively. GET issued a "Quarterly Monitoring Report" on 3/31/02. Well construction details are presented in Table 1.

In 2002, groundwater samples were collected on 5/7, 9/11 and 12/1. These were analyzed for TPHd, TPHg/BTEX and MTBE. Directly downgradient extraction well EX1 contained concentrations of TPHg ranging from 3,000 to 7,700 µg/L; MTBE in well EX1 ranged from 1,200 to 6,200 µg/L. The 9/11 sample from well MW1 contained TPHg at 130,000 µg/L, but MTBE was below the detection limit of 5,000 µg/L. In the 12/1/02 monitoring episode, MW1 was dry. Respective quarterly monitoring reports were issued on May 28, and December 13, 2002, and in February 2003.

In 2003, groundwater samples were collected on 3/14, 6/25, 9/16 and 12/22, and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient well MW1 contained concentrations of TPHg ranging from 37,000 to 180,000 µg/L, and concentrations of MTBE ranging from 150,000 to 210,000 µg/L. Downgradient well EX1 contained concentrations of TPHg ranging from 120 to 260 µg/L, and concentrations of MTBE ranging from 260 to 1,200 µg/L. In the 12/22 sampling episode, groundwater from MW2 was found to contain 240 µg/L of TPHg and 1,200 µg/L of MTBE. Quarterly monitoring reports were issued in April, July and October 2003, and January 2004.

On 3/10/04 and 6/15/04 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient well MW1 continues to contain high concentrations of TPHg. Wells MW1, MW2 and MW5 continue to contain high concentrations of MTBE. GET issued Quarterly monitoring reports in May and July 2004.

### 3.0 SITE CONTACTS

The following is a listing of site contacts, addresses and phone numbers.

UST Operator: Livermore Gas and Mini Mart  
Attention: Marwel and Samira Shuwayhat  
54 Wolfe Canyon Road  
Kentfield, CA 94904

Local Oversight Agency: ACEHS  
Attention: Donna Drogos  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502  
Phone: (510) 567-6700

Environmental engineers: Geo Environmental Technologies  
Attention: Costas Orountiotis  
343 Soquel Avenue, #33  
Santa Cruz, CA 95062  
Phone: (831) 423-8780

## **4.0 METHODS AND PROCEDURES**

### **4.1 Sample Collection and Analysis**

Groundwater was sampled on 9/17/04. Depth to groundwater (DTW) was measured in each of the monitoring wells prior to purging and sampling. DTW data is summarized in Table 2. A sample of static groundwater was collected from each well using a clean, clear plastic bailer to visually assess for the presence of floating product or product sheen. No floating product or sheen was found.

To maximize the possibility of sampling fresh, inflowing groundwater, individual wells were purged of four well casing volumes of groundwater prior to sample collection. Purged groundwater was stored onsite in a steel, 55-gallon, DOT 17H drum. After ascertaining that a minimum 80 percent recovery of the initial casing volume had occurred in the well, the monitoring wells were sampled. Field purge data is presented in Appendix A.

Groundwater samples were collected using new, clean, disposable plastic bailers. Water was decanted from the bailer into 1-liter amber glass bottles and 40-ml VOA vials with caps equipped with Teflon-lined septa, in such a manner that neither headspace nor air bubbles were allowed to remain in the containers. Samples were labeled and placed in a pre-cooled container on ice, to minimize potential loss of volatile constituents. Labels contained project name, sample number, date and time of collection, and sampler ID.

Sample collection information was entered onto a Chain of Custody (COC) document that accompanied the samples during site time and during transport to McCampbell Analytical Labs, Inc., a State certified laboratory for hazardous materials analysis, for the requisite analyses.

Groundwater samples were analyzed for TPHd, TPHg, BTEX, and MTBE using EPA Methods 8015MOD and 8020.

### **4.2 Results**

Downgradient monitoring well MW1 remains severely impacted. TPHd was detected at 2,900  $\mu\text{g/L}$ , TPHg at 24,000  $\mu\text{g/L}$  and MTBE at 83,000  $\mu\text{g/L}$ . BTEX constituent concentrations were 2,800, < 33, 2,900, and 500  $\mu\text{g/L}$ , respectively.

Cross-gradient well MW2 contained concentration levels of 70  $\mu\text{g/L}$  TPHd, 61  $\mu\text{g/L}$  TPHg, and 730  $\mu\text{g/L}$  MTBE; traces of BTEX concentrations also were detected.

Upgradient monitoring well MW3 contained no detectable concentrations of TPHd, TPHg, BTEX, or MTBE.

Offsite monitoring well MW5 contained no detectable concentrations of TPHd, TPHg or BTEX; MTBE was detected at 780 µg/L.

Offsite monitoring wells MW4 and MW6 contained no detectable concentrations of TPHg, TPHd, MTBE or BTEX.

Extraction well EX1 was not sampled since it is located within 10 feet of well MW1.

Cumulative groundwater analytical results are presented in Table 2. Copies of the Laboratory analysis report and COC documentation for this monitoring event are presented in Appendix B.

#### **4.3 Groundwater Flow and Gradient**

DTW measurements taken on 9/17/04 were used to calculate the groundwater flow direction and gradient. Groundwater flow direction was northerly, consistent with general area direction of flow. The gradient was 0.031 ft/ft. This information is presented graphically in Figure 4.

#### **5.0 RECOMMENDATIONS**

Based on the results of this groundwater monitoring episode, conversations and directives of the ACEHS the following course of action will be pursued:

- Continue quarterly groundwater sampling and depth to water data collection. Next monitoring date within a 15-day window of opportunity, is 11/13/04.
- Install pressure transducers in monitoring wells MW5 and MW1 (which contained MTBE at 1,100 and 260,000 µg/L respectively) to monitor the pumping cycle of the nearest drinking water wells for a period of 72 hours. This will identify the impact, if any, that active pumping from nearby drinking water wells may have on the dispersal of MTBE across the aquifer.
- Perform a downgradient receptor survey and discuss cleanup levels with the ACEHS.
- Prepare an interim Remedial Action Plan for site remediation.
- Forward a copy of this report to:  
ACEHS  
Attention: Donna Drogos  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502

# TABLES



**TABLE 1 - Well Construction Details**

Livermore Gas and Minimart, 160 Holmes, Livermore, California

Well Number	Date Installed	TOC (feet)	Total Depth (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Slot (inch)	Interval					DTW 09/17/04 (feet)
							Screen (feet)	Blank Casing (feet)	Sand Pack (feet)	Bentonite Seal (feet)	Cement Grout (feet)	
MW-1	07/26/00	465.04	30	8	2	0.01	30-15	15-0.5	30-13	13-11	11-1.0	25.61
MW-2	07/26/00	464.96	30	8	2	0.01	30-15	15-0.5	30-13	13-11	11-1.0	25.44
MW-3	07/26/00	465.86	30	8	2	0.01	30-15	15-0.5	30-13	13-11	11-1.0	26.09
MW-4	10/30/01	465.25	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	26.12
MW-5	10/30/01	464.74	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	27.68
MW-6	10/30/01	464.23	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	26.56
EX1	10/30/01	465.39	55	10	6	0.01	55-30	30-0.5	55-28	28-26	26-0.5	25.91

**Notes:**      bgs                      Below ground surface  
                     DTW                      Depth to water  
                     TOC                      Top of Casing Elevation

**TABLE 2 - Groundwater Analytical Results**  
**Livermore Gas and Minimart, 160 Holmes, Livermore, California**

Well ID.	Date	DTW (feet)	TPHd (µg/L)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)
MW3	06/15/04	22.82	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	09/17/04	26.09	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
MW4	11/14/01	33.84	90	510	4	< 0.50	< 0.50	< 0.50	14
	05/07/02	26.75	< 50	150	3.5	0.5	< 0.50	< 0.50	48
	09/11/02	26.66	NA	< 50	< 0.50	< 0.50	< 0.50	< 0.50	15
	12/11/02	28.39	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	24
	03/14/03	23.14	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0
	06/25/03	22.72	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0
	09/16/03	25.39	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	12/22/03	22.42	69	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	03/04/04	18.20	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	37
	06/15/04	22.95	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	7.4
	09/17/04	26.12	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
MW5	11/14/01	34.94	< 66	< 50	< 0.50	< 0.50	< 0.50	< 0.50	8.2
	05/07/02	27.90	< 50	140	< 0.50	< 0.50	< 0.50	< 0.50	110
	09/11/02	27.99	NA	< 50	< 0.50	< 0.50	< 0.50	< 0.50	6.3
	12/11/02	29.50	< 50	73	< 0.50	< 0.50	< 0.50	< 0.50	160
	03/14/03	24.26	< 50	110	< 0.50	< 0.50	< 0.50	< 0.50	170
	06/25/03	24.01	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	89
	09/16/03	26.83	< 50	630	< 0.50	3.5	< 0.50	2.63	1,500
	12/22/03	23.68	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	630
	03/10/04	19.22	< 50	57	< 0.50	< 0.50	< 0.50	< 0.50	1,100
	06/15/04	24.20	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	750
	09/17/04	27.68	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	780
MW6	11/14/01	33.88	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	05/07/02	27.01	< 67	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	09/11/02	27.03	NA	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	12/11/02	28.77	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0
	03/14/03	23.46	< 50	< 50	< 0.50	< 0.50	< 0.50	< 1.0	< 1.0
	06/25/03	23.08	< 50	< 50	< 0.50	< 0.50	< 0.50	< 1.0	< 1.0
	09/16/03	25.77	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	12/22/03	22.59	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	03/10/04	18.65	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	06/15/04	23.31	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	09/17/04	26.56	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
EX1	11/14/01	33.41	2,000	13,000	180	1,000	330	3,200	2,200
	05/07/02	27.58	560	7,700	320	< 25	66	150	6,200
	09/11/02	NM	NA	2,800	32	< 13	14	< 13	2,500
	12/11/02	27.98	100	3,000	81	< 0.50	44	< 1	4,800
	03/14/03	23.02	50	750	< 0.50	< 0.50	7.7	13	1,200
	06/25/03	22.41	<50	120	3.2	3.7	4.2	7.6	260

**TABLE 2 - Groundwater Analytical Results**

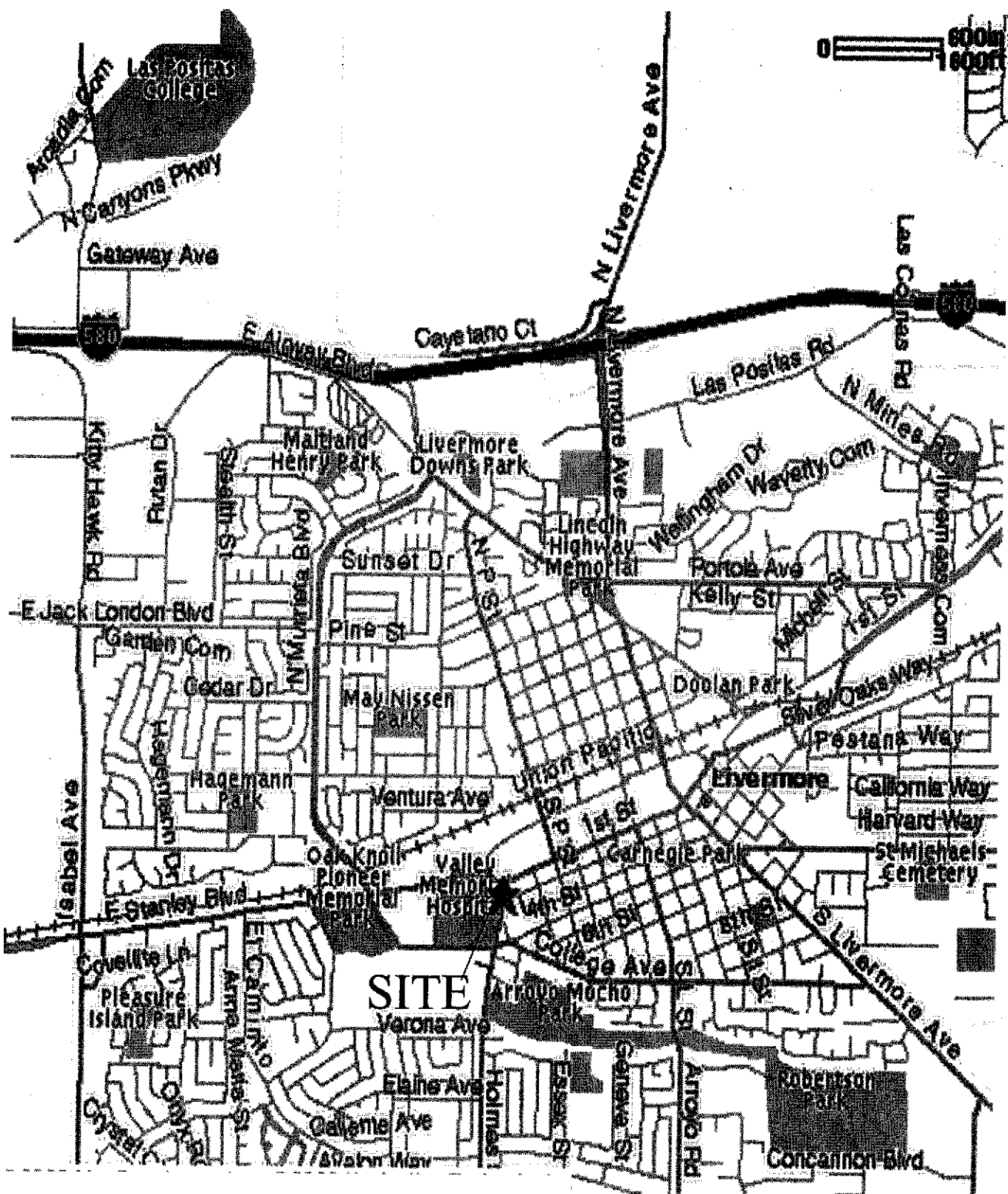
Livermore Gas and Minimart, 160 Holmes, Livermore, California

Well ID.	Date	DTW (feet)	TPHd (µg/L)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)
MW1	08/11/00		57,000	170,000	6,400	7,600	4,200	9,700	320,000
	10/19/00	21.94	17,000	170,000	8,400	3,200	2,700	10,000	200,000
	02/22/01	22.91	11,000	82,000	5,100	1,000	13,000	8,700	190,000
	05/30/01	Dry	not sampled						
	11/14/01	Dry	not sampled						
	05/07/02	Dry	not sampled						
	09/11/02	26.16	NA	130,000	7,700	1,100	4,500	1,500	<5000
	12/01/02	27.55	NS	NS	NS	NS	NS	NS	NS
	03/14/03	22.63	3,800	180,000	7,100	3,200	4,300	6,000	220,000
	06/25/03	22.1	3,100	71,000	7,500	4,700	4,800	8,900	210,000
	09/16/03	24.91	3,600	37,000	4,600	220	3,600	930	150,000
	12/22/03	21.75	4,000	44,000	6,800	1,500	4,000	3,800	180,000
	03/10/04	17.45	3,100	72,000	6,000	11,000	3,900	10,000	260,000
	06/15/04	22.38	4,300	42,000	5,000	1,800	3,700	6,000	210,000
	09/17/04	25.61	2,900	24,000	2,800	< 33	2,900	500	83,000
MW2	08/11/00		1,900	4,500	220	52	160	170	3,000
	10/19/00	21.80	1,300	3,400	150	21	100	70	1,900
	02/22/01	22.87	880	7,600	25	< 10	69	25	2,200
	05/30/01	Dry	not sampled						
	11/14/01	Dry	not sampled						
	05/07/02	26.70	86	400	5.4	<0.50	1.9	2.3	230
	09/11/02	25.98	NA	260	1.3	<0.50	0.57	0.77	200
	12/11/02	27.56	120	250	7.9	1.6	13	9.9	180
	03/14/03	22.41	110	830	56	<0.50	<0.50	<1.0	1,200
	06/25/03	21.97	180	260	0.92	2.9	3.1	8.1	2,000
	09/16/03	24.70	260	420	3.6	3.4	5.2	2.4	1,300
	12/22/03	21.58	120	240	0.82	3.1	7.8	3.9	1,400
	03/10/04	17.31	210	280	9.4	4.2	14	11	1,400
	06/15/04	22.18	150	150	2.1	2.4	2.2	1.3	1,500
	09/17/04	25.44	70	61	< 0.50	1.0	< 0.50	< 0.50	730
MW3	08/11/00		260	59	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	10/19/00	22.45	< 65	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	02/22/01	23.51	100	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	05/30/01	Dry	not sampled						
	11/14/01	Dry	not sampled						
	05/07/02	Dry	not sampled						
	09/11/02	26.61	NA	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	12/11/02	28.18	not sampled						
	03/14/03	23.04	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	06/25/03	22.59	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	09/16/03	25.33	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	12/22/03	22.37	69	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
	03/10/04	17.88	< 50	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0

TABLE 2 - Groundwater Analytical Results									
Livermore Gas and Minimart, 160 Holmes, Livermore, California									
Well ID.	Date	DTW (feet)	TPHd (µg/L)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)
EX1	09/16/03	24.65	< 50	170	0.51	1.5	< 0.50	0.94	1,600
	12/22/03	NM	not sampled						
	03/10/04	17.99	not sampled						
	06/15/04	22.48	not sampled						
	09/17/04	25.91	not sampled						

**Notes:**  
 DTW: Depth to Groundwater  
 NM: Not Measured  
 NA: Not Analyzed  
 TPHg: Total Petroleum Hydrocarbons as gasoline  
 TPHd: Total Petroleum Hydrocarbons as diesel  
 MTBE: Methyl tertiary Butyl Ether  
 µg/L: Micrograms per liter

# FIGURES

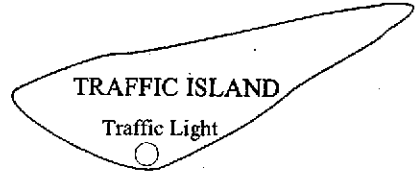
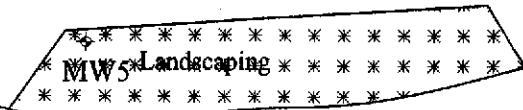
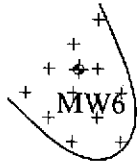


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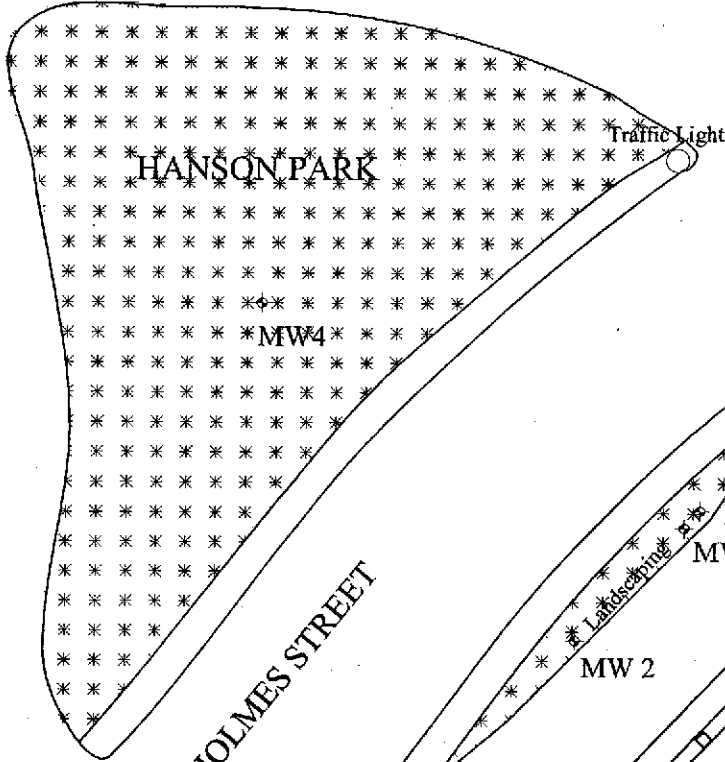
Site Vicinity Map  
Livermore Gas and Mini Mart  
160 Holmes Street  
Livermore, California

Figure No.  
1  
Project  
MANWEL

Noah's Bagels



South St



Traffic Light

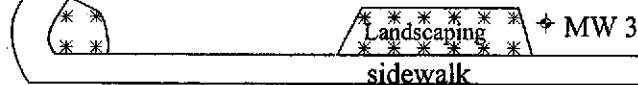
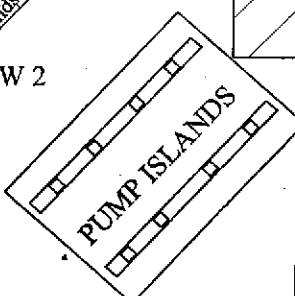
LIVERMORE INN

HOLMES STREET



EX1 MW 1

MW 2



SECOND STREET



LEGEND: ♦ Groundwater Monitoring Well

Geo Environmental Technologies

Site Plan  
9/17/04  
Livermore Gas and Minimart  
160 Homes Street, Livermore, CA

Figure No. 2

Project Manwel



Noah's Bagels

TPHd: < 50  
TPHg: < 50  
B: < 0.50  
T: < 0.50  
E: < 0.50  
X: < 0.50  
MTBE: 780

MW5 Landscaping

TPHd: < 50  
TPHg: < 50  
B: < 0.50  
T: < 0.50  
E: < 0.50  
X: < 0.50  
MTBE: < 5.0

15 S 11th St

HANSON PARK

TRAFFIC ISLAND

Traffic Light Pole

TPHd: < 50  
TPHg: < 50  
B: < 0.50  
T: < 0.50  
E: < 0.50  
X: < 0.50  
MTBE: < 5.0

MW4

TPHd: 2,900  
TPHg: 24,000  
B: 2,800  
T: < 33  
E: 2,900  
X: 500  
MTBE: 83,000

Not Sampled

EX1

FORMER UST PIT

TPHd: 70  
TPHg: 61  
B: < 0.50  
T: 1.0  
E: < 0.50  
X: < 0.50  
MTBE: 730

MW 1

MW 2

HOLMES STREET

LIVERMORE INN

Landscaping

PUMP ISLANDS

SERVICE BUILDING

TPHd: < 50  
TPHg: < 50  
B: < 0.50  
T: < 0.50  
E: < 0.50  
X: < 0.50  
MTBE: < 5.0

Landscaping

MW 3

sidewalk

SECOND STREET



LEGEND:

TPHd: Total petroleum hydrocarbons as diesel  
TPHg: Total petroleum hydrocarbons as gasoline  
B: Benzene  
T: Toluene  
E: Ethyl-Benzene  
X: Xylenes  
MTBE: Methyl tertiary butyl ether

◆ Groundwater Monitoring Well

Geo  
Environmental  
Technologies

Groundwater Analyticals  
9/17/04  
Livermore Gas and Minimart  
160 Homes Street, Livermore, CA

Figure No.  
3

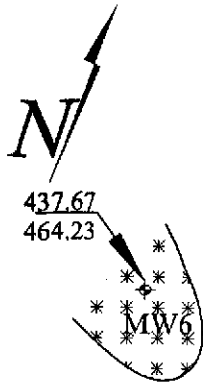
Project  
Manwel



Noah's Bagels

Gradient range:  
low = 0.008 ft/ft (9/11/02)  
high = 0.031 ft/ft (9/17/04)

The mean gradient from 2001 to the present is 0.0129 ft/ft in a northerly direction.



437.06  
464.74

MW5 \* \* \* \* \* Landscaping \* \* \* \* \*

South St

Gradient = 0.031 ft/ft

439.13  
465.25

HANSON PARK

MW4

TRAFFIC ISLAND

Traffic Light Pole

Not measured

439.43  
465.04

EX1

FORMER UST PIT

439.52  
464.96

MW1

MW2

PUMP ISLANDS

SERVICE BUILDING

HOLMES STREET

Landscaping

MW3

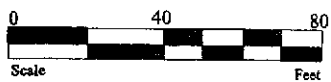
Sidewalk

SECOND STREET

439.77  
465.86

LIVERMORE INN

Landscaping



LEGEND:

- Groundwater Monitoring Well
- Groundwater Elevation
- Well Casing Elevation (MSL)

**Geo  
Environmental  
Technologies**

**Groundwater Direction and Gradient**  
9/17/04  
Livermore Gas and Minimart  
160 Homes Street, Livermore, CA

**Figure No.**  
4  
**Project**  
Manwel

# APPENDIX A

Project <b>Manwel</b>		Sampler: <b>DK</b>
Site Location: <b>Livermore</b>		
Well ID: <b>MW1</b>	Well Diameter(in): <b>2</b> (1)	Initial Depth of water (ft): <b>25.61</b> (2) Total Depth (ft): <b>30</b>
Free Product (Y/N) <input checked="" type="checkbox"/>	Product Thickness(in):	
Measurements Referenced to: <b>(TOC)</b> Grade Other:		

Calculations

$$\text{Length of water column} = \frac{30}{2} \text{ ft} - \frac{25.61}{1} \text{ ft} = \frac{4.39}{3} \text{ ft}$$

$$80\% \text{ of the water level} = \frac{25.61}{1} \text{ ft} + \left( \frac{4.39}{3} \text{ ft} \times 0.2 \right) = \frac{26.5}{1} \text{ ft}$$

$$\text{Estimated purge volume (EPV)} = \frac{4.39}{3} \text{ ft} \times \frac{.16}{\text{VCF}} \times \frac{.7}{1 \text{ casing vol}} \times 3 = \frac{2.1}{\text{purge volume}} \text{ Gal}$$

Volume conversion factor(VCF)	
VCF=0.052gal/(in <sup>2</sup> x ft)xP(d <sup>2</sup> /4)	
where p=3.14 and d=well dia(in)	
Well Dia	VCF
2"	0.16
3"	0.37
4"	0.65
5"	1.02
6"	1.47

Purging Equipment:

- Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? if yes, \_\_\_\_\_ gal Time: \_\_\_\_\_

Sample ID: **MW1** Sampling time: \_\_\_\_\_ Sampling date: **9/17**

Notes:

\_\_\_\_\_

**Strong odor**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Sampler: OK

Project Manuel

Site Location: Livermore

Well ID: MW 2

Well Diameter(in): 2

(1) Initial Depth of water (ft): 25.44

(2) Total Depth (ft): 30

Free Product (Y/N): (N)

Product Thickness(in):

Measurements Referenced to: (TOC) Grade Other:

Calculations

Length of water column =  $\frac{30}{2}$  ft -  $\frac{25.44}{1}$  ft =  $\frac{4.56}{3}$  ft

80% of the water level =  $\frac{25.44}{1}$  ft +  $\frac{4.56}{3}$  (x0.2) = 26.39 ft

Estimated purge volume (EPV) =  $\frac{4.56}{3}$  ft x  $\frac{.16}{VCF}$  x  $\frac{.73}{1 \text{ casing vol}}$  x 3 =  $\frac{2.2}{\text{purge volume}}$  Gal

Volume conversion factor (VCF)

VCF = 0.058 gal / (in<sup>2</sup> x ft) x π (d<sup>2</sup> / 4)

where π = 3.14 and d = well dia (in)

Well Dia	VCF
<u>2"</u>	<u>0.16</u>
3"	0.37
4"	0.65
6"	1.02
8"	1.47

Purging Equipment:

- Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? If yes, \_\_\_\_\_ gal

Time:

Sample ID: MW2

Sampling time:

Sampling date: 9/17

Notes:

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Project <b>Manwell</b>		Sampler: <b>OK</b>	
Site Location: <b>Livermore</b>			
Well ID: <b>MW3</b>	Well Diameter(in): <b>2</b>	(1) Initial Depth of water (ft): <b>26.09</b>	(2) Total Depth (ft): <b>30</b>
Free Product (Y/N) <input checked="" type="checkbox"/>		Product Thickness(in):	
Measurements Referenced to: TOC    Grade    Other:			

Calculations

$$\text{Length of water column} = \frac{30}{2} \text{ ft} - \frac{26.09}{1} \text{ ft} = \frac{3.91}{3} \text{ ft}$$

$$80\% \text{ of the water level} = \frac{26.09}{1} \text{ ft} + \frac{(3.91 \text{ ft} \times 0.2)}{3} = \frac{26.87}{3} \text{ ft}$$

$$\text{Estimated purge volume (EPV)} = \frac{3.91}{3} \text{ ft} \times \frac{.16}{\text{VCF}} \times \frac{.63}{1 \text{ casing vol}} \times 3 = \frac{1.88}{\text{purge volume}} \text{ Gal}$$

Volume conversion factor (VCF)	
VCF = 0.052 gal / (ln <sup>2</sup> x ft) x P (d <sup>2</sup> /4)	
where p=3.14 and d=well dia (in)	
Well Dia	VCF
2"	0.16
3"	0.37
4"	0.65
5"	1.02
6"	1.47

Purging Equipment:

- Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? if yes, _____ gal	Time:
Sample ID: <b>MW3</b>	Sampling date: <b>9/17</b>

Notes:

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Sampler: DK

Project: Manwel

Site Location: Livermore

Well ID: MW4

Well Diameter (in): 2

(1) Initial Depth of water (ft): 26.12

(2) Total Depth (ft): 50

Free Product (Y/N): (Y)

Product Thickness (in):

Measurements Referenced to: (TOC) Grade Other:

Calculations

Length of water column =  $\frac{50}{2} \text{ ft} - \frac{26.12}{1} \text{ ft} = \frac{23.88}{3} \text{ ft}$

60% of the water level =  $\frac{26.12}{1} \text{ ft} + \frac{(23.88 \text{ ft} \times 0.2)}{3} = \frac{27.6}{3} \text{ ft} = 30.9$

Estimated purge volume (EPV) =  $\frac{23.88}{3} \text{ ft} \times \frac{.16}{\text{VCF}} \times \frac{4.1}{1 \text{ casing vol}} \times 3 = \frac{12.3}{\text{purge volume}} \text{ Gal}$

Volume conversion factor (VCF)  
 $\text{VCF} = 0.032 \text{ gal}/(\text{in}^2 \times \pi \times \text{ft}) \times \frac{d^2}{4}$   
 where  $\pi = 3.14$  and  $d = \text{well dia (in)}$

Well Dia	VCF
2"	0.16
3"	0.37
4"	0.65
6"	1.02
8"	1.47

Purging Equipment:

- Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? if yes, \_\_\_\_\_ gal

Time:

Sample ID: MW4

Sampling time:

Sampling date: 9/17

Notes:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Sampler: DK

Project: Manwel

Site Location: Livermore

(2) Total Depth (ft): 50

Well ID: MWS

Well Diameter (in): 2 (1) Initial Depth of water (ft):

Free Product (Y/N)

Product Thickness (in):

Measurements Referenced to: TOC Grade Other:

Volume conversion factor (VCF)

$VCF = 0.052 \text{ gal/in}^3 \times \pi \times (d/2)^2$   
where  $\pi = 3.14$  and  $d = \text{well dia (in)}$

Well Dia	VCF
2"	0.18
3"	0.37
4"	0.65
6"	1.02
8"	1.47

Calculations

Length of water column =  $\frac{50}{2} \text{ ft} - \frac{27.68}{1} \text{ ft} = \frac{22.32}{3} \text{ ft}$

80% of the water level =  $\frac{27.68}{1} \text{ ft} + \frac{(22.32 \text{ ft} \times 0.2)}{3} = \frac{32.4}{3} \text{ ft}$

Estimated purge volume (EPV) =  $\frac{22.32}{3} \text{ ft} \times \frac{.16}{VCF} \times \frac{3.6}{1 \text{ casing vol}} \times 3 = \frac{10.7}{\text{purge volume}} \text{ Gal}$

Purging Equipment:

- Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? if yes, \_\_\_\_\_ gal

Time:

Sample ID: MWS

Sampling time:

Sampling date: 9/17

Notes:

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Project: Manwel Sampler: OK

Site Location: Livermore

Well ID: MW6 Well Diameter (in): 2 (1) Initial Depth of water (ft): 26.56 (2) Total Depth (ft): 50

Free Product (Y/N): N Product Thickness (in): \_\_\_\_\_

Measurements Referenced to: TOC Grade Other: \_\_\_\_\_

Calculations

$$\text{Length of water column} = \frac{50}{2} \text{ ft} - \frac{26.56}{1} \text{ ft} = \frac{23.44}{3} \text{ ft}$$

$$80\% \text{ of the water level} = \frac{26.56}{1} \text{ ft} + \frac{(23.44 \text{ ft} \times 0.2)}{3} = \frac{31.2}{3} \text{ ft}$$

$$\text{Estimated purge volume (EPV)} = \frac{23.44}{3} \text{ ft} \times \frac{.16}{\text{VCF}} \times \frac{3.7}{1 \text{ casing vol}} \times 3 = \frac{11.2}{\text{purge volume}} \text{ Gal}$$

Volume conversion factor (VCF)  
 $VCF = 0.052 \text{ gal} / (\text{in}^2 \times \pi \times \text{ft}) \times \pi (d^2 / 4)$   
 where  $\pi = 3.14$  and  $d = \text{well dia (in)}$

Well Dia	VCF
2"	0.16
3"	0.37
4"	0.65
6"	1.02
8"	1.47

Purging Equipment:

- \_\_\_\_\_ Bailer
- Disposable bailer
- Electric Submersible Pump
- Extraction Pump
- Other

Sampling Equipment:

- \_\_\_\_\_ Bailer
- Disposable Bailer
- Extraction Port
- Other

Did well dewater? if yes, \_\_\_\_\_ gal

Time: \_\_\_\_\_

Sample ID: MW6 Sampling time: \_\_\_\_\_

Sampling date: 9/17

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Sampler: DK

Project ~~EX-1~~ Manwel

Site Location: Lives more

(2) Total Depth (ft): 55

Well ID: EX1 Well Diameter(in): 8 (1) Initial Depth of water (ft):

Free Product (Y/N) Product Thickness(in): Measurements Referenced to: TOC Grade Other:

Volume conversion factor(VCF)  
 $VCF = 0.058 \text{ gal/in}^2 \times \text{ft} \times \pi(d^2/4)$   
 where  $p = 2.14$  and  $d = \text{well dia(in)}$

Well Dia	VCF
2"	0.16
3"	0.37
4"	0.85
6"	1.02
8"	1.47

Calculations

Length of water column =  $\frac{\text{ft}}{2} \cdot \frac{\text{ft}}{1} = \frac{\text{ft}}{3}$

80% of the water level =  $\frac{\text{ft}}{1} + (\frac{\text{ft} \times 0.2}{3}) = \text{ft}$

Estimated purge volume (EPV) =  $\frac{\text{ft}}{3} \times \frac{\text{ft}}{\text{VCF}} \times \frac{\text{ft}}{1 \text{ casing vol}} \times 3 = \frac{\text{Gal}}{\text{purge volume}}$

- Purging Equipment:
- ( ) Bailer
  - ( ) Disposable bailer
  - ( ) Electric Submersible Pump
  - ( ) Extraction Pump
  - ( ) Other

- Sampling Equipment:
- ( ) Bailer
  - ( ) Disposable Bailer
  - ( ) Extraction Port
  - ( ) Other

Did well dewater? If yes, \_\_\_\_\_ gal

Time:

Sample ID: EX1

Sampling time:

Sampling date: 9/17

Notes: EX1 was not sampled due to its close proximity (within 1 meter) of MWI

## **APPENDIX B**

GET 0409281

00

**McCAMPBELL ANALYTICAL INC.**

110 2<sup>nd</sup> AVENUE SOUTH, #D7  
PACHECO, CA 94553-5560

Telephone: (925) 798-1620

Fax: (925) 798-1622

Email: main@mccampbell.com

**CHAIN OF CUSTODY RECORD**

TURN AROUND TIME

EDF Required?  Yes  No  
 RUSH  24 HR  48 HR  72 HR  5 DAY

Report To: Costas Orontiotis

Bill To: GET

Company: Geo Environmental Technologies

343 Soquel Ave. #33  
Santa Cruz, CA 95062

Tele: (831) 423-8780

E-Mail: mcfrootrock@yahoo.com  
Fax: (831) 423-8827

Project #:

Project Name: Manuel

Project Location: Livermore

Sampler Signature: *[Signature]*

Analysis Request Other Comments

BTEX & TPH as Gas (802/8020 + 8015) (M/T/S/E)	TPH as Diesel (8015)	Total Petroleum Oil & Grease (5520 E&F/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 601 / 8010	BTEX ONLY (EPA 602 / 8020)	EPA 608 / 8080	EPA 608 / 8080 PCB's ONLY	EPA 624 / 8240 / 8260	EPA 625 / 8270	PAH's / PNA's by EPA 625 / 8270 / 8310	CAM-17 Metals	LUFT 5 Metals	Lead (7240/7421/239.2/6010)	RCI	pH	TSS	Specific Conductivity	
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SAMPLE ID (Field Point Name)	LOCATION	SAMPLING		# Containers	Type Containers	MATRIX					METHOD PRESERVED							
		Date	Time			Water	Soil	Air	Sludge	Other	Ice	HCl	HNO <sub>3</sub>	Other				
+ MW1	Manuel	9/17		3	mpa obr	X					X	X	X	X				
+ MW2	↓	↓		↓	↓	X					X	X	X	X				
+ MW3	↓	↓		↓	↓	X					X	X	X	X				
+ MW4	↓	↓		↓	↓	X					X	X	X	X				
+ MW5	↓	↓		↓	↓	X					X	X	X	X				
+ MW6	↓	↓		↓	↓	X					X	X	X	X				

Relinquished By: *[Signature]* Date: 9/17/04 Time: Received By: Scott Brown

Relinquished By: *[Signature]* Date: 09/17/04 Time: Received By: Scott Brown

Relinquished By: *[Signature]* Date: 09/17/04 Time: Received By: Scott Brown

ICE/c  PRESERVATION APPROPRIATE CONTAINERS

GOOD CONDITION HEAD SPACE ABSENT

VOAS  O&G METALS OTHER



**McC Campbell Analytical, Inc.**

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560  
Telephone : 925-798-1620 Fax : 925-798-1622  
Website: www.mcccampbell.com E-mail: main@mcccampbell.com

Geo Environmental Technologies 343 Soquel Avenue #33 Santa Cruz, CA 95062	Client Project ID: Manuel	Date Sampled: 09/17/04
		Date Received: 09/17/04
	Client Contact: Costas Orountiotis	Date Reported: 09/24/04
	Client P.O.:	Date Completed: 09/24/04

**WorkOrder: 0409281**

September 24, 2004

Dear Costas:

Enclosed are:

- 1). the results of 6 analyzed samples from your **Manuel project**,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions please contact me. McC Campbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Yours truly,

Angela Rydelius, Lab Manager

# McC Campbell Analytical, Inc.

# CHAIN-OF-CUSTODY RECORD



110 Second Avenue South, #D7  
 Pacheco, CA 94553-5560  
 (925) 798-1620

WorkOrder: 0409281

ClientID: GET

**Report to:**

Costas Orountiotis  
 Geo Environmental Technologies  
 343 Soquel Avenue #33  
 Santa Cruz, CA 95062

TEL: (831) 423-8780  
 FAX: (831) 423-8827  
 ProjectNo: Manuel  
 PO:

**Bill to:**

Accounts Payable  
 Geo Environmental Technologies  
 343 Soquel Avenue #33  
 Santa Cruz, CA 95062

Requested TAT: 5 days

Date Received: 9/17/04

Date Printed: 9/17/04

Sample ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0409281-001	MW1	Water	9/17/04	<input type="checkbox"/>	A	A	B												
0409281-002	MW2	Water	9/17/04	<input type="checkbox"/>	A		B												
0409281-003	MW3	Water	9/17/04	<input type="checkbox"/>	A		B												
0409281-004	MW4	Water	9/17/04	<input type="checkbox"/>	A		B												
0409281-005	MW5	Water	9/17/04	<input type="checkbox"/>	A		B												
0409281-006	MW6	Water	9/17/04	<input type="checkbox"/>	A		B												

**Test Legend:**

1	G-MBTEX_W	2	PREF REPORT	3	TPH(D)_W	4		5	
6		7		8		9		10	
11		12		13		14		15	

Prepared by: Elisa Venegas

**Comments:**

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.



# McC Campbell Analytical, Inc.

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560  
 Telephone : 925-798-1620 Fax : 925-798-1622  
 Website: www.mccampbell.com E-mail: main@mccampbell.com

Geo Environmental Technologies  343 Soquel Avenue #33  Santa Cruz, CA 95062	Client Project ID: Manuel	Date Sampled: 09/17/04
		Date Received: 09/17/04
	Client Contact: Costas Orountiotis	Date Extracted: 09/17/04
	Client P.O.:	Date Analyzed: 09/21/04-09/23/04

## Diesel Range (C10-C23) Extractable Hydrocarbons as Diesel\*

Extraction method: SW3510C Analytical methods: SW8015C Work Order: 0409281

Lab ID	Client ID	Matrix	TPH(d)	DF	% SS
0409281-001B	MW1	W	2900,d	1	109
0409281-002B	MW2	W	70,d	1	109
0409281-003B	MW3	W	ND	1	105
0409281-004B	MW4	W	ND	1	108
0409281-005B	MW5	W	ND	1	89.5
0409281-006B	MW6	W	ND	1	99.0

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	50	µg/L
	S	NA	NA

\* water samples are reported in µg/L, wipe samples in µg/wipe, soil/solid/sludge samples in mg/kg, product/oil/non-aqueous liquid samples in mg/L, and all DISTLC / STLC / SPLP / TCLP extracts are reported in µg/L.

# cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

+The following descriptions of the TPH chromatogram are cursory in nature and McC Campbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant; d) gasoline range compounds are significant; e) unknown medium boiling point pattern that does not appear to be derived from diesel; f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~1 vol. % sediment; k) kerosene/kerosene range/jet fuel range; l) bunker oil; m) fuel oil; n) stoddard solvent/mineral spirit.

DHS Certification No. 1644

*J* Angela Rydelius, Lab Manager



# McC Campbell Analytical, Inc.

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560  
 Telephone : 925-798-1620 Fax : 925-798-1622  
 Website: www.mcccampbell.com E-mail: main@mcccampbell.com

Geo Environmental Technologies  343 Soquel Avenue #33  Santa Cruz, CA 95062	Client Project ID: Manuel	Date Sampled: 09/17/04
		Date Received: 09/17/04
	Client Contact: Costas Orountiotis	Date Extracted: 09/22/04-09/24/04
	Client P.O.:	Date Analyzed: 09/22/04-09/24/04

### Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE\*

Extraction method: SW5030B

Analytical methods: SW8021B/8015Cm

Work Order: 0409281

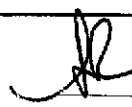
Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	MW1	W	24,000,a	83,000	2800	ND<33	2900	500	67	115
002A	MW2	W	61,a	730	ND	1.0	ND	ND	1	81.5
003A	MW3	W	ND	ND	ND	ND	ND	ND	1	82.6
004A	MW4	W	ND	ND	ND	ND	ND	ND	1	83.8
005A	MW5	W	ND	780	ND	ND	ND	ND	1	84.0
006A	MW6	W	ND	ND	ND	ND	ND	ND	1	81.2

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	50	5.0	0.5	0.5	0.5	0.5	0.5	1	µg/L
	S	NA	NA	NA	NA	NA	NA	NA	1	mg/Kg

\* water and vapor samples and all TCLP & SPLP extracts are reported in ug/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

# cluttered chromatogram; sample peak coelutes with surrogate peak.

†The following descriptions of the TPH chromatogram are cursory in nature and McC Campbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent / mineral spirit?); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~1 vol. % sediment; j) reporting limit raised due to high MTBE content; k) TPH pattern that does not appear to be derived from gasoline (aviation gas). m) no recognizable pattern; n) TPH(g) range non-target isolated peaks subtracted out of the TPH(g) concentration at the client's request.

 Angela Rydelius, Lab Manager



QC SUMMARY REPORT FOR SW8021B/8015Cm

Matrix: W

WorkOrder: 0409281

EPA Method: SW8021B/8015Cm    Extraction: SW5030B    BatchID: 13207    Spiked Sample ID: 0409268-007A										
Analyte	Sample	Spiked	MS*	MSD*	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(btex) <sup>E</sup>	ND	60	97.7	94.2	3.63	97.2	91.6	5.94	70	130
MTBE	ND	10	91.8	97.8	6.35	99.4	98.7	0.640	70	130
Benzene	ND	10	104	105	1.25	106	106	0	70	130
Toluene	ND	10	96.9	98.6	1.83	98.8	108	9.17	70	130
Ethylbenzene	ND	10	101	101	0	104	102	2.13	70	130
Xylenes	ND	30	90.3	90	0.370	91	90.3	0.735	70	130
%SS:	97.3	10	105	107	1.22	105	108	2.76	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:  
NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 \* (MS-Sample) / (Amount Spiked); RPD = 100 \* (MS - MSD) / ((MS + MSD) / 2).

\* MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

<sup>E</sup> TPH(btex) = sum of BTEX areas from the FID.

# cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not applicable or not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.





QC SUMMARY REPORT FOR SW8021B/8015Cm

Matrix: W

WorkOrder: 0409281

EPA Method: SW8021B/8015Cm		Extraction: SW5030B		BatchID: 13222			Spiked Sample ID: 0409281-004A			
Analyte	Sample	Spiked	MS*	MSD*	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(btex) <sup>£</sup>	ND	60	93.4	93.4	0	96	93	3.23	70	130
MTBE	ND	10	89.3	87.9	1.59	98	98.6	0.628	70	130
Benzene	ND	10	102	97.5	4.25	103	102	1.13	70	130
Toluene	ND	10	93.4	89.3	4.47	96.5	94.8	1.74	70	130
Ethylbenzene	ND	10	96.8	97	0.208	101	97.6	3.32	70	130
Xylenes	ND	30	85.7	86	0.388	90.7	89.7	1.11	70	130
%SS:	83.8	10	106	104	1.67	102	103	1.54	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:  
NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 \* (MS-Sample) / (Amount Spiked); RPD = 100 \* (MS - MSD) / ((MS + MSD) / 2).

\* MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

£ TPH(btex) = sum of BTEX areas from the FID.

# cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not applicable or not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

QA/QC Officer



QC SUMMARY REPORT FOR SW8015C

Matrix: W

WorkOrder: 0409281

EPA Method: SW8015C		Extraction: SW3510C		BatchID: 13208		Spiked Sample ID: N/A				
Analyte	Sample	Spiked	MS*	MSD*	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(d)	N/A	7500	N/A	N/A	N/A	106	97.2	8.37	70	130
%SS:	N/A	2500	N/A	N/A	N/A	119	114	3.91	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:  
NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 \* (MS-Sample) / (Amount Spiked); RPD = 100 \* (MS - MSD) / ((MS + MSD) / 2).

\* MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

QA/QC Officer