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GET

Geo Environmental Technology

Groundwater Monitoring Report
First Quarter 2004

Livermore Gas and Mini Mart
160 Holmes Street
Livermore, California

Prepared by:

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

5/10/04

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Date

5-10-04

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May 2004

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

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GROUNDWATER MONITORING REPORT
FIRST QUARTER 2004

Livermore Gas and Mini Mart
160 Holmes Street
Livermore, California

1.0 INTRODUCTION

This report documents the results of the 3/10/04 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 (LPFD). 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 µg/l, Benzene: 6,100 µg/l, MTBE: 60,000 µg/L). The results were communicated to the Livermore-Pleasanton Fire Department (LPFD) and a UST Unauthorized Release Report was generated.

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On 4/5/99, three gasoline and one diesel USTs, associated dispensers and piping were removed, manifested and disposed, under permit by the LPFD. 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 μg/L and 320,000 μg/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 μg/L and 200,000 μg/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 μg/L and 190,000 μg/L, respectively. GET issued a "Quarterly Monitoring Report" on 3/31/01.

On 05/30/01 groundwater samples were not collected because all three monitoring wells were found to be dry.

The monitoring wells also were dry in August 2001.

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 μg/L and 2,200 μg/L, respectively. GET issued a "Quarterly Monitoring Report" on 3/31/02. Well construction details are presented in Table 1.

On 5/7/02 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Directly downgradient extraction well EX1 contained concentrations of TPHg and MTBE of 7,700 μg/L and 6,200 μg/L, respectively. GET issued a "Quarterly Monitoring Report" on May 28, 2002.

On 9/11/02 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Directly downgradient wells EX1 and MW1 contained TPHg concentrations of 2,800 and 130,000 μg/L and MTBE of 2,500 and <5,000 μg/L, respectively. GET issued a "Quarterly Monitoring Report" on December 13, 2002.

On 12/1/02 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Directly downgradient well EX1 contained concentrations of TPHg at 3,000 μg/L and MTBE at 1,200 μg/L. Down-gradient well MW1 was dry and therefore was not sampled. GET issued a "Quarterly Monitoring Report" in February 2003.

On 3/14/03 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient wells MW1 and EX1 contained concentrations of TPHg at 180,000 and 750 μg/L, respectively and concentrations of MTBE at 220,000 and 1,200 μg/L, respectively. GET issued a "Quarterly Monitoring Report" in April 2003.

On 6/25/03 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient wells MW1 and EX1 contained concentrations of TPHg at 71,000 and 120 μg/L, respectively and concentrations of MTBE at 210,000 and 260 μg/L, respectively. GET issued a "Quarterly Monitoring Report" in July 2003.

On 8/7/03 Geo Environmental personnel met onsite with Donna Drogos of the ACEHS. Ms. Drogos requested a workplan for additional site investigation using a multiple well-point system to monitor different aquifer levels beneath the site.

On 9/16/03 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient well MW1 contained concentrations of TPHg at 37,000 and concentrations of MTBE at 150,000. GET issued a "Quarterly Monitoring Report" in October 2003.

On 12/22/03 groundwater samples were collected and analyzed for TPHd, TPHg/BTEX and MTBE. Downgradient wells MW1 and MW2 contained concentrations of TPHg at 44,000 and 240 μg/L, respectively and concentrations of MTBE at 180,000 and 1,400 μg/L, respectively. GET issued a "Quarterly Monitoring Report" in January 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: Manwel 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 3/10/04. 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.

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 impacted. TPHd was detected at 3,100 µg/L, TPHg at 72,000 µg/L and MTBE at 260,000 µg/L. BTEX constituent concentrations were 6,000, 11,000, 3,900, and 10,000 µg/L, respectively.

Cross-gradient well MW2 contained concentration levels of 210 µg/L TPHd, 280 µg/L TPHg, and 1,400 µg/L MTBE; traces of BTEX concentrations also were detected.

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

Offsite monitoring well MW4 contained no detectable concentrations of TPHd, TPHg or BTEX; MTBE was detected at 37 µg/L.

Offsite monitoring well MW5 contained no detectable concentrations of TPHd or BTEX; TPHg and MTBE concentrations were detected at 57 and 1,100 µg/L, respectively.

Offsite monitoring well 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 3/10/04 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 0.020 ft/ft. This information is presented graphically in Figure 4.

5.0 RECOMMENDATIONS

Based on the results of this groundwater monitoring episode 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 6/13/04.

- 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, active pumping from the drinking water wells may have on the dispersal of MTBE across the aquifer.

- Prepare a workplan for additional site investigation using a multiple well-point system to monitor different aquifer levels beneath the site.

- Perform a downgradient receptor survey and discuss cleanup levels with the ACEHS.

- Prepare a 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 03/10/04 (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	17.45
MW-2	07/26/00	464.96	30	8	2	0.01	30-15	15-0.5	30-13	13-11	11-1.0	17.31
MW-3	07/26/00	465.86	30	8	2	0.01	30-15	15-0.5	30-13	13-11	11-1.0	17.88
MW-4	10/30/01	465.25	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	18.20
MW-5	10/30/01	464.74	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	19.22
MW-6	10/30/01	464.23	50	8	2	0.01	50-20	20-0.5	50-18	18-16	16-0.5	18.65
EX1	10/30/01	465.39	55	10	6	0.01	55-30	30-0.5	55-28	28-26	26-0.5	17.99

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)
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							
	11/14/01	Dry							
	05/07/02	Dry							
	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
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	25.96	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
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

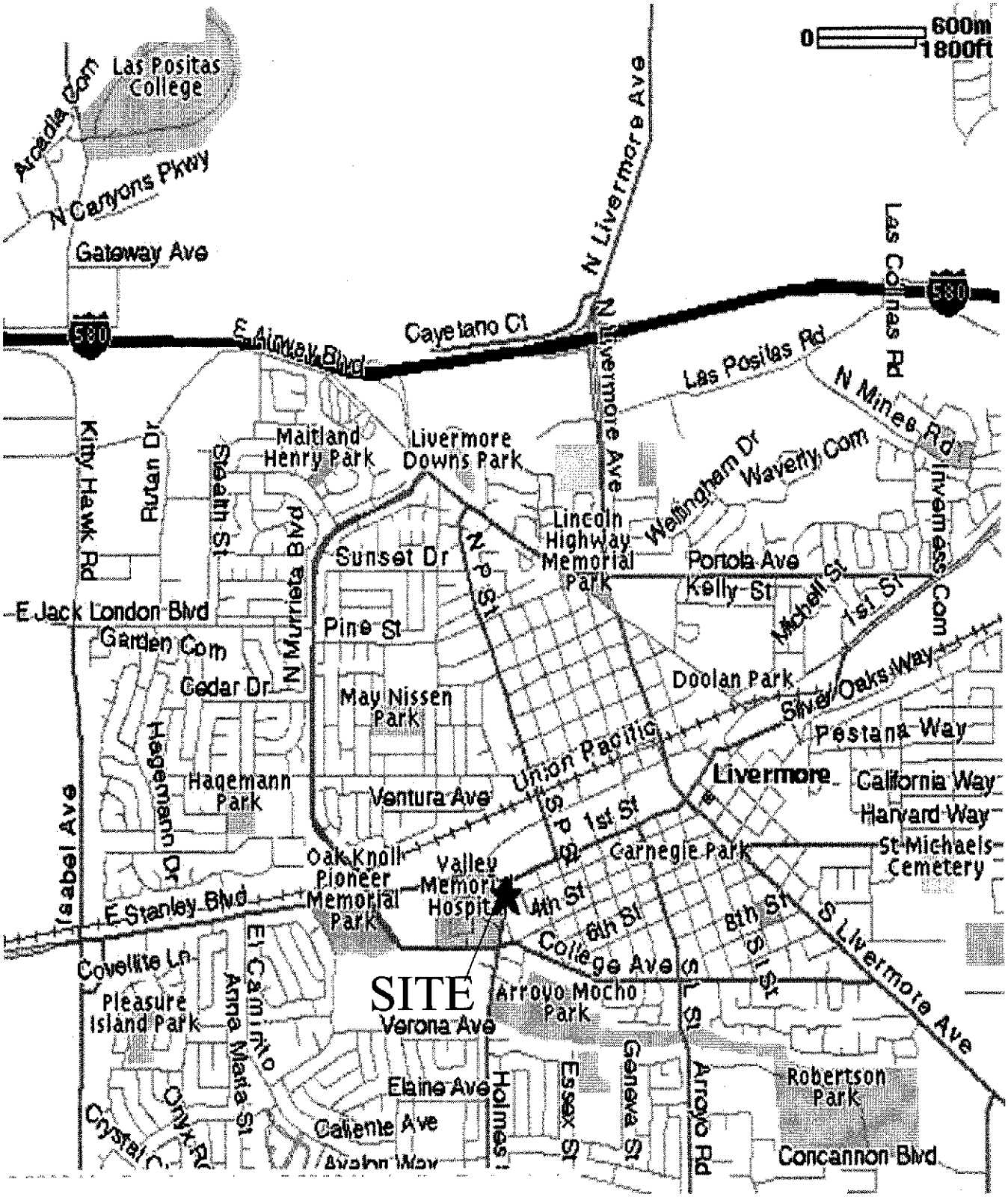
Livermore Gas and Minimart, 160 Holmes, Livermore, California

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)
MW-4	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
MW-5	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
MW-6	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
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
	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						

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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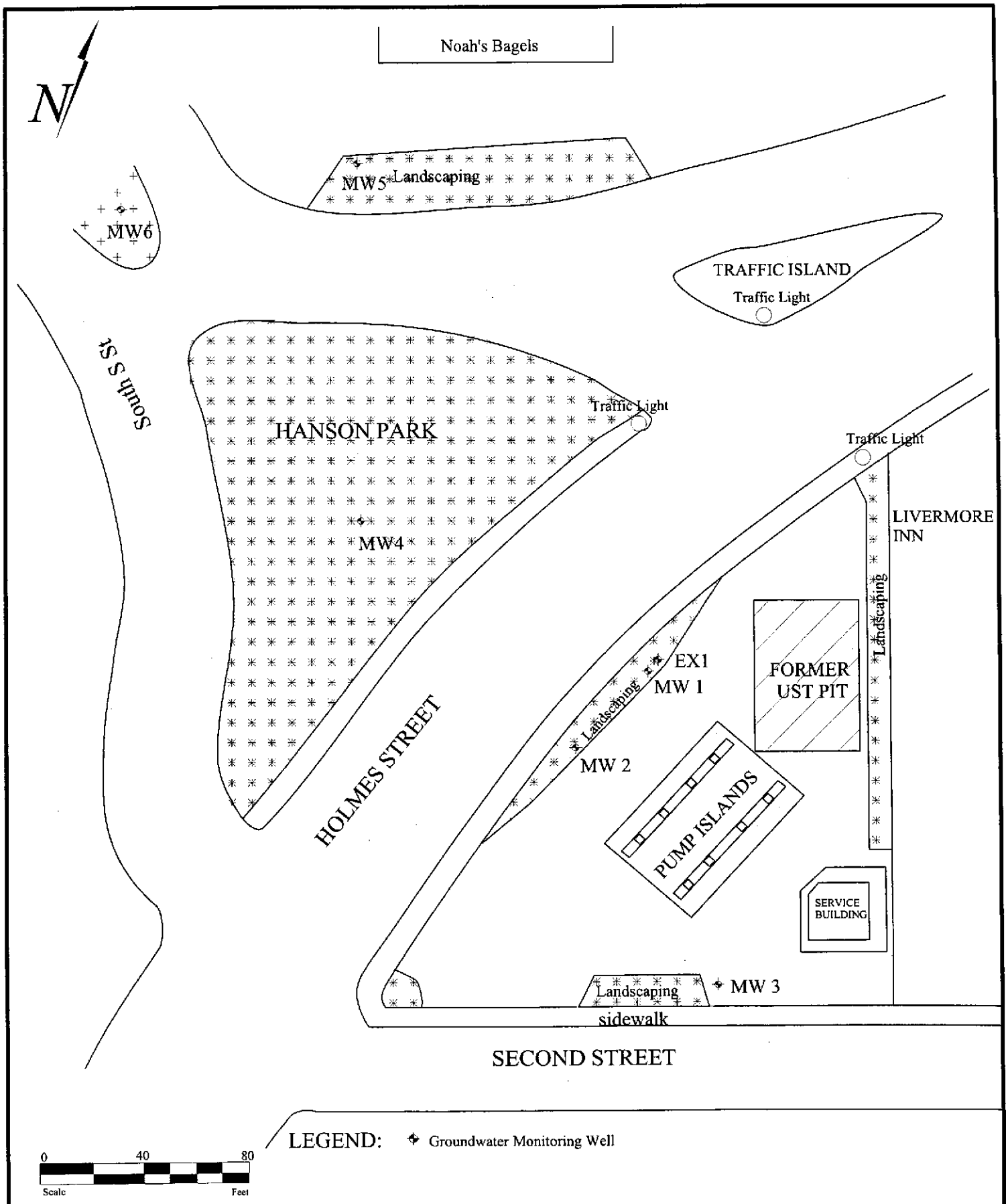
Site Vicinity Map

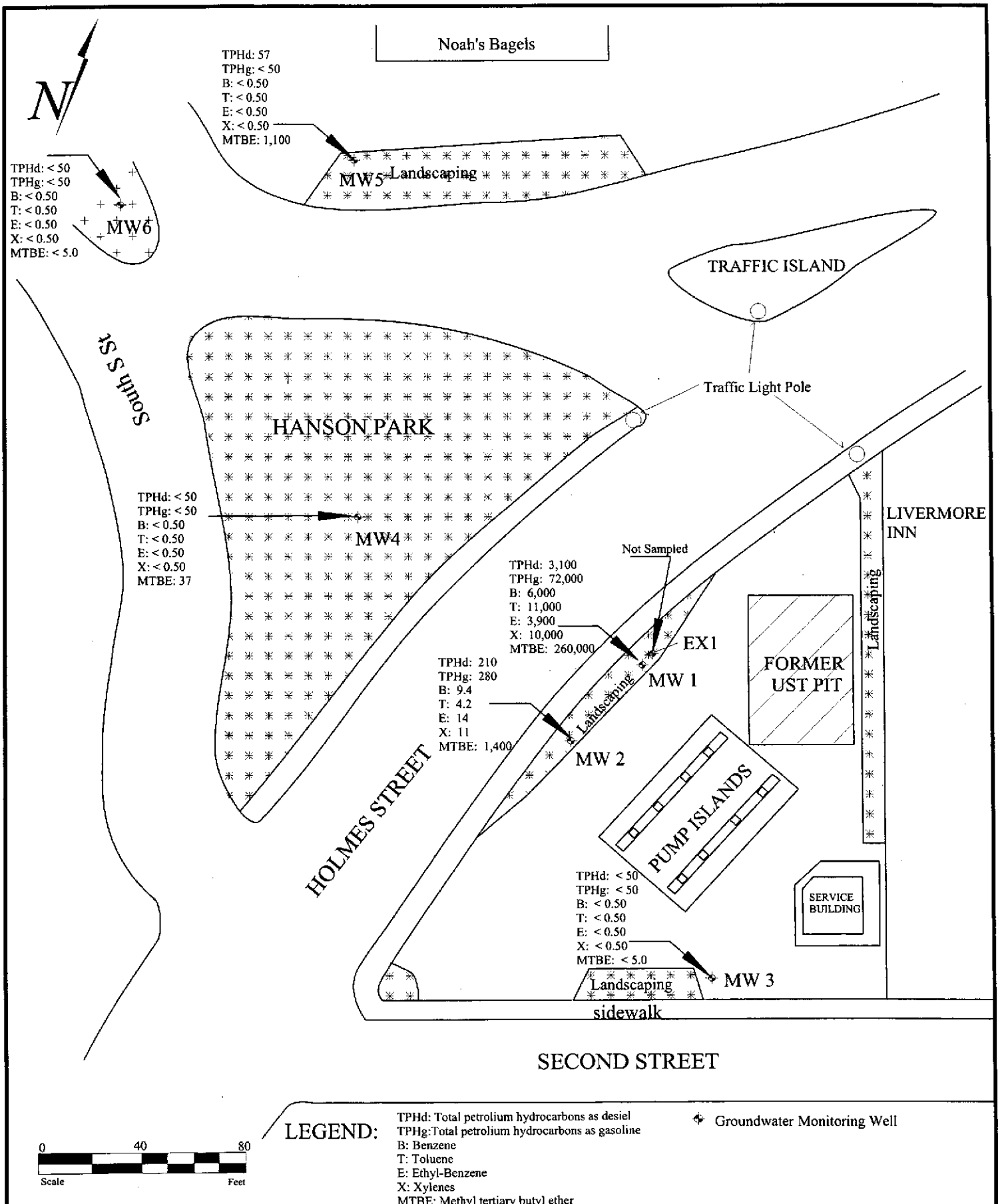
Livermore Gas and Mini Mart
160 Holmes Street
Livermore, California

Figure No.
1

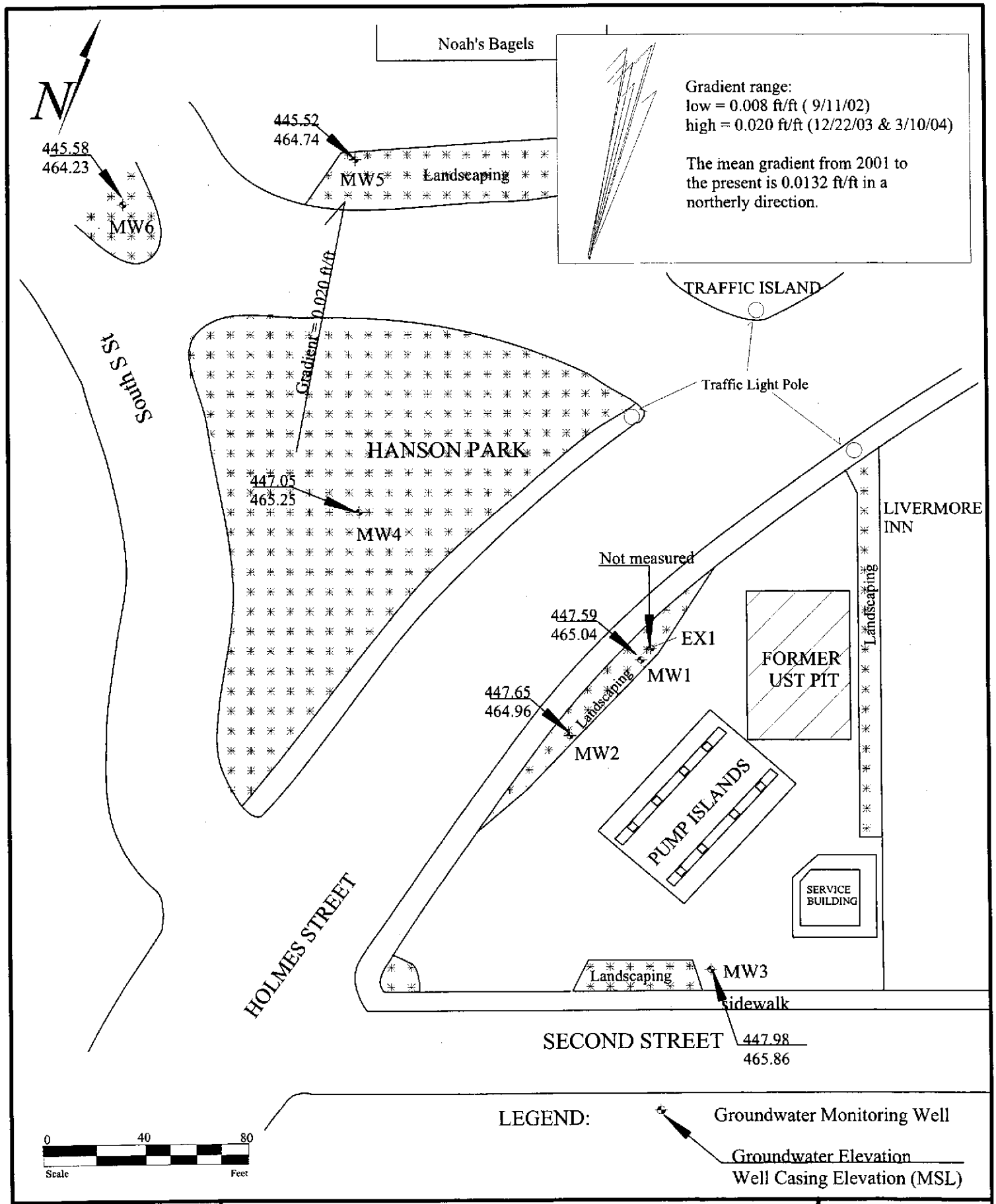
Project
MANWEL



Geo Environmental Technologies	Site Plan 3/10/04 Livermore Gas and Minimart 160 Homes Street, Livermore, CA	Figure No. 2 Project Manwel



Geo Environmental Technologies	Groundwater Analyticals 3/10/04 Livermore Gas and Minimart 160 Homes Street, Livermore, CA	Figure No. 3 Project Manwel



Geo Environmental Technologies	Groundwater Direction and Gradient 3/10/04 Livermore Gas and Minimart 160 Homes Street, Livermore, CA	Figure No. 4 Project Manwel

APPENDIX A

Project: Manwet				Sampler: DK
Site Loacation: Livermore				
Well ID: MW1	Well Diameter(in): 2	(1)Depth of water (ft): 17.45		(2) Total Depth (ft): 30
Free Product (Y/N) N	Depth of free product(ft):	Product thickness(in):		
	Measurements Referenced to: (TOC) Grade Other:			

Calculations

Length of water column= $\frac{30}{2}$ ft - $\frac{17.5}{1}$ ft= $\frac{12.5}{3}$ ft

80% of the water level= $\frac{17.5}{1}$ ft + $\frac{12.5}{3}$ ftx0.2)= $\frac{20}{}$ ft

Estimated purge volume (EPV)= $\frac{12.5}{3}$ ft x $\frac{.16}{\text{VCF}}$ x $\frac{3}{\text{Casing vol}}$ = $\frac{6}{}$ Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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
(X)Disposable Bailer
( )Extraction Port
( )Other

Did well dewater? if yes, _____gal		Time:	Gallons actually purged: 6
Sample ID: MW1	Sampling time:	Sampling date: 3/10/04	Water level (ft): No of bottles: 3

Notes:

Project: Manuel				
Site Loacation: Livermore			Sampler: DK	
Well ID: MW2	Well Diameter(in): 2	(1)Depth of water (ft): 17.3	(2) Total Depth (ft): 30	
Free Product (Y/N) N	Depth of free product(ft):	Product thickness(in):		
	Measurements Referenced to: (TOC) Grade Other:			

Calculations

Length of water column= $\frac{30}{2}$ ft - $\frac{17.3}{1}$ ft = $\frac{12.7}{3}$ ft

80% of the water level= $\frac{17.3}{1}$ ft + $\frac{12.7}{3}$ ft x 0.2) = $\frac{20}{}$ ft

Estimated purge volume (EPV)= $\frac{12.7}{3}$ ft x $\frac{.16}{\text{VCF}}$ x $\frac{3 \text{ to } 6}{\text{Casing vol}}$ Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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
(X)Electric Submersible Pump
( )Extraction Pump
( )Other

Sampling Equipment:
( )_____Bailer
(X)Disposable Bailer
( )Extraction Port
( )Other

Did well dewater? if yes, _____gal | Time: | Gallons actually purged: 6

Sample ID: MW2 | Sampling time: | Sampling date: 3/10/04 | Water level (ft): | No of bottles: 3

Notes:

Project: Manwel				
Site Loacation: Livermore			Sampler: DC	
Well ID: MW3	Well Diameter(in): 2	(1)Depth of water (ft): 17.8	(2) Total Depth (ft): 30	
Free Product (Y/N) N	Depth of free product(ft):	Product thiokness(in):		
	Measurements Referenced to: TOC Grade Other:			

Calculations

Length of water column= 30 (2) ft - 18 (1) ft = 12 (3) ft

80% of the water level= 18 (1) ft + (12 (3) ft x 0.2) = 20.4 ft

Estimated purge volume (EPV)= 12 (3) ft x .16 (VCF) x 3 (Casing vol) = 5.76 Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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:	Gallons actually purged: 6
Sample ID: MW3	Sampling time:	Sampling date: 3/10/04	Water level (ft):
			No of bottles: 3

Notes:

Project: Manuel			Sampler: DC
Site Loacation: Livermore			
Well ID: MW4	Well Diameter(in): 2	(1)Depth of water (ft): 18.2	(2) Total Depth (ft): 50
Free Product (Y/N) N	Depth of free product(ft):	Product thickness(in):	
	Measurements Referenced to: TOC Grade	Other:	

Calculations

Length of water column= $\frac{50}{2}$ ft - $\frac{18}{1}$ ft= $\frac{32}{3}$ ft

80% of the water level= $\frac{18}{1}$ ft + $\frac{32}{3}$ ft x 0.2)= 25 ft

Estimated purge volume (EPV)= $\frac{32}{3}$ ft x $\frac{.16}{\text{VCF}}$ x $\frac{3}{\text{Casing vol}}$ = 15 Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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: | Gallons actually purged: 15

Sample ID: MW4 | Sampling time: | Sampling date: 3/10 | Water level (ft): | No of bottles: 3

Notes:

Project: Manwel			Sampler: DK
Site Loacation: Livermore			
Well ID: MW5	Well Diameter(in): 2	(1)Depth of water (ft): 19.2	(2) Total Depth (ft): 50
Free Product (Y/N) N	Depth of free product(ft):	Product thickness(in):	
	Measurements Referenced to: TOC Grade Other:		

Calculations

Length of water column= $\frac{50}{2}$ ft - $\frac{19.2}{1}$ ft= $\frac{31}{3}$ ft

80% of the water level= $\frac{19.2}{1}$ ft + $\frac{31}{3}$ ft x 0.2)= 25 ft

Estimated purge volume (EPV)= $\frac{31}{3}$ ft x $\frac{.16}{\text{VCF}}$ x $\frac{3}{\text{Casing vol}}$ = 15 Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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
(X)Electric Submersible Pump
( )Extraction Pump
( )Other

Sampling Equipment:
( )_____ Bailer
(X)Disposable Bailer
( )Extraction Port
( )Other

Did well dewater? if yes, _____ gal | Time: | Gallons actually purged: 15

Sample ID: MW5 | Sampling time: | Sampling date: 3/10 | Water level (ft): | No of bottles: 3

Notes:

Project: Manuel			Sampler: DK
Site Loacation: Livermore			
Well ID: MW6	Well Diameter(in): 2	(1)Depth of water (ft): 18.65	(2) Total Depth (ft): 50
Free Product (Y/N) N	Depth of free product(ft):	Product thickness(in):	
	Measurements Referenced to: TOC	Grade Other:	

Calculations

Length of water column= $\frac{50}{2}$ ft - $\frac{18.65}{1}$ ft= $\frac{31}{3}$ ft

80% of the water level= $\frac{18.65}{1}$ ft + $\frac{31}{3}$ ft x 0.2)= 25 ft

Estimated purge volume (EPV)= $\frac{31}{3}$ ft x $\frac{.16}{\text{VCF}}$ x $\frac{3}{\text{Casing vol}}$ = 15 Gallons

Volume conversion factor(VCF)
VCF=0.052gal/(in^2x ft)xP(d^2/4)
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: | Gallons actually purged: 15

Sample ID: MW6 | Sampling time: | Sampling date: 3/10 | Water level (ft): | No of bottles: 3

Notes:

APPENDIX B

McCampbell 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	Client Project ID: Manuel	Date Sampled: 03/10/04
343 Soquel Avenue #33		Date Received: 03/12/04
Santa Cruz, CA 95062	Client Contact: Costas Orountiotis	Date Reported: 03/18/04
	Client P.O.:	Date Completed: 03/18/04

WorkOrder: 0403207

March 18, 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. McCampbell 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

McCampbell 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	Client Project ID: Manuel	Date Sampled: 03/10/04
343 Soquel Avenue #33		Date Received: 03/12/04
Santa Cruz, CA 95062	Client Contact: Costas Orountiotis	Date Extracted: 03/16/04-03/17/04
	Client P.O.:	Date Analyzed: 03/16/04-03/17/04

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

Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0403207

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	MW1	W	72,000,a	260,000	6000	11,000	3900	10,000	200	102
002A	MW2	W	280,a	1400	9.4	4.2	14	11	1	109
003A	MW3	W	ND	ND	ND	ND	ND	ND	1	107
004A	MW4	W	ND	37	ND	ND	ND	ND	1	104
005A	MW5	W	57,f	1100	ND	ND	ND	ND	1	98.7
006A	MW6	W	ND	ND	ND	ND	ND	ND	1	97.8

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	1	µg/L
	S	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 McCampbell 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 ~2 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.

DHS Certification No. 1644

Angela Rydelius, Lab Manager

McCampbell 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	Client Project ID: Manuel	Date Sampled: 03/10/04
343 Soquel Avenue #33		Date Received: 03/12/04
Santa Cruz, CA 95062	Client Contact: Costas Orountiotis	Date Extracted: 03/12/04
	Client P.O.:	Date Analyzed: 03/15/04-03/16/04

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

Extraction method: SW3510C Analytical methods: SW8015C Work Order: 0403207

Lab ID	Client ID	Matrix	TPH(d)	DF	% SS
0403207-001B	MW1	W	3100,d,b	1	95.8
0403207-002B	MW2	W	210,d	1	92.6
0403207-003B	MW3	W	ND	1	91.8
0403207-004B	MW4	W	ND	1	90.0
0403207-005B	MW5	W	ND	1	88.2
0403207-006B	MW6	W	ND	1	88.6

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 McCampbell 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 ~2 vol. % sediment; k) kerosene/kerosene range/jet fuel range; l) bunker oil; m) fuel oil; n) stoddard solvent/mineral spirit.

DHS Certification No. 1644

Angela Rydelius, Lab Manager

McCampbell 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

QC SUMMARY REPORT FOR SW8021B/8015Cm

Matrix: W WorkOrder: 0403207

EPA Method: SW8021B/8015Cm Extraction: SW5030B BatchID: 10729 Spiked Sample ID: 0403203-014A

	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)£	ND	60	95.1	99.7	4.77	103	102	1.07	70	130
MTBE	ND	10	97	100	3.35	101	102	0.765	70	130
Benzene	ND	10	102	113	10.1	106	109	2.45	70	130
Toluene	ND	10	89.6	108	18.2	100	102	1.78	70	130
Ethylbenzene	ND	10	109	113	3.91	106	109	2.71	70	130
Xylenes	ND	30	100	100	0	96	96.7	0.692	70	130
%SS:	97.1	10	105	103	1.56	102	101	1.09	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 and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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

cluttered chromatogram; sample peak coelutes with surrogate peak.

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.

DHS Certification No. 1644

QA/QC Officer

McCampbell 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

QC SUMMARY REPORT FOR SW8015C

Matrix: W WorkOrder: 0403207

EPA Method: SW8015C	Extraction: SW3510C	BatchID: 10730	Spiked Sample ID: N/A

	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	109	109	0	70	130
%SS:	N/A	2500	N/A	N/A	N/A	96.6	96.3	0.337	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 and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with 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.

DHS Certification No. 1644

TL QA/QC Officer

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

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0403207

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: 3/12/04
Date Printed: 3/12/04

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
0403207-001	MW1	Water	3/10/04	☐	A	A	B												
0403207-002	MW2	Water	3/10/04	☐	A		B												
0403207-003	MW3	Water	3/10/04	☐	A		B												
0403207-004	MW4	Water	3/10/04	☐	A		B												
0403207-005	MW5	Water	3/10/04	☐	A		B												
0403207-006	MW6	Water	3/10/04	☐	A		B												

Test Legend:

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

Prepared by: Maria 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.

04/03207

Route # 1916 | Driver # 773 | Pick-up Time | Shipper's Signature
Driver's Signature | Print Name

Telephone: (925) 798-1620 Fax: (925) 798-1622

RUSH

EDF Required? ☒ Yes ☐ No

Report To: DMITRI KELLY Bill To: GET
Company: GET
343 Soquel #33
Santa Cruz, CA 95062 E-Mail: mcrootrock@yahoo.com
Tele: ( ) 831 423-8780 Fax: ( ) 831 423 8827
Project #: Project Name: Manuel
Project Location: Livermore
Sampler Signature:

SAMPLE ID (Field Point Name)	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	Soil	Air	Sludge	Other	METHOD PRESERVED Ice	HCl	HNO_3	Other
MW1	Manuel	3/10		3	VOA amber	X					X	X		
MW2				3		X					X	X		
MW3				3		X					X	X		
MW4				3		X					X	X		
MW5				3		X					X	X		
MW6				3		X					X	X		

Analysis Request

BTEX & TPH as Gas (602/8020 + 8015)/MTBE	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
X	X													
X	X													
X	X													
X	X													
X	X													
X	X													

Relinquished By:	Date:	Time:	Received By:
			Soveem
Relinquished By:	Date: 3/12/04	Time: 1000	Received By:
shed By:	Date:	Time:	Received By:

	VOAS	O&G	METALS	OTHER
ICE/T NO				
GOOD CONDITION ✓				
HEAD SPACE ABSENT				
DECHLORINATED IN LAB				
PRESERVATION APPROPRIATE ✓				
CONTAINERS ✓				
PERSERVED IN LAB				

REC'D SEALED & INTACT VIA C/D