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**THIRD QUARTER 2008  
GROUNDWATER MONITORING  
REPORT**

**2836 UNION STREET  
OAKLAND, CALIFORNIA**

*Prepared for:*

**ESTATE OF LARRY M. WADLER  
2525 MANDELA PARKWAY  
OAKLAND, CA 94607**

**July 2008**

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REPORT**

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OAKLAND, CALIFORNIA**

*Prepared for:*

**ESTATE OF LARRY M. WADLER  
2525 MANDELA PARKWAY  
OAKLAND, CA 94607**

*Prepared by:*

**STELLAR ENVIRONMENTAL SOLUTIONS, INC.  
2198 SIXTH STREET, SUITE 201  
BERKELEY, CALIFORNIA 94710**

**July 24, 2008**

July 24, 2008

Ms. Donna Drogos  
Alameda County Environmental Health Care Services Agency  
Department of Environmental Health – Local Oversight Program  
1131 Harbor Bay Parkway, Suite 250  
Alameda, California 94502

Subject: Third Quarter 2008 Groundwater Monitoring Report  
Former Modern Mail Service, 2836 Union Street, Oakland, California  
Alameda County Environmental Health Department Fuel Leak Case No. RO2901

Dear Ms. Drogos:

On behalf of the property owner and “Responsible Party” (Estate of Lawrence M. Wadler), Stellar Environmental Solutions, Inc. (SES) is submitting this Third Quarter 2008 Groundwater Monitoring Report for the former Modern Mail Service Facility at 2836 Union Street, Oakland, California. This report documents the Q3-2008 groundwater monitoring event related to petroleum contamination from a former underground fuel storage tank. This is the 8th consecutive quarterly groundwater monitoring event conducted at this site. The report has been uploaded to Alameda County Environmental Health and to the State Water Resources Control Board’s GeoTracker system.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report are true and correct to the best of my knowledge. If you have any questions regarding this report, please contact us at (510) 644-3123.

Sincerely,



Henry Pietropaoli, R.G., R.E.A.  
Project Manager



Richard S. Makdisi, R.G., R.E.A.  
Principal



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# **1.0 INTRODUCTION**

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## **PROJECT BACKGROUND**

Stellar Environmental Solutions, Inc. (SES) was contracted by Mr. Lawrence Wadler (property owner currently referred to as the Estate of Lawrence Wadler) to conduct corrective actions related to soil and groundwater contamination associated with a 10,000-gallon underground fuel storage tank (UFST) at 2836 Union Street in Oakland, California. A list of all known environmental reports is included in Section 6.0.

This report discusses the Third Quarter 2008 activities conducted on July 7, 2008. Figure 1 shows the site location. Figure 2 shows the site plan with the locations of groundwater wells, borings, and the former UFST.

## **SITE DESCRIPTION AND HISTORY**

The approximately 7,200-square foot rectangular subject property is developed with one approximately 1,500-square foot two-story building. A narrow driveway borders the building to the north, and the rear of the property is undeveloped (paved). Adjacent uses include:

- A residence (to the north);
- A paved parking area (to the east);
- A residence (to the south); and
- A sidewalk, then Union Street, then a moving company (to the west).

The property operated as an express courier facility (Modern Mail Services, Inc.) between 1951 and 2003. One 10,000-gallon gasoline UFST was installed in the late 1970s. The UFST operated under an Alameda County Environmental Health permit (permit No. STID 4065) until it was removed in 1998. The tank closure report was submitted to the Oakland Fire Department (Golden Gate Tank Removal, 1998).

An initial site characterization conducted by SES in November 2005, which included the advancement of four borings, revealed gasoline and associated aromatic hydrocarbons at elevated levels in both soil and groundwater. That investigation was summarized in a technical report (SES, 2005b).



**SITE LOCATION ON U.S.G.S. TOPOGRAPHIC MAP**

2836 Union Street  
Oakland, CA

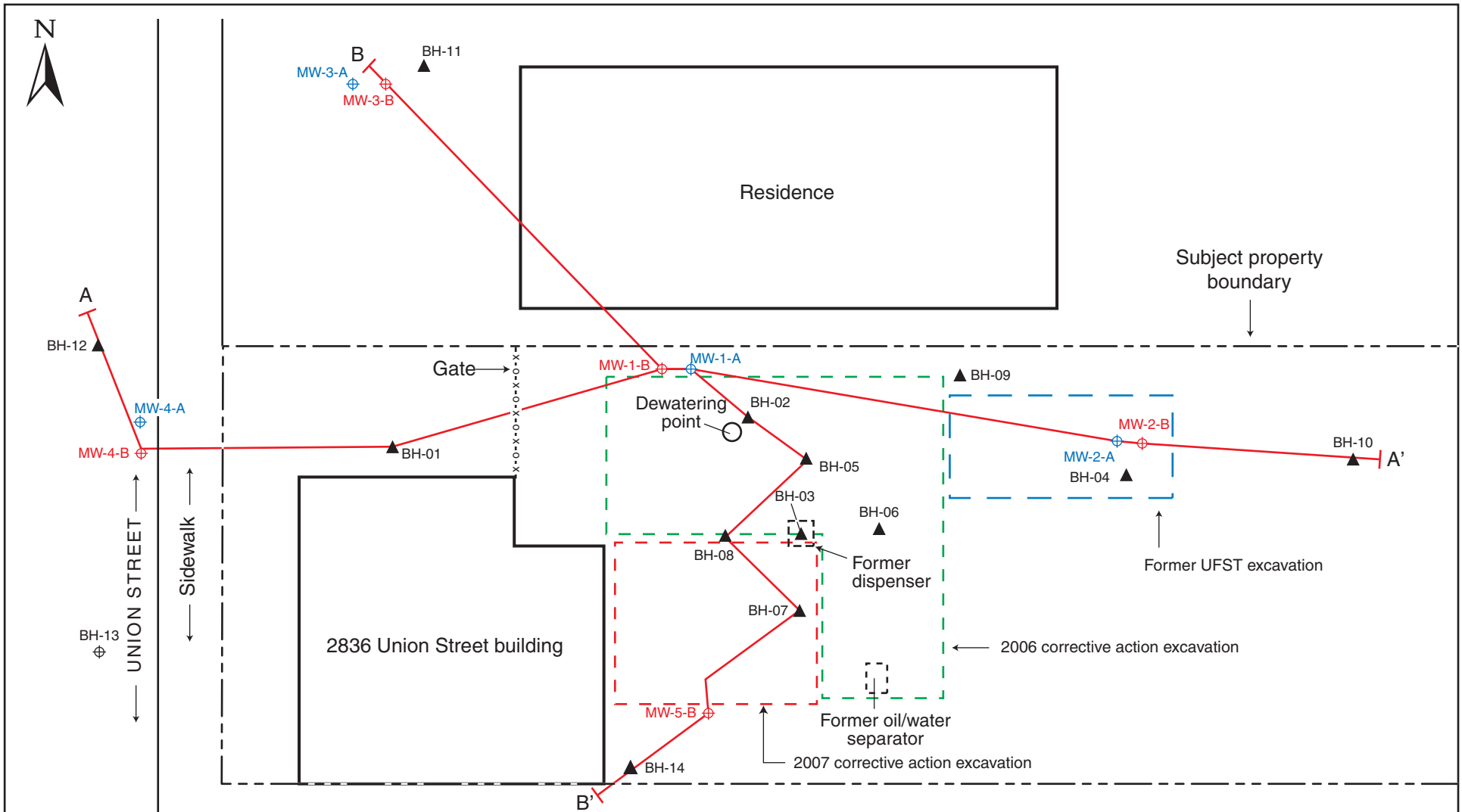
By: MJC

NOVEMBER 2005

**Figure 1**



2005-65-01



**LEGEND**

- MW-1-A Groundwater monitoring well; 10'-13' deep screened interval
- MW-1-B Groundwater monitoring well; 19'-25' deep screened interval
- BH-01 Previous exploratory borehole
- A-A' Cross-section A-A'
- ND = TPH-gas not detected, concentration of TPH-gas in mg/kg

0 10  
SCALE IN FEET (approx.)

**SITE PLAN SHOWING LOCATIONS OF SOIL BORINGS AND MONITORING WELLS  
2836 Union Street, Oakland, CA**

**Figure 2**

by: MJC DECEMBER 2007

2005-65-62





Additional site investigations in April 2006 involved the advancement of nine exploratory boreholes to determine the areal and vertical extent of soil and groundwater contamination. Site data indicated the presence of petroleum hydrocarbons in soil and groundwater. Actions such as groundwater monitoring, and the removal of any remaining (accessible) contaminated soils by excavation, were recommended as an interim corrective action. The April 2006 investigation is summarized in a technical report (SES, 2006b).

A corrective action which implemented the April 2006 recommendations was conducted between September and December 2006. This involved the installation of ten monitoring wells, the advancement of one soil boring, the removal of 398 tons of contaminated soil, and the pumping of 5,100 gallons of contaminated groundwater from the backfilled excavation. Some residual contaminated soil was inaccessible for removal, and remained beneath the onsite building. Removal of this portion of the building and the previously inaccessible soil was conducted in November 2007. This corrective action was effective in removing 212 tons of contaminated soil; and included purging contaminated groundwater and applying Oxygen Reducing Compound (ORC) Advanced™ product into the open excavation. Monitoring well MW-5A was destroyed by excavation during the November 2007 activity. These investigations are summarized in SES technical reports (SES, 2006d and 2007f). The site wells have been monitored quarterly since October 2006.

## **REGULATORY STATUS**

The Alameda County Environmental Health Care Services Agency, Department of Environmental Health Services (Alameda County Environmental Health) is the lead regulatory agency for the case, acting as a Local Oversight Program (LOP) for the Regional Water Quality Control Board – San Francisco Bay Region (Water Board). There are no Alameda County Environmental Health or Water Board cleanup orders for the site; however, all site work has been conducted under the oversight of Alameda County Environmental Health Services. Alameda County Environmental Health Services assigned the site to its fuel leak case system (RO#2901), and the case officer assigned was Mr. Barney Chan. However, Mr. Chan transferred to another Alameda County department in 2007 and he is no longer providing oversight of the site. Ms. Donna Drogos, head of the Alameda County Environmental Health Services unit, has not informed SES of any replacement for Mr. Chan as of yet.

The case has been assigned No. T0600105641 in the Water Board's GeoTracker system. Electronic uploads of required data/reports are submitted to both agencies. The site has been granted a Letter of Commitment, and has been receiving financial reimbursement from the California Underground Storage Tank Cleanup Fund.

## **2.0 PHYSICAL SETTING**

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### **TOPOGRAPHY AND DRAINAGE**

The mean elevation of the property is approximately 18 feet above mean sea level (amsl), and the general topographic gradient in the site vicinity is slight and to the west-southwest (toward San Francisco Bay). The site itself has no discernible slope. The nearest downgradient (to the west) permanent surface water body is the Airport Channel of San Leandro Bay (which is connected to San Francisco Bay), approximately 2 miles west of the subject property. According to the commercially available database, the site is not located within a flood zone or wetland.

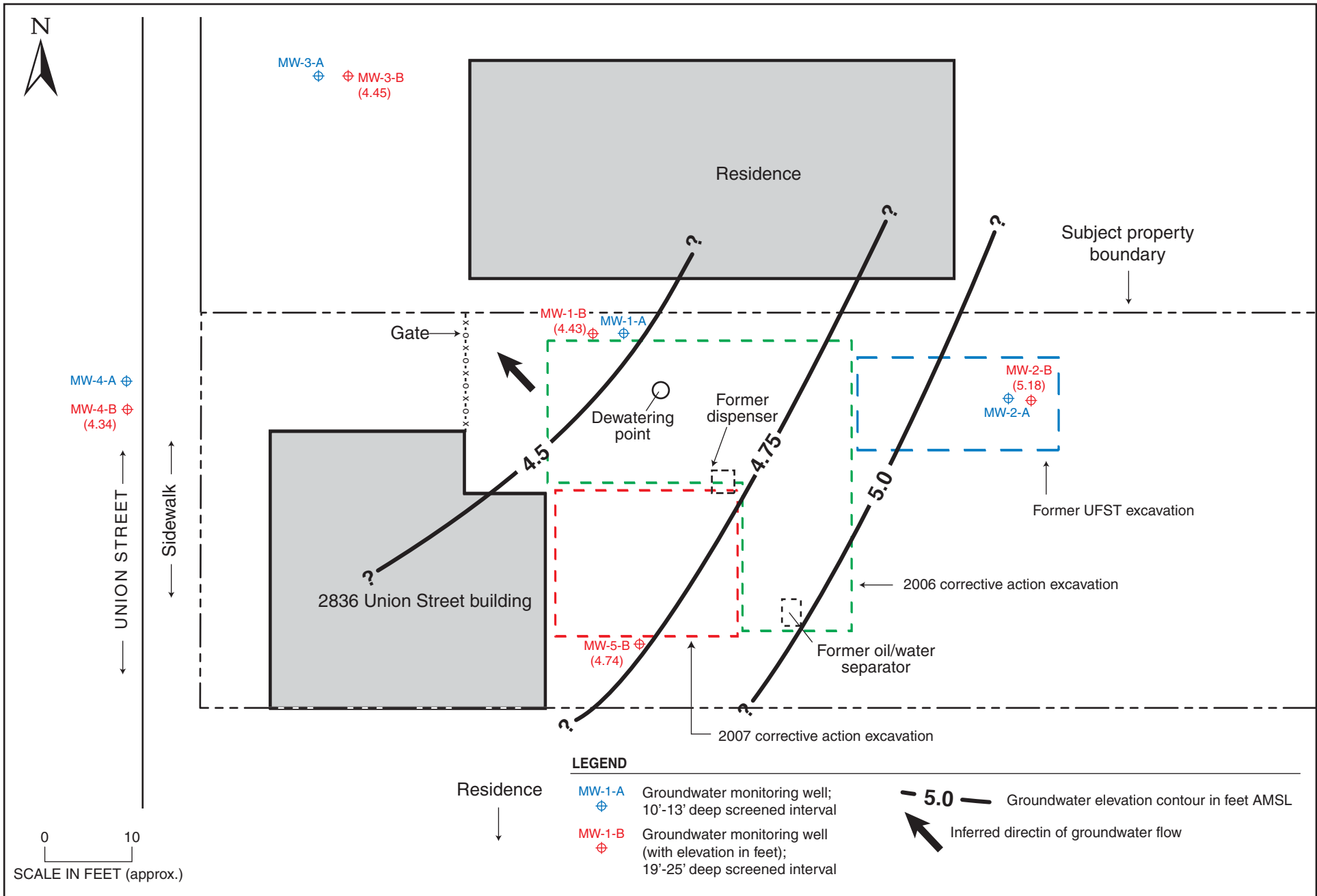
### **LITHOLOGY AND HYDROGEOLOGY**

The predominant soil type in all site boreholes was generally firm and plastic silty clay. Several of the boreholes had no obvious sand or gravel units, although minor amounts of sand and gravel were occasionally present in the overall clay matrix. Groundwater occurred in these units with higher sandy-gravel than clay content. Local heterogeneities in shallow lithology and groundwater levels are typical of the alluvial deposits in this area.

Local groundwater flow direction is generally to the west (toward San Francisco Bay and following local topography) in this area of west Oakland. Groundwater in the immediate vicinity of the former UFST occurs at a depth of less than 10 feet, and appears to be under semi-confining conditions, rising from approximately 20 feet below ground surface to as high as 6 feet below grade such that groundwater is in contact with residual contaminated soil. The groundwater contaminant plume has not been fully delineated, but appears to have an elliptical configuration with the long axis trending east to west-northwest.

### **GROUNDWATER FLOW DIRECTION**

Figure 3 is a groundwater elevation map based on the July 7, 2008 groundwater elevation measurements. The flow direction during the July 2008 event was found to be toward the west-northwest (toward San Francisco Bay), generally parallel to the long dimension of the groundwater contaminant plume. The subject property groundwater gradient ranged from approximately 0.008 feet/foot on the western side of the property to 0.001 feet/foot on the eastern side of the property. The groundwater gradient has varied since October 2006 between approximately 0.006 feet/foot and 0.01 feet/foot, averaging approximately 0.008 feet/foot.



### GROUNDWATER ELEVATION MAP (B-WELLS)

2836 Union Street, Oakland, CA

### Figure 3

by: MJC

JULY 2008

### **3.0 THIRD QUARTER 2008 GROUNDWATER MONITORING**

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This section presents the groundwater sampling and analytical methods for the most recent event (Third Quarter 2008), conducted on July 7, 2008.

#### **GROUNDWATER MONITORING**

Groundwater monitoring well water level measurements, sampling, and field analyses were conducted by Blaine Tech Services (San Jose, California) on July 7, 2008, under the direct supervision of SES personnel. To minimize the potential for cross-contamination, wells were purged and sampled in order of anticipated increasing contamination (based on analytical results from the previous quarter).

As the first monitoring task, static water levels were measured in the nine site wells using an electric water level indicator. Monitoring well MW-5A was destroyed by excavation during the November 2007 corrective action and thus is no longer available for monitoring. The wells were then sampled with a peristaltic pump, during which the groundwater quality parameters of temperature, pH, conductivity, and turbidity were field-measured using daily-calibrated instruments. Approximately 7.48 gallons of sampling purge water was generated and containerized onsite, and will be disposed of at later date after subsequent monitoring events and additional purge water has accumulated. The samples were placed in an ice chest with ice at approximately 4°C and transported to the analytical laboratory under chain-of-custody the same day. Laboratory analysis was conducted by Curtis and Tompkins, Ltd. (Berkeley, California), an analytical laboratory certified by the State of California Environmental Laboratory Accreditation Program (ELAP).

The locations of all site monitoring wells are shown on Figure 2. Well construction information and groundwater elevation data are summarized in Table 1. Appendix A contains the groundwater monitoring field records for the current event. Appendix B outlines SES's standard sampling protocol for groundwater. Groundwater analytical results are presented and discussed in Section 4.0. Historical groundwater elevation data is contained in Appendix D.

**Table 1**  
**Monitoring Well Groundwater Elevation Data – July 7, 2008**  
**2836 Union Street, Oakland, California**

<b>Well</b>	<b>Well Depth Below TOC</b>	<b>Rim Elevation</b>	<b>TOC Elevation</b>	<b>Groundwater Elevation (7/7/08)</b>
MW-1A	12.59	12.52	12.25	4.00
MW-1B	22.52	12.48	12.05	4.43
MW-2A	12.69	13.06	12.82	5.12
MW-2B	24.59	13.16	12.96	5.18
MW-3A	13.06	11.76	11.59	4.86
MW-3B	25.06	12.10	11.95	4.45
MW-4A	12.28	11.25	11.02	4.72
MW-4B	24.32	11.25	11.04	4.34
MW-5B	25.39	12.57	12.38	4.74

Notes:

TOC = top of casing

Wells are 1-inch diameter.

All elevations are in feet above mean sea level.

## 4.0 REGULATORY CONSIDERATIONS, ANALYTICAL RESULTS, AND DISCUSSION OF FINDINGS

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### REGULATORY CONSIDERATIONS AND SCREENING LEVELS

The Water Board has established Environmental Screening Levels (ESLs) for evaluating the likelihood of environmental impact. ESLs are conservative screening-level criteria for soil and groundwater, designed to be generally protective of both drinking water resources and aquatic environments; they incorporate both environmental and human health risk considerations. ESLs are not cleanup criteria (i.e., health-based numerical values or disposal-based values). Rather, they are used as a preliminary guide in determining whether additional remediation and/or investigation may be warranted. Exceedance of ESLs suggests that additional investigation and/or remediation is warranted.

Different ESLs are published for commercial/industrial vs. residential land use, for sites where groundwater is a potential drinking water resource vs. is not a drinking water resource, and the type of receiving water body. A Water Board-published map of the East Bay shows areas where groundwater is, and is not, a potential drinking water resource.

In our professional opinion, the appropriate ESLs for the subject site are based on the following:

- Residential land use (due to the residences adjoining the property) and commercial/industrial use (for the subject property itself). Note that, for both soil and groundwater contaminants, all ESLs for the site contaminants are the same for both residential and commercial/industrial land use.
- Groundwater is a potential drinking water resource. In our professional opinion, the appropriate ESLs for the subject site are *commercial/industrial land use* and *groundwater is a potential drinking water resource*. This is based on both the property zoning status (commercial/industrial) and the designation of this area of Oakland as “Zone A – Significant Drinking Water Resource (Water Board, 1999).
- The receiving body for groundwater discharge is an estuary (San Francisco Bay).

The State of California has also promulgated drinking water standards (Maximum Contaminant Levels [MCLs]) for some of the site contaminants. Drinking water standards may also be utilized by regulatory agencies to evaluate the potential risk associated with groundwater

contamination. For the site contaminants, MCLs are generally the same as the ESLs (except that there is no MCL for gasoline).

Once ESLs or drinking water standards are exceeded the need for, and/or type of additional investigative and corrective actions are generally driven by the potential risk associated with the contamination. Minimum regulatory criteria generally applied to fuel leak cases in groundwater include:

- The contaminant source has been removed, including reasonably accessible contaminated soils that pose a long-term impact to groundwater;
- The extent of residual contamination has been fully characterized to obtain sufficient lithologic and hydrogeologic understanding (generally referred to as a Site Conceptual Model);
- Groundwater wells have been installed and are monitored periodically to evaluate groundwater contaminant concentrations and hydrochemical trends;
- The stability of the contaminant plume has been evaluated to determine whether it is moving or increasing in concentration; and
- A determination has been made as to whether the residual contamination poses an unacceptable risk to sensitive receptors.

As stated above, ESLs are used as a preliminary guide in determining whether additional remediation or other action is warranted. Exceeding ESLs may warrant additional actions, such as monitoring plume stability to demonstrate no risk to sensitive receptors in the case of sites where drinking water is not threatened.

## **ANALYTICAL METHODS**

The initial site characterization documented contamination by the following LUFT-related constituents: gasoline; benzene toluene, ethyl benzene, and xylenes (BTEX); and methyl *tertiary*-butyl ether (MTBE). In addition, several other contaminants were analyzed (as required by Alameda County Environmental Health)—ethanol; fuel oxygenates (*tertiary*-butyl alcohol [TBA], di-isopropyl ether [DIPE], ethyl *tertiary*-butyl ether [ETBE], and *tertiary*-amyl methyl ether [TAME]); and lead scavengers (1,2-dichloroethane [EDC] and 1,2-dibromoethane [EDB]). Fuel oxygenates and lead scavengers were analyzed in monitoring wells for which there were no data, or in those that showed previous laboratory detectable concentrations for these constituents.

Groundwater samples were analyzed using the following methods for:

- Total volatile hydrocarbons (TVH) gasoline range by EPA Method 8015M;
- BTEX and MTBE by EPA Method 8260;

- TBA, DIPE, ETBE, and TAME by EPA Method 8260B (in accordance with Alameda County Environmental Health requirement); and
- EDC and EDB by EPA Method 8260B (in accordance with Alameda County Environmental Health requirement).

All groundwater samples were analyzed by Curtis & Tompkins, Ltd. (Berkeley, California) which maintains current ELAP certifications for all the analytical methods utilized in this investigation.

## **QUALITY CONTROL SAMPLE ANALYTICAL RESULTS**

Laboratory quality control (QC) samples (e.g., method blanks, matrix spikes, surrogate spikes) were analyzed by the laboratory in accordance with requirements of each analytical method. All laboratory QC sample results and sample holding times were within the acceptance limits of the methods (see Appendix C).

## **ANALYTICAL RESULTS AND DISTRIBUTION OF CONTAMINANTS**

Tables 2 and 3 summarize the groundwater monitoring analytical results for TVHg, and associated constituents. Table 3 presents the analytic results of the fuel oxygenates and lead scavengers analysis. The certified analytical results and chain of custody record are contained in Appendix C. Historical analytical results are contained in Appendix E.

### **Groundwater Analytical Results**

TVH as gasoline was detected above the ESL of 100 micrograms per liter ( $\mu\text{g/L}$ ) in monitoring wells MW-1A, MW-1B, MW-2B, MW-3B, MW-4B, and MW-5B. TVH as gasoline was also detected in monitoring well MW-2A, but below the ESL. No other monitoring wells had detections of TVH as gasoline above the laboratory detection limit. Benzene was detected in MW-1A at  $1.0 \mu\text{g/L}$ , which is equal to the ESL. Benzene was not detected in any of the other monitoring wells above the laboratory detection limit. MTBE was detected above its ESL of  $5.0 \mu\text{g/L}$  in wells MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, MW-4A, and MW-5B. MTBE was not detected above the laboratory detection limit in any of the other monitoring wells. Total xylenes were not detected above the laboratory detection limit in any of the monitoring wells, except for MW-2A ( $0.72 \mu\text{g/L}$ ), which is below the ESL of  $20 \mu\text{g/L}$ . Toluene and ethyl benzene were not detected above the laboratory detection limit in any of the monitoring wells.

The lead scavenger 1,2-dichloroethane was detected above the ESL of  $0.5 \mu\text{g/L}$  in wells MW-1B ( $5.4 \mu\text{g/L}$ ), MW-2B ( $1.3 \mu\text{g/L}$ ), and MW-3A ( $0.8 \mu\text{g/L}$ ). Tertiary-amyl methyl ether (TAME) was detected in MW-1A and MW-5B; however, there is no published ESL for this constituent.



None of the other lead scavengers analyzed for were detected above the laboratory detection limits in any of the other groundwater monitoring wells.

Figure 4 shows an isoconcentration contour map of TVH as gasoline concentrations in groundwater based on the July 2008 monitoring well analytical results. The plume geometry indicates a west-by-northwest migrational pattern, which is in line with general groundwater flow direction in this area.

In general, contaminant concentrations have decreased since the Q2-2008 sampling event. Concentrations in monitoring wells MW-2B and MW-5B have increased slightly, but are below the concentrations observed during the same quarter in 2007. This is most notable in MW-5, located in the former source area, which had a concentration of TVH as gasoline of 2,000 µg/L in the Q3 2007 event, but was observed to be 310 µg/L during this Q3 2008 event.

**Table 2**  
**Groundwater Sample Analytical Results – July 7, 2008**  
**TVHg, BTEX, and MTBE,**  
**2836 Union Street, Oakland, California**

Sample	TVHg	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
<b>Monitoring Wells</b>						
MW-1A	<b>120</b>	<b>1.0</b>	<0.5	<0.5	<0.5	<b>86</b>
MW-1B	<b>300</b>	<0.5	<0.5	<0.5	<0.5	<b>8.4</b>
MW-2A	97	<0.5	<0.5	<0.5	<0.5	<b>5.5</b>
MW-2B	<b>570</b>	<0.5	<0.5	<0.5	0.72	<b>17</b>
MW-3A	<50	<0.5	<0.5	<0.5	<0.5	<b>56</b>
MW-3B	<b>1,700</b>	<0.5	<0.5	<0.5	<0.5	<2.0
MW-4A	<50	<0.5	<0.5	<0.5	<0.5	<b>46</b>
MW-4B	<b>1,200</b>	<0.5	<0.5	<0.5	<0.5	<2.0
MW-5B	<b>310</b>	<0.5	<0.5	<0.5	<0.5	<b>68</b>
<b>Groundwater ESLs</b>	100 / 210	1.0 / 46	40 / 130	30 / 43	20 / 100	5 / 1,800

Notes:

ESLs = Water Board Environmental Screening Levels for commercial/industrial sites where groundwater *is/is not* a potential drinking water resource (Water Board, 2008). Sample concentrations in **bold-face** type exceed the ESL criterion where groundwater is a potential resource.

MTBE = methyl tertiary-butyl ether

TVHg = total volatile hydrocarbons as gasoline

NA = not analyzed for this constituent; NS = not sampled, insufficient sample amount

All concentrations are in micrograms per liter (µg/L).

**Table 3**  
**Groundwater Sample Analytical Results – July 7, 2008**  
**Lead Scavengers and Fuel Oxygenates,**  
**2836 Union Street, Oakland, California**

Sample I.D.	EDC	EDB	ETBE	DIPE	TAME	TBA
<b>Groundwater Analyses (µg/L)</b>						
MW-1A	<0.5	<0.5	<0.5	<0.5	0.6	<10
MW-1B	<b>5.4</b>	<0.5	<0.5	<0.5	<0.5	<10
MW-2A	<0.5	<0.5	<0.5	<0.5	<0.5	<10
MW-2B	<b>1.3</b>	<0.5	<0.5	<0.5	<0.5	<10
MW-3A	<b>0.8</b>	<0.5	<0.5	<0.5	<0.5	<10
MW-3B	<6.3	<6.3	<6.3	<6.3	<6.3	<130
MW-4A	<0.5	<0.5	<0.5	<0.5	<0.5	<10
MW-4B	<4.2	<4.2	<4.2	<4.2	<4.2	<83
MW-5B	<0.5	<0.5	<0.5	<0.5	3.3	<10
<b>Groundwater ESLs</b>	0.5 / 690	0.05 / 510	NLP	NLP	NLP	12/ 18,000

Notes:

ESLs = Water Board Environmental Screening Levels for residential sites where groundwater *is/is not* considered a potential drinking water resource. (Water Board, 2007).

Sample concentrations in **bold-face** type exceed the ESL criterion where groundwater is considered a potential drinking water resource.

EDB = ethylene dibromide (1,2-dibromoethane)

EDC = ethylene dichloride (1,2-dichloroethane).

ETBE = ethyl tertiary-butyl ether

DIPE = isopropyl ether

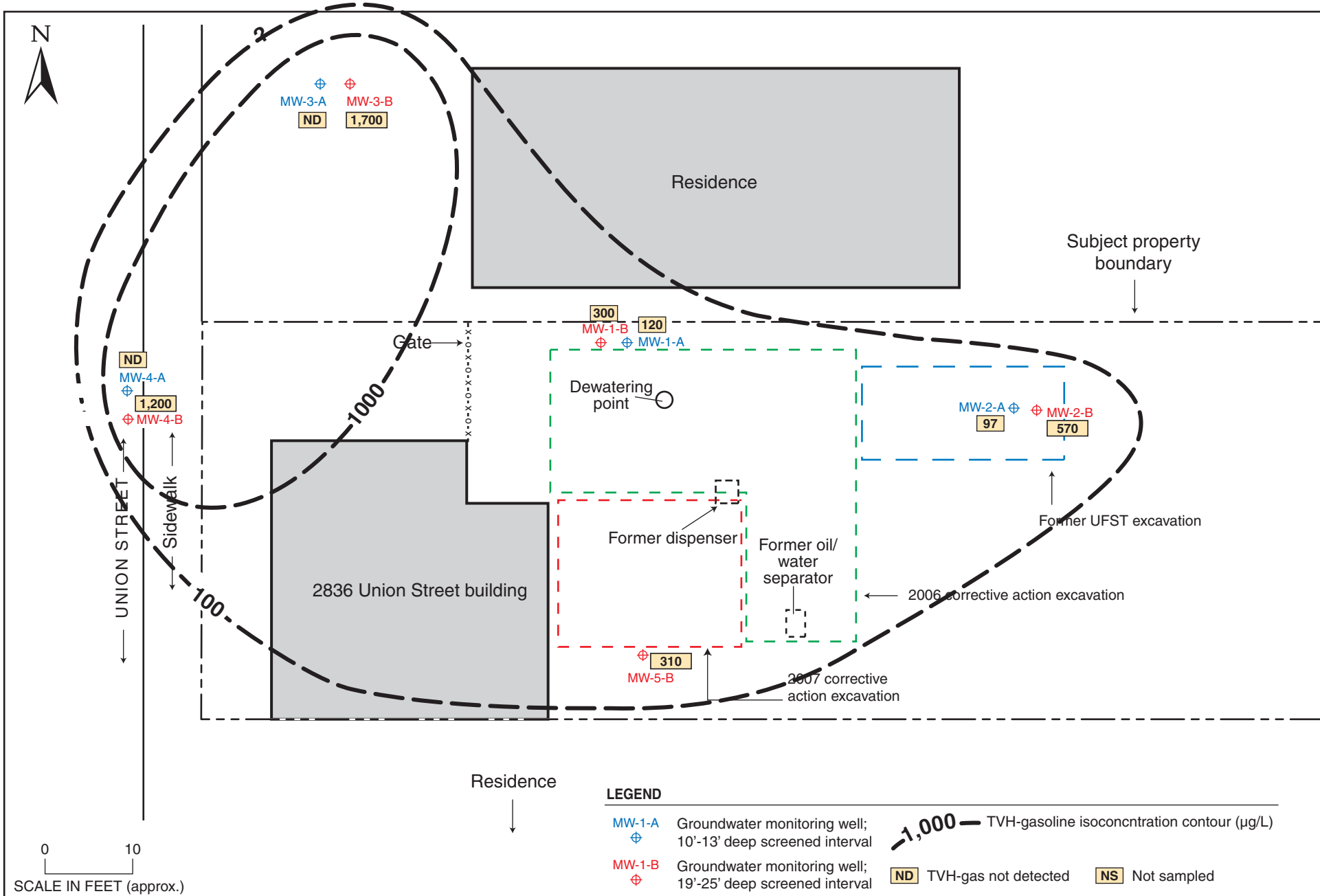
TAME = tertiary-amyl methyl ether

TBA = tertiary-butyl alcohol

NA = not analyzed for this constituent

NS = not sampled

NLP = no level published



**TVH-GASOLINE PLUME — JULY 7, 2008**  
**2836 Union Street, Oakland, CA**

**Figure 4**

by: MJC

JULY 2008

## **5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

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### **SUMMARY AND CONCLUSIONS**

- One 10,000-gallon gasoline UFST was installed in the late 1970s. The UFST operated under an Alameda County Environmental Health permit until its removal in 1998.
- A preliminary investigation was conducted in August 2005, additional site characterization investigations were conducted in October 2005 and April 2006, and corrective action entailing contaminated soil excavation and the installation of ten monitoring wells was conducted in September to October 2006. The remaining accessible contaminated soil was removed in November 2007 from beneath the former garage building, and the excavation area was treated with ORC® product. The November 2007 corrective action also entailed destruction by excavation of monitoring well MW-5A.
- The primary source (UFST) and secondary source (contaminated soil) have been remediated by excavation. All known accessible residual contaminated soil has been excavated from this site. Residual TVH as gasoline soil contamination (790 to 270 mg/kg) above regulatory ESLs was documented during the October 2006 corrective action along the northern property boundary, but is inaccessible for removal over the property line.
- The subject property groundwater gradient ranged from approximately 0.008 feet/foot on the western side of the property to 0.001 feet/foot on the eastern side of the property.
- Decreases in TVH as gasoline were most pronounced in well MW-5B during this event, which was reported at 2,000 µg/L in the Q3-2007 monitoring event versus 310 µg/L in the Q3-2008 monitoring event. Dissolved gasoline concentration reductions as compared to the previous Q2-2007 event were observed in MW 1-A, MW-1B, MW-2A, and MW-4B. Concentrations in both MW-3A and MW-4A were below the laboratory detection limit. The reduction in dissolved gasoline concentrations is attributed to the additional contaminated soil removal in the area of well MW-5.
- TVH as gasoline was detected above the ESL in monitoring wells MW-1A, MW-1B, MW-2B, MW-3B, MW-4B, and MW-5B. TVH as gasoline was also detected in monitoring well MW-2A, but below the ESL.

- Benzene was detected in MW-1A at 1.0 µg/L, which is equal to the ESL, but was below the detection limit in all other monitoring wells.
- MTBE was detected above the ESL in wells MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, MW-4A, and MW-5B. MTBE was not detected above the laboratory detection limit in any of the other monitoring wells.
- Total xylenes were not detected above the laboratory detection limit in any of the monitoring wells except MW-2A, which was below the ESL.
- Toluene and ethyl benzene were not detected above the laboratory detection limit in any of the monitoring wells.
- The lead scavenger 1,2-dichloroethane was detected above the ESL in wells MW-1B, MW-2B, and MW-3A. Tertiary-amyl methyl ether was detected in MW-1A and MW-5B; however, there is no published ESL for this constituent.
- Slight reductions in the TVH as gasoline concentration were observed in monitoring wells MW-1B, MW-2A, MW-3B, and MW-4B. Slight increases were observed in MW-2B and MW-5B; however, the concentrations were significantly below the concentrations observed during the Q3-2007 sampling event.
- The groundwater contaminate plume has not been fully delineated, but appears to be in elliptical configuration with its long axis trending east by west-northwest.

## RECOMMENDATIONS

- We recommend following up with Alameda County Environmental Health following its receipt of this report, to discuss the requirements to move the site toward regulatory closure. We further recommend that the Alameda County Environmental Health-requested work be implemented, and that all future technical reports be provided to the appropriate regulatory agencies, including electronic uploads to Alameda County Environmental Health's "ftp" system and the State Water Board's GeoTracker system.
- A replacement for Mr. Barney Chan, the former case officer for Alameda County Environmental Health, needs to be assigned to the case.
- SES does not feel the need for an additional dewatering episode at this time. While concentrations in the offsite wells MW-3B and MW-4B have increased slightly as compared to the Q3-2007 sampling event (between 200 and 500 µg/L), data collected from previous dewatering events indicated these wells aren't significantly affected by dewatering. In addition, more time is needed to determine the extent that oxygen reducing compound (ORC) applied in November 2007 may affect the concentrations in these wells. If future sampling events indicate a dramatic increase in contaminant concentrations, application of additional ORC may be considered.

- SES recommends changing the sampling frequency from quarterly to semi-annually at the completion of the quarter four 2008 sampling event. Over two years of data has been collected, and an accurate representation of the plume concentration fluctuations has been obtained.
- In our professional opinion, semi-annual groundwater monitoring is the appropriate action to further evaluate the magnitude and stability of the contaminant plume over time, and to determine whether site closure criteria can be met.
- Reimbursement requests should continue to be submitted under the State of California Petroleum UST Cleanup Fund.

## 6.0 REFERENCES

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- Stellar Environmental Solutions, Inc. (SES), 2008b. Second Quarter 2008 Groundwater Monitoring Report – 2836 Union Street, Oakland, California. April 25.



## **7.0 LIMITATIONS**

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This report has been prepared for the exclusive use by the Estate of Mr. Lawrence Wadler (subject property owner), the regulatory agencies, and their authorized assigns and/or representatives. No reliance on this report shall be made by anyone other than those for whom it was prepared.

The findings and conclusions presented in this report are based solely on the findings of the investigations discussed herein. This report has been prepared in accordance with generally accepted methodologies and standards of practice of the area. The personnel performing this assessment are qualified to perform such investigations and have accurately reported the information available, but cannot attest to the validity of that information. No warranty, expressed or implied, is made as to the findings, conclusions, and recommendations included in the report.

**APPENDIX A**

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**GROUNDWATER MONITORING AND  
SAMPLING FIELD REPORT**



# WELL GAUGING DATA

Project # 080707-BD1 Date 7/7/08 Client Stellar ENV

Site 2836 Union St OAKLAND CA

Well ID	Time	Well Size (in.)	Sheen / Odor	Depth to Immiscible Liquid (ft.)	Thickness of Immiscible Liquid (ft.)	Volume of Immiscibles Removed (ml)	Depth to water (ft.)	Depth to well bottom (ft.)	Survey Point: TOB or <u>TOC</u>	Notes
MW-4A	0850	3/4	-				6.30	12.15	↓	
MW-2A	0855	3/4	-				7.70	12.60		
MW-1B	0900	3/4	-				7.62	22.45		
MW-1A	0905	3/4	-				8.25	12.50		
MW-4B	0910	3/4	-				6.70	24.29		
MW-3B	0915	3/4	-				7.50	25.00		
MW-2B	0920	3/4	-				7.78	24.60		
MW-5B	0925	3/4	-				7.64	25.30		
MW-3A	0930	3/4	-				6.73	12.93		



## WELL MONITORING DATA SHEET

Project #: <u>080707-BD1</u>	Client: <u>Stellar Env</u>
Sampler: <u>BD</u>	Date: <u>7/7/08</u>
Well I.D.: <u>MW-1A</u>	Well Diameter: 2 3 4 6 8 <u>3/4</u>
Total Well Depth (TD): <u>12.50</u>	Depth to Water (DTW): <u>8.25</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>PVO</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: <u>9.10</u>	

Purge Method: Bailer	Waterra	Sampling Method: Bailer
Disposable Bailer	<input checked="" type="checkbox"/> Peristaltic	Disposable Bailer
Positive Air Displacement	Extraction Pump	Extraction Port
Electric Submersible	Other: _____	<input checked="" type="checkbox"/> Dedicated Tubing
		Other: _____

$321 \text{ mL (Gals.)} \times 4 = 1284 \text{ mL Gals.}$ I Case Volume      Specified Volumes      Calculated Volume	<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius<sup>2</sup> * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius <sup>2</sup> * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius <sup>2</sup> * 0.163														

Time	Temp ( <input checked="" type="checkbox"/> or °C)	pH	Cond. (mS or <input checked="" type="checkbox"/> )	Turbidity (NTUs)	mL Gals. Removed	Observations
<u>1040</u>	<u>75.5</u>	<u>7.21</u>	<u>1141</u>	<u>35</u>	<u>321 mL</u>	<u>clear</u>
						<u>DTW</u>
						<u>* WELL DEWATERED @ ~ 490 mL *</u>
<u>1600</u>	<u>69.0</u>	<u>7.04</u>	<u>1303</u>	<u>179</u>	<u>-</u>	<u>Grey</u>

Did well dewater?  Yes    No      Gallons actually evacuated: 490 mL

Sampling Date: 7/7/08    Sampling Time: 1600    Depth to Water: 19.70

Sample I.D.: MW-1A      Laboratory: Kiff    CalScience    Other: CAT

Analyzed for: TPH-G    BTEX    MTBE    TPH-D    Oxygenates (5)    Other: SEE COL

EB I.D. (if applicable): @ \_\_\_\_\_ Time      Duplicate I.D. (if applicable):

Analyzed for: TPH-G    BTEX    MTBE    TPH-D    Oxygenates (5)    Other:

D.O. (if req'd):	Pre-purge:	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	Pre-purge:	mV	Post-purge:	mV



## WELL MONITORING DATA SHEET

Project #: <u>080307-BD1</u>	Client: <u>Stellar ENV</u>
Sampler: <u>BD</u>	Date: <u>7/7/08</u>
Well I.D.: <u>MW-2A</u>	Well Diameter: 2 3 4 6 8 <u>3/4</u>
Total Well Depth (TD): <u>12.60</u>	Depth to Water (DTW): <u>7.70</u>
Depth to Free Product: <u>-</u>	Thickness of Free Product (feet): <u>-</u>
Referenced to: <u>PVO</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: <u>8.68</u>	

Purge Method: Bailer	Watertra	Sampling Method: Bailer
<input checked="" type="checkbox"/> Disposable Bailer <u>1/2</u>	Peristaltic	<input checked="" type="checkbox"/> Disposable Bailer <u>1/2</u>
Positive Air Displacement	Extraction Pump	Extraction Port
Electric Submersible	Other _____	Dedicated Tubing
		Other: _____

<u>371</u> <sup>ML</sup> (Gals.) X	<u>4</u>	= <u>1484</u> <sup>ML</sup> Gals.
1 Case Volume	Specified Volumes	Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius <sup>2</sup> * 0.163

Time	Temp ( <del>F</del> or °C)	pH	Cond. (mS or <del>µS</del> )	Turbidity (NTUs)	<del>ml</del> Gals. Removed	Observations
<u>0955</u>	<u>70.3</u>	<u>7.14</u>	<u>886</u>	<u>&gt;1000</u>	<u>371ml</u>	<u>DARK</u> <u>Grey</u>
<u>0959</u>	<u>70.4</u>	<u>6.96</u>	<u>972</u>	<u>&gt;1000</u>	<u>742ml</u>	↓
<u>1003</u>	<u>70.1</u>	<u>7.02</u>	<u>982</u>	<u>&gt;1000</u>	<u>1113ml</u>	
<u>1007</u>	<u>70.1</u>	<u>7.05</u>	<u>986</u>	<u>&gt;1000</u>	<u>1484ml</u>	

Did well dewater? Yes  No  Gallons actually evacuated: 1484ml

Sampling Date: 7/7/08 Sampling Time: 1018 Depth to Water: 7.80

Sample I.D.: MW-2A Laboratory: Kiff CalScience Other CFT

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other: SEE COC

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	Pre-purge:	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	Pre-purge:	mV	Post-purge:	mV





## WELL MONITORING DATA SHEET

Project #: <u>080707-BD1</u>	Client: <u>Stellar Env</u>
Sampler: <u>BD</u>	Date: <u>7/7/08</u>
Well I.D.: <u>MW-3A</u>	Well Diameter: 2 3 4 6 8 <u>3/4</u>
Total Well Depth (TD): <u>12.93</u>	Depth to Water (DTW): <u>6.73</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>PVC</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: <u>7.97</u>	

Purge Method: Bailer	Watrera	Sampling Method: Bailer
Disposable Bailer	<input checked="" type="checkbox"/> Peristaltic	Disposable Bailer
Positive Air Displacement	Extraction Pump	Extraction Port
Electric Submersible	Other _____	<input checked="" type="checkbox"/> Dedicated Tubing
		Other: _____

<u>469</u> <sup>ml</sup> (Gals.) X <u>4</u>	=	<u>1876</u> <sup>ml</sup> Gals.
1 Case Volume	Specified Volumes	Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65 <u>.02</u>
2"	0.16	6"	1.47
3"	0.37	Other	radius <sup>2</sup> * 0.163

Time	Temp ( $\text{D}$ or $^{\circ}\text{C}$ )	pH	Cond. (mS or $\mu\text{S}$ )	Turbidity (NTUs)	Gals. Removed	Observations
<u>1110</u>	<u>* WELL DEWATERED @ ~301ml *</u>					<u>DTW 12.90</u>
<u>1630</u>	<u>77.9</u>	<u>6.99</u>	<u>1450</u>	<u>40</u>	<u>-</u>	<u>clear</u>

Did well dewater?  Yes No      Gallons actually evacuated: ~301ml

Sampling Date: 7/7/08      Sampling Time: 1630      Depth to Water:

Sample I.D.: MW-3A      Laboratory: Kiff CalScience Other CFT

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other: see COC

EB I.D. (if applicable): @ \_\_\_\_\_ Time      Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	Pre-purge:	mg/L	Post-purge:	mg/L
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O.R.P. (if req'd):	Pre-purge:	mV	Post-purge:	mV
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## WELL MONITORING DATA SHEET

Project #: <u>080302-BD1</u>	Client: <u>Stellar Env.</u>
Sampler: <u>BD</u>	Date: <u>7/7/08</u>
Well I.D.: <u>MW-5B</u>	Well Diameter: 2 3 4 6 8 <u>3/4</u>
Total Well Depth (TD): <u>25.30</u>	Depth to Water (DTW): <u>7.64</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>PVO</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: <u>11.17</u>	

Purge Method: Bailer	Water: Waterra	Sampling Method: Bailer
Disposable Bailer	Peristaltic	Disposable Bailer
Positive Air Displacement	<input checked="" type="checkbox"/> Extraction Pump	Extraction Port
Electric Submersible	Other _____	<input checked="" type="checkbox"/> Dedicated Tubing
		Other: _____

$\frac{1336 \text{ mL}}{\text{Case Volume}} \times \frac{4}{\text{Specified Volumes}} = \frac{5344 \text{ mL}}{\text{Calculated Volume}}$	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius<sup>2</sup> * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius <sup>2</sup> * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius <sup>2</sup> * 0.163														

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	ml Gals. Removed	Observations
1450	70.3	7.13	1071	41	1336 mL	<del>30</del> Grey / odor
1454	67.7	6.80	1064	17	2672 mL	clear / odor
1458	68.2	6.79	1058	12	4008 mL	↓
1502	67.8	6.76	1052	12	5344 mL	

Did well dewater? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Gallons actually evacuated: <u>5344 mL</u>
Sampling Date: <u>7/7/08</u> Sampling Time: <u>1516</u> Depth to Water: <u>8.83</u>	
Sample I.D.: <u>MW-5B</u> Laboratory: Kiff CalScience Other <u>CFT</u>	
Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other: <u>see coc</u>	
EB I.D. (if applicable): @ _____ Time Duplicate I.D. (if applicable):	
Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:	
D.O. (if req'd): Pre-purge: _____ mg/L Post-purge: _____ mg/L	
O.R.P. (if req'd): Pre-purge: _____ mV Post-purge: _____ mV	

# H or Purge Water Drum L

Client: STELLAR ENV.

Site Address: 2836 UNION ST., OAKLAND

## STATUS OF DRUM(S) UPON ARRIVAL

Date	4/10/08	7/7/08				
Number of drum(s) empty:	1	1				
Number of drum(s) 1/4 full:	1	1				
Number of drum(s) 1/2 full:	1	1				
Number of drum(s) 3/4 full:						
Number of drum(s) full:	1	1				
Total drum(s) on site:	4	4				
Are the drum(s) properly labeled?	Y					
Drum ID & Contents:	purge H <sub>2</sub> O	soil, Purge H <sub>2</sub> O / Tools				
If any drum(s) are partially or totally filled, what is the first use date:	—	—				

- If you add any SPH to an empty or partially filled drum, drum must have at least 20 gals. of Purgewater or DI Water.

-If drum contains SPH, the drum MUST be steel AND labeled with the appropriate label.

-All BTS drums MUST be labeled appropriately.

## STATUS OF DRUM(S) UPON DEPARTURE

Date	4/10/08					
Number of drums empty:	1	2				
Number of drum(s) 1/4 full:	1	2				
Number of drum(s) 1/2 full:	1	1				
Number of drum(s) 3/4 full:		2				
Number of drum(s) full:	1	1				
Total drum(s) on site:	4	4				
Are the drum(s) properly labeled?	Y	Yes				
Drum ID & Contents:	purge H <sub>2</sub> O	soil, Purge H <sub>2</sub> O Tools				

## LOCATION OF DRUM(S)

Describe location of drum(s): ALONG THE SOUTH FENCE BEHIND THE BUILDING

Drums w/ soil & Tools not secure

## FINAL STATUS

Number of new drum(s) left on site this event	0	0				
Date of inspection:	4/10/08	7/7/08				
Drum(s) labelled properly:	Y	Y				
Logged by BTS Field Tech:	IW	BD				
Office reviewed by:	<i>[Signature]</i>	<i>[Signature]</i>				

## **APPENDIX B**

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# **SES GROUNDWATER STANDARD SAMPLING PROTOCOLS**



## **APPENDIX B**

### **SES GROUNDWATER STANDARD SAMPLING PROTOCOLS**

#### **SAMPLING AND ANALYSIS PERSONNEL**

Sampling and analysis is conducted by Blaine Tech Services, a subcontractor to SES, which uses appropriately trained personnel to perform the water level measurements, sampling, and analyses of key natural attenuation indicators.

#### **SUMMARY OF SAMPLING PROCEDURES**

Activities that will occur during groundwater sampling are summarized as follows:

- Pre-arrangement with testing laboratory
- Assembly and preparation of equipment and supplies
- Groundwater sampling
  - water-level measurements
  - immiscible material measurements (with an interface probe, if applicable)
  - visual inspection of borehole water
  - well bore evacuation
  - sampling
- Sample preservation and shipment
  - sample preparation
  - onsite measurement of parameters using direct read instruments
  - sample labeling
- Completion of sample records
- Completion of chain-of-custody records
- Samples placed in chilled cooler
- Sample shipment

Detailed sampling and analysis procedures are presented in the following sections.

## **ARRANGEMENTS WITH ANALYTICAL LABORATORY**

Prior to sampling, arrangements will be made with an analytical laboratory to conduct the sample analyses. Samples will be analyzed by Curtis and Tompkins, Ltd. (C&T), an analytical laboratory in Berkeley, California. C&T has the required Department of Toxic Substances Control (DTSC) certification to perform the analyses, and will provide a sufficient number of sample containers for the wells to be sampled and the blanks to be included. C&T will determine the proper type and size for the containers based on the analyses requested. For samples requiring chemical preservation, preservatives will be added to containers by the C&T prior to shipping containers to the facility. Shipping containers (ice chests with adequate container padding) will be sent to the facility with the sample containers.

## **PREPARATION FOR SAMPLING**

Prior to the sampling episode, equipment to be used will be assembled and its operating condition verified, calibrated (if required), and properly cleaned (if required). In addition, all record-keeping materials will be prepared.

### **Equipment Calibration**

Where appropriate, equipment will be calibrated according to the manufacturer's specifications prior to field use. This applies to the equipment for making onsite chemical measurements of pH, conductivity, water temperature, and photoionization detector (PID).

### **Equipment Cleaning**

Portions of sampling and test equipment that will come into contact with the sample will be thoroughly cleaned before use. Such equipment includes water-level probe, bailers, lifting line, and other equipment or portions thereof that may be immersed. The procedure for cleaning non-dedicated equipment is as follows:

- Clean with potable water and phosphate-free detergent;
- Rinse with potable water;
- Rinse with distilled or deionized water; and
- Air dry the equipment prior to use.

Any deviations from these procedures will be documented in the permanent record of the sampling event.

Laboratory-supplied sample containers will be cleaned and sealed by the laboratory before shipping. The type of container provided and the method of container cleaning should be in the laboratory's permanent record of the sampling event.

Sampling equipment to be disposed of after use will be cleaned with potable water and phosphate-free detergent before disposal as solid waste. Rinse water will be stored in properly labeled 55-gallon drums for proper disposal, pending receipt of laboratory results of groundwater and soil sample analyses with assistance from SES.

## **SAMPLING PROCEDURES**

Special care will be exercised to prevent contamination of the groundwater and extracted samples during the sampling activities. Contamination of a sample can occur through contact with improperly cleaned equipment. Cross-contamination of the groundwater can occur through insufficient cleaning of equipment between wells. Pre-cleaned disposable sampling equipment will be rinsed with distilled water prior to use. Sampling equipment and sample containers will be thoroughly cleaned before and after field use and between uses at different sampling locations according to the procedures discussed above. In addition to the use of properly cleaned equipment, two further precautions will be taken:

- A new pair of clean, disposable latex (or similar) gloves will be worn each time a different well is sampled.
- Sample collection activities will progress from the least affected (upgradient) area to the most affected (downgradient) area. Wells described as “background” or “upgradient” wells will be sampled first.

The following paragraphs present procedures for the several activities that comprise groundwater sample acquisition. These activities will be performed in the same order as presented below. Exceptions to this procedure will be noted in the permanent sampling record.

### **Preparation of Location**

Prior to starting the sampling procedure, the area around the well will be cleared of foreign materials, such as brush, rocks, debris, etc. A clean (new) disposable plastic sheet will be placed around the well casing so that the sheet is flat on the ground. The sheet will be placed such that the flush-mount well projects through the center of the sheet. This preparation will prevent sampling equipment from inadvertently contacting the ground or exterior parts of the well.

### **Water-Level Measurement**

The first sampling operation is water-level measurement. An electrical probe or a weighted tape will be used to measure the depth to groundwater below the datum to the nearest 0.01 foot. The datum, usually the top of the inner casing (inside and below the protective steel cover), will be described in the monitoring well records. A permanent mark or scribe will be marked on the inner casing.

If the wells to be sampled are closely spaced, the water levels at all of the closely-spaced wells will be measured before any of the wells are evacuated. The water-level probe or weighted tape will be cleaned with phosphate-free detergent in distilled water and with a distilled water rinse between usage at different wells.

### **Total Depth Measurement**

Once the water level and immiscible material thickness is measured and recorded, the water-level probe or weighted tape will be slowly lowered to the bottom of the well. The depth to the bottom will be measured and recorded. The probe or tape will then be slowly withdrawn from the well. The bottom of the probe or tape will be observed after withdrawal to determine any evidence of viscous, heavy contaminants. Descriptions (and measurements, if possible) of such materials will be made from observation of the probe or tape.

### **Visual Inspection of Well Water**

Prior to well evacuation, a small quantity of water will be removed with a bailer that is not completely immersed. The recovered sample is representative of the top of the water column in the well casing. If immiscible materials are present as measured by the interface probe at the top of the water column, this technique can allow their detection. The water will be observed for the presence of any floating films or other indications of immiscible materials. Any sample odors will be noted. Observations regarding odor or visual evidence of immiscible materials will be recorded in the sampling record.

The well water sample will be discarded unless the site-specific protocol calls for retention of this sample. The sample will be placed in a labeled container for proper disposal.

### **Well Bore Evacuation**

Water contained within and adjacent to the well casing can potentially reflect chemical interaction with the atmosphere (by diffusion of gases down the casing) or the well construction materials (through prolonged residence adjacent to the casing).

Observations of this water will be recorded during removal and prior to it being discarded. Onsite parameter measurements of the purged water, as described in this section, will indicate when water-quality parameters have stabilized, and also will be recorded.

The volume of water contained within the well bore at the time of sampling will be calculated, and 4 times the calculated water volume will be removed from the well and discarded. A bailer will be used for well evacuation. The volume of water to be evacuated will be calculated as follows:

Number of Bailers:

$$\text{Number of bailers} = 4 \times \frac{\text{Volume of water in well (Vw)}}{\text{Volume of bailer (Vb)}}$$

Volume of Water in Well:

$$V_w = \frac{3.142 \times d_w^2 \times L_w}{4}$$

where:  $V_w$  = water volume in well (ft<sup>3</sup>)  
 $d_w$  = inside diameter of well (ft)  
 $L_w$  = length of water column in well (ft)

Volume of Water in Full Bailer:

$$V_b = \frac{3.142 \times d_b^2 \times L_b}{4}$$

where:  $V_b$  = water volume in bailer (ft<sup>3</sup>)  
 $d_b$  = inside diameter of bailer (ft)  
 $L_b$  = length of bailer (ft)

Wells that can be evacuated to a dry state will be evacuated completely; samples will be taken as soon as sufficient water for sampling is present. Sample compositing—sampling over a lengthy period by accumulating small volumes of water at different times to eventually obtain a sample of sufficient volume—will not be conducted.

Water produced during well evacuation will be contained in a suitable container and temporarily stored onsite pending proper disposal.

Some chemical and physical parameters in water can change significantly within a short time of sample acquisition. The following parameters cannot be accurately measured in a laboratory located more than a few hours from the facility, and will be measured onsite with portable equipment:

- pH
- Specific conductance
- Temperature
- Turbidity units

These parameters will be measured in unfiltered, unpreserved, “fresh” water, using the same sampling technique as for laboratory analyses. The measurements will be made in a clean glass container separate from those intended for laboratory analyses. The tested sample will be discarded after use. The measured values will be recorded in the sampling record.

### **Natural Attenuation Field Measurements**

In addition to the meter reading above, following the indicators that groundwater has been purged sufficiently to represent water within the water bearing materials, natural attenuation parameters were measured by the Blaine Tech sampling personnel. These include meter readings for:

- Oxidation reduction potential;
- Dissolved oxygen; and
- Dissolved ferrous iron.

### **Sample Extraction**

Natural attenuation parameters are measured before the water is purged and sampled. Care will be taken during insertion of sampling equipment to prevent undue disturbance of water in the well.

The pump or bailer will be lowered into the water gently to prevent splashing, and extracted gently to prevent creation of an excessive vacuum in the well. The sample will be transferred directly into the appropriate container. While pouring water from a bailer, the water will be carefully poured down the inside of the sample bottle to prevent significant aeration of the sample. Unless other instructions are given by the analytical laboratory, the sample containers will be completely filled so that no air space remains in the container. Excess water taken during sampling will be placed in a container for proper disposal.

## **SAMPLE HANDLING**

### **Sample Preservation**

Water samples will be properly prepared for transportation to the laboratory by refrigeration and chemical preservation, as necessary. The laboratory providing sample containers will add any necessary chemical preservatives to the sealed containers provided prior to shipment.

### **Container and Labels**

Glass containers and appropriate container lids will be provided by the laboratory. The containers will be filled and container lids tightly closed. Sample container lids will be sealed so as to make obvious any seal tampered with or broken. The label will be firmly attached to the container side (rather than the lid). The following information will be written with permanent marker on the label:

- Facility name;
- Sample identification;
- Sample type (groundwater, surface water, etc.);
- Sampling date;
- Sampling time; and
- Preservatives added, and sample collector's initials.

### **Sample Shipment**

In most instances, the concentration and type of compounds present in the groundwater are considered by the U.S. Department of Transportation to be non-hazardous. Thus, the following packaging and labeling requirements for the sample materials are appropriate for shipping the sample to the testing laboratory:

- Package sample so that it does not leak, spill, or vaporize from its packaging
- Label package with:
  - sample collector's name, address, and telephone number
  - laboratory's name, address, and telephone number
  - description of sample
  - quantity of sample
  - date of shipment

To comply with packaging regulations and prevent damage to expensive groundwater samples, SES will follow packaging and shipping instructions supplied by the certified testing laboratory.

### **Chain-of-Custody Control**

After samples are obtained, chain-of-custody procedures will be followed to establish a written record concerning sample movement between the sampling site and the testing laboratory. Each shipping container will contain a chain-of-custody form to be completed by the sampling personnel packing the samples. The chain-of-custody form for each container will be completed in triplicate. One copy of this form will be maintained at the site; the other two copies will remain at the laboratory. One of the laboratory copies will become a part of the permanent record for the sample and will be returned with the sample analyses.

The record will contain the following minimum information:

- Collector's sample number
- Signature of collector
- Date and time of collection
- Place and address of collection
- Material type
- Preservatives added
- Analyses requested
- Signatures involved in the chain of possession
- Inclusive dates of possession

The shipping container will be sealed so as to make obvious any seal tampered with or broken. The chain-of-custody documentation will be placed inside the container so that it is immediately apparent to the laboratory personnel receiving the container, but could not be damaged or lost during shipping.

### **SAMPLING RECORDS**

To provide complete documentation of sampling, detailed records containing the following information will be maintained during sampling:

- Sample location (facility name)
- Sample identification (name and sample number)
- Sample location map or detailed sketch
- Date and time of sampling



- Sampling method
- Field observations of sample appearance and odor
- Weather conditions
- Samples identification
- Any other significant information

## **APPENDIX C**

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# **CERTIFIED ANALYTICAL LABORATORY REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION**

# Chain of Custody Record

204493

Lab job no. 080303-1301

Date 7/7/08

Page 1 of 1

Laboratory C&T  
 Address 2823 Fifth St  
Berkeley, CA

Method of Shipment Lab Pickup

Shipment No. \_\_\_\_\_

Airbill No. \_\_\_\_\_

Cooler No. \_\_\_\_\_

Project Owner Larry Uadler  
 Site Address 2836 Union St.  
Oakland, CA

Project Manager R. Makdisi

Telephone No. (510) 644-3123

Project Name USTCP CLAIM # 018639

Fax No. (510) 644-3859

Project Number 2005-65

Samplers: (Signature) \_\_\_\_\_

Field Sample Number	Location/Depth	Date	Time	Sample Type	Type/Size of Container	Preservation		Analysis Required				Remarks	
						Cooler	Chemical	Filtered	No. of Containers	TPH-5/RTX/MTR by 8015G	OM-5(5) by 8260F		EDC/EDR by 8260F
1	MW-2A	7/7/08	1018	W	2 40ml HCL VOA'S	X	HCl	6	X	X	X		
2	MW-1A		1600		40ml VOA'S w/HCL			6					
3	MW-1B		1442					6					
4	MW-2B		1540					6					
5	MW-3A		1630					3					
6	MW-3B		1204					6					
7	MW-4A		1618					5					
8	MW-4B		1234					6					
9	MW-5B		1516					6					

Relinquished by: [Signature]  
 Signature \_\_\_\_\_  
 Printed BRANDON DOSTEN  
 Company BTS

Date 7/7/08  
 Received by: [Signature]  
 Signature \_\_\_\_\_  
 Printed B. DOSTEN  
Sampler  
 Company BTS

Date 7/7/08  
 Relinquished by: [Signature]  
 Signature \_\_\_\_\_  
 Printed Pete Cornish  
 Company BTS

Date 7/7/08  
 Received by: [Signature]  
 Signature \_\_\_\_\_  
 Printed ALAN CRONIN  
 Company C&T

Date 7/7/08  
 Time 1400

Turnaround Time: STANDARD TAT  
 Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

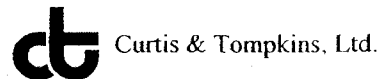
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 Company \_\_\_\_\_

Date \_\_\_\_\_  
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 Signature \_\_\_\_\_  
 Printed \_\_\_\_\_  
 Company \_\_\_\_\_

Date \_\_\_\_\_  
 Time \_\_\_\_\_

2000-00-01

COOLER RECEIPT CHECKLIST



Login # 204493 Date Received 7-9-08 Number of coolers 1
Client SES Project OSTCF Claim # 018639

Date Opened 7-9-08 By (print) F Nichols (sign) [Signature]
Date Logged in [initials] By (print) [initials] (sign) [initials]

1. Did cooler come with a shipping slip (airbill, etc)?..... YES NO
Shipping info \_\_\_\_\_

2A. Were custody seals present? .... YES (circle) on cooler on samples NO
How many \_\_\_\_\_ Name \_\_\_\_\_ Date \_\_\_\_\_

2B. Were custody seals intact upon arrival? ..... YES NO N/A

3. Were custody papers dry and intact when received?..... YES NO

4. Were custody papers filled out properly (ink, signed, etc)?..... YES NO

5. Is the project identifiable from custody papers? (If so fill out top of form)..... YES NO

6. Indicate the packing in cooler: (if other, describe)
Bubble Wrap Foam blocks Bags None
Cloth material Cardboard Styrofoam Paper towels

7. If required, was sufficient ice used? Samples should be < or = 6°C ..... YES NO N/A

Type of ice used: Wet Blue None Temp(°C) \_\_\_\_\_

Samples Received on ice & cold without a temperature blank

Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? ..... YES NO
If YES, what time were they transferred to freezer? \_\_\_\_\_

9. Did all bottles arrive unbroken/unopened?..... YES NO

10. Are samples in the appropriate containers for indicated tests? ..... YES NO

11. Are sample labels present, in good condition and complete? ..... YES NO

12. Do the sample labels agree with custody papers? ..... YES NO

13. Was sufficient amount of sample sent for tests requested? ..... YES NO

14. Are the samples appropriately preserved? ..... YES NO N/A

15. Are bubbles > 6mm absent in VOA samples?..... YES NO N/A

16. Was the client contacted concerning this sample delivery?..... YES NO

If YES, Who was called? \_\_\_\_\_ By \_\_\_\_\_ Date: \_\_\_\_\_

COMMENTS

[Blank lines for comments]



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 204493
ANALYTICAL REPORT

Stellar Environmental Solutions
2198 6th Street
Berkeley, CA 94710

Project : 2005-65
Location : USTCF Claim #018639
Level : II

Table with 2 columns: Sample ID and Lab ID. Rows include MW-2A through MW-5B with corresponding Lab IDs from 204493-001 to 204493-009.

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signatures. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: [Handwritten Signature]
Project Manager

Date: 07/16/2008

Signature: [Handwritten Signature]
Senior Program Manager

Date: 07/16/2008

### CASE NARRATIVE

Laboratory number: 204493  
Client: Stellar Environmental Solutions  
Project: 2005-65  
Location: USTCF Claim #018639  
Request Date: 07/09/08  
Samples Received: 07/09/08

This hardcopy data package contains sample and QC results for nine water samples, requested for the above referenced project on 07/09/08. The samples were received cold and intact.

**TPH-Purgeables and/or BTXE by GC (EPA 8015B and EPA 8021B):**

High surrogate recoveries were observed for trifluorotoluene (PID) in MW-3B (lab # 204493-006) and MW-4B (lab # 204493-008), due to interference from coeluting hydrocarbon peaks; the corresponding bromofluorobenzene (PID) surrogate recoveries were within limits, and no target analytes were detected in these samples. No other analytical problems were encountered.

**Volatile Organics by GC/MS (EPA 8260B):**

No analytical problems were encountered.













## Batch QC Report

**Curtis & Tompkins Laboratories Analytical Report**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8021B
Matrix:	Water	Batch#:	140234
Units:	ug/L	Analyzed:	07/12/08
Diln Fac:	1.000		

Type: BS Lab ID: QC450474

Analyte	Spiked	Result	%REC	Limits
MTBE	10.00	10.69	107	70-129
Benzene	10.00	9.242	92	80-120
Toluene	10.00	10.27	103	80-120
Ethylbenzene	10.00	10.48	105	80-120
m,p-Xylenes	10.00	10.77	108	80-120
o-Xylene	10.00	11.25	113	80-120

Surrogate	%REC	Limits
Trifluorotoluene (PID)	92	60-146
Bromofluorobenzene (PID)	113	65-143

Type: BSD Lab ID: QC450475

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
MTBE	10.00	10.46	105	70-129	2	21
Benzene	10.00	9.063	91	80-120	2	20
Toluene	10.00	9.572	96	80-120	7	20
Ethylbenzene	10.00	9.378	94	80-120	11	20
m,p-Xylenes	10.00	9.910	99	80-120	8	20
o-Xylene	10.00	10.19	102	80-120	10	20

Surrogate	%REC	Limits
Trifluorotoluene (PID)	83	60-146
Bromofluorobenzene (PID)	104	65-143

RPD= Relative Percent Difference

## Batch QC Report

**Curtis & Tompkins Laboratories Analytical Report**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC450476	Batch#:	140234
Matrix:	Water	Analyzed:	07/12/08
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	1,000	1,027	103	80-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	122	69-140
Bromofluorobenzene (FID)	124	73-144

## Batch QC Report

**Curtis & Tompkins Laboratories Analytical Report**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8015B
Field ID:	MW-2A	Batch#:	140234
MSS Lab ID:	204493-001	Sampled:	07/07/08
Matrix:	Water	Received:	07/09/08
Units:	ug/L	Analyzed:	07/12/08
Diln Fac:	1.000		

Type: MS Lab ID: QC450477

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	97.03	2,000	1,766	83	67-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	135	69-140
Bromofluorobenzene (FID)	114	73-144

Type: MSD Lab ID: QC450478

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	2,000	1,737	82	67-120	2	20

Surrogate	%REC	Limits
Trifluorotoluene (FID)	138	69-140
Bromofluorobenzene (FID)	117	73-144

RPD= Relative Percent Difference



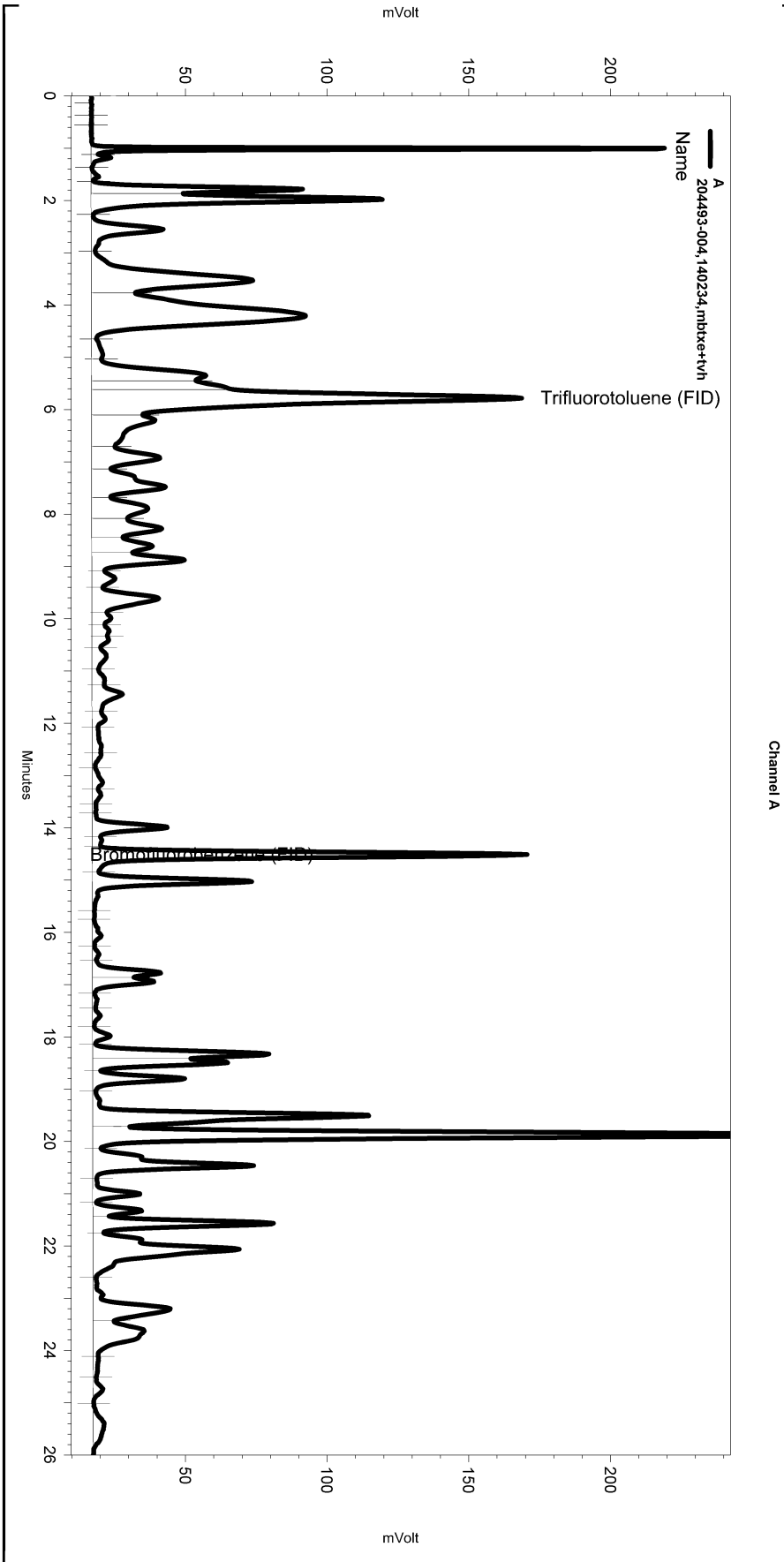






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 Sample Amount: 5 Multiplier: 5  
 Vial & pH or Core ID: c1.3



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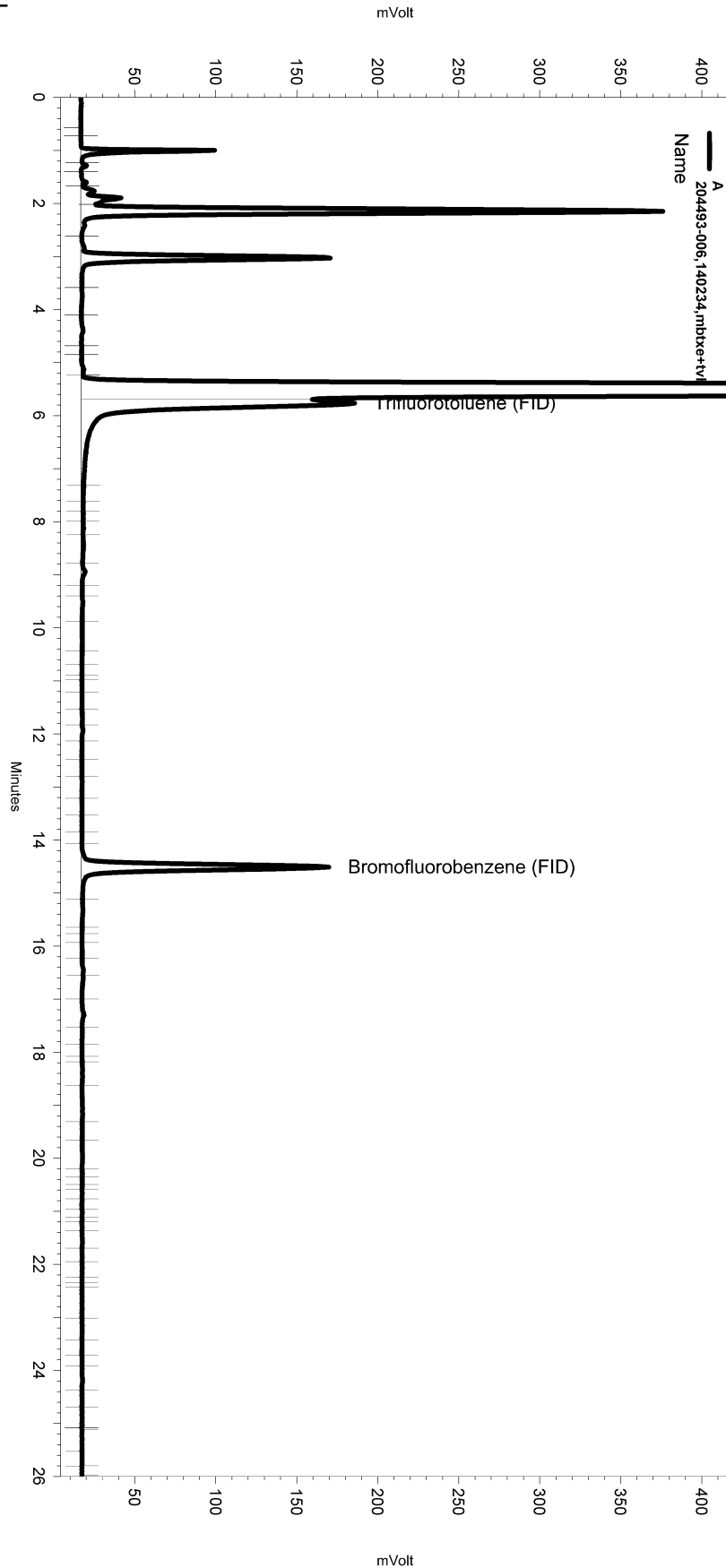
Manual Integration Fixes

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 Sample Name: 204493-006,140234,mbtxe+tvh  
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 Vial & pH or Core ID: b1.3



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Yes	Threshold	0	0	50

Manual Integration Fixes

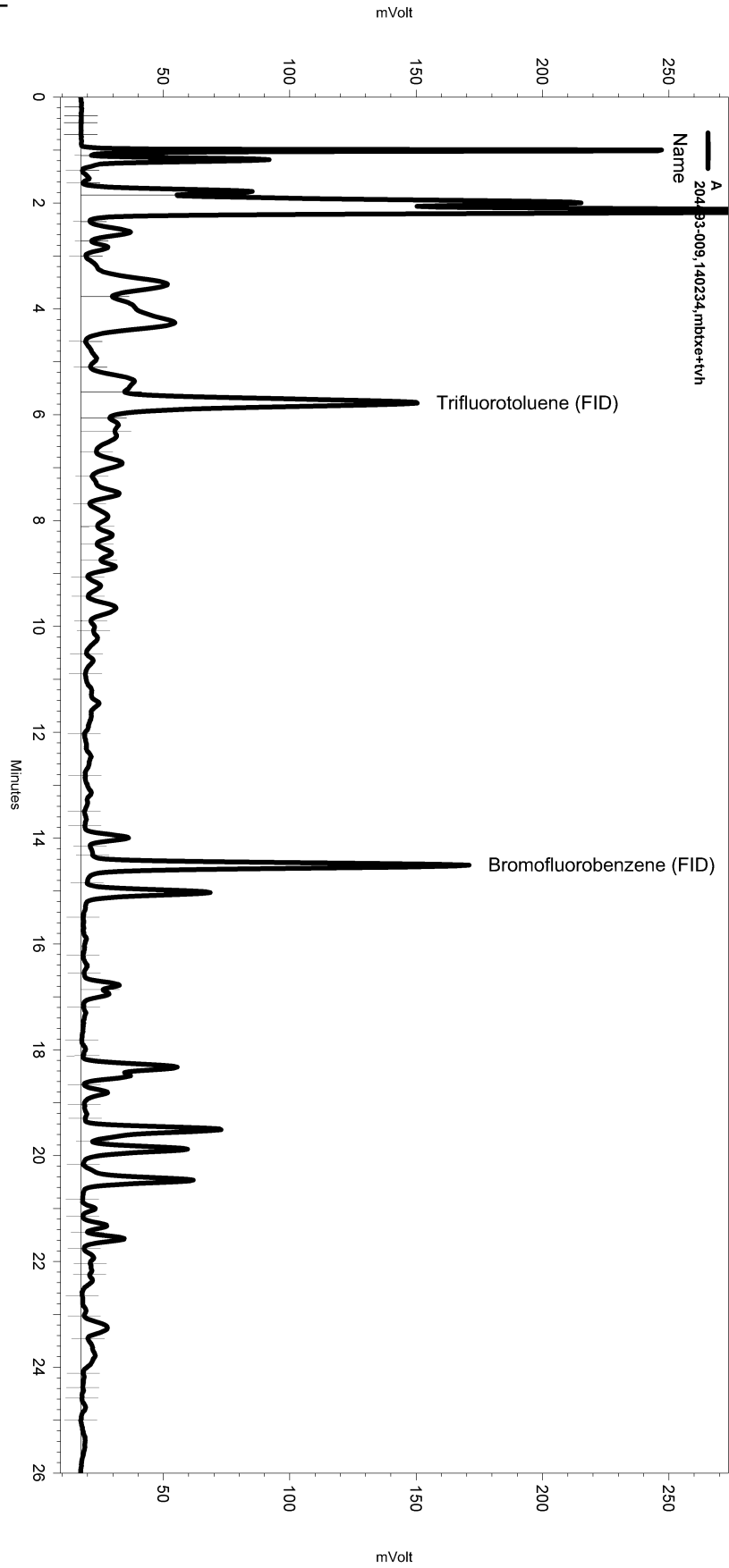
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Software Version 3.1.7  
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 Sample Amount: 5 Multiplier: 5  
 Vial & pH or Core ID: b1.3



Channel A

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No items selected for this section

Integration Events

Enabled	Event Type	Start (Minutes)	Stop (Minutes)	Value
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Yes	Threshold	0	0	50

Manual Integration Fixes

Data File: \\Lims\gdrive\ezchrom\Projects\GC04\Data\194\_023

Enabled	Event Type	Start (Minutes)	Stop (Minutes)	Value
Yes	Split Peak	14.315	0	0



### Gasoline Oxygenates by GC/MS

Lab #: 204493	Location: USTCF Claim #018639
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: 2005-65	Analysis: EPA 8260B
Matrix: Water	Sampled: 07/07/08
Units: ug/L	Received: 07/09/08

Field ID: MW-2A	Diln Fac: 1.000
Type: SAMPLE	Batch#: 140144
Lab ID: 204493-001	Analyzed: 07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	3.0	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	ND	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	101	80-123
1,2-Dichloroethane-d4	114	76-138
Toluene-d8	102	80-120
Bromofluorobenzene	106	80-120

Field ID: MW-1A	Diln Fac: 1.000
Type: SAMPLE	Batch#: 140144
Lab ID: 204493-002	Analyzed: 07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	86	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	0.6	0.5
1,2-Dichloroethane	ND	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	101	80-123
1,2-Dichloroethane-d4	115	76-138
Toluene-d8	106	80-120
Bromofluorobenzene	101	80-120

ND= Not Detected  
 RL= Reporting Limit

### Gasoline Oxygenates by GC/MS

Lab #: 204493	Location: USTCF Claim #018639
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: 2005-65	Analysis: EPA 8260B
Matrix: Water	Sampled: 07/07/08
Units: ug/L	Received: 07/09/08

Field ID: MW-1B	Diln Fac: 1.000
Type: SAMPLE	Batch#: 140144
Lab ID: 204493-003	Analyzed: 07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	9.6	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	5.4	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	102	80-123
1,2-Dichloroethane-d4	113	76-138
Toluene-d8	103	80-120
Bromofluorobenzene	106	80-120

Field ID: MW-2B	Diln Fac: 1.000
Type: SAMPLE	Batch#: 140144
Lab ID: 204493-004	Analyzed: 07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	18	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	1.3	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	100	80-123
1,2-Dichloroethane-d4	113	76-138
Toluene-d8	105	80-120
Bromofluorobenzene	97	80-120

ND= Not Detected  
 RL= Reporting Limit



**Gasoline Oxygenates by GC/MS**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8260B
Matrix:	Water	Sampled:	07/07/08
Units:	ug/L	Received:	07/09/08

Field ID:	MW-3A	Diln Fac:	1.000
Type:	SAMPLE	Batch#:	140144
Lab ID:	204493-005	Analyzed:	07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	72	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	0.8	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	102	80-123
1,2-Dichloroethane-d4	113	76-138
Toluene-d8	103	80-120
Bromofluorobenzene	97	80-120

Field ID:	MW-3B	Diln Fac:	12.50
Type:	SAMPLE	Batch#:	140199
Lab ID:	204493-006	Analyzed:	07/11/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	130
MTBE	ND	6.3
Isopropyl Ether (DIPE)	ND	6.3
Ethyl tert-Butyl Ether (ETBE)	ND	6.3
Methyl tert-Amyl Ether (TAME)	ND	6.3
1,2-Dichloroethane	ND	6.3
1,2-Dibromoethane	ND	6.3

Surrogate	%REC	Limits
Dibromofluoromethane	97	80-123
1,2-Dichloroethane-d4	110	76-138
Toluene-d8	94	80-120
Bromofluorobenzene	101	80-120

ND= Not Detected  
 RL= Reporting Limit

**Gasoline Oxygenates by GC/MS**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8260B
Matrix:	Water	Sampled:	07/07/08
Units:	ug/L	Received:	07/09/08

Field ID:	MW-4A	Diln Fac:	1.000
Type:	SAMPLE	Batch#:	140199
Lab ID:	204493-007	Analyzed:	07/11/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	68	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	ND	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	97	80-123
1,2-Dichloroethane-d4	107	76-138
Toluene-d8	94	80-120
Bromofluorobenzene	108	80-120

Field ID:	MW-4B	Diln Fac:	8.333
Type:	SAMPLE	Batch#:	140199
Lab ID:	204493-008	Analyzed:	07/11/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	83
MTBE	ND	4.2
Isopropyl Ether (DIPE)	ND	4.2
Ethyl tert-Butyl Ether (ETBE)	ND	4.2
Methyl tert-Amyl Ether (TAME)	ND	4.2
1,2-Dichloroethane	ND	4.2
1,2-Dibromoethane	ND	4.2

Surrogate	%REC	Limits
Dibromofluoromethane	99	80-123
1,2-Dichloroethane-d4	118	76-138
Toluene-d8	101	80-120
Bromofluorobenzene	107	80-120

ND= Not Detected  
 RL= Reporting Limit

**Gasoline Oxygenates by GC/MS**

Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8260B
Matrix:	Water	Sampled:	07/07/08
Units:	ug/L	Received:	07/09/08

Field ID:	MW-5B	Diln Fac:	1.000
Type:	SAMPLE	Batch#:	140163
Lab ID:	204493-009	Analyzed:	07/10/08

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	72	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	3.3	0.5
1,2-Dichloroethane	ND	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	98	80-123
1,2-Dichloroethane-d4	92	76-138
Toluene-d8	97	80-120
Bromofluorobenzene	90	80-120

Type:	BLANK	Batch#:	140144
Lab ID:	QC450101	Analyzed:	07/10/08
Diln Fac:	1.000		

Analyte	Result	RL
tert-Butyl Alcohol (TBA)	ND	10
MTBE	ND	0.5
Isopropyl Ether (DIPE)	ND	0.5
Ethyl tert-Butyl Ether (ETBE)	ND	0.5
Methyl tert-Amyl Ether (TAME)	ND	0.5
1,2-Dichloroethane	ND	0.5
1,2-Dibromoethane	ND	0.5

Surrogate	%REC	Limits
Dibromofluoromethane	100	80-123
1,2-Dichloroethane-d4	116	76-138
Toluene-d8	107	80-120
Bromofluorobenzene	101	80-120

ND= Not Detected  
 RL= Reporting Limit



## Batch QC Report

Gasoline Oxygenates by GC/MS			
Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8260B
Matrix:	Water	Batch#:	140144
Units:	ug/L	Analyzed:	07/10/08
Diln Fac:	1.000		

Type: BS Lab ID: QC450099

Analyte	Spiked	Result	%REC	Limits
tert-Butyl Alcohol (TBA)	125.0	97.06	78	55-158
MTBE	25.00	25.31	101	60-136
Isopropyl Ether (DIPE)	25.00	23.96	96	63-122
Ethyl tert-Butyl Ether (ETBE)	25.00	24.77	99	62-133
Methyl tert-Amyl Ether (TAME)	25.00	24.99	100	69-137

Surrogate	%REC	Limits
Dibromofluoromethane	99	80-123
1,2-Dichloroethane-d4	105	76-138
Toluene-d8	101	80-120
Bromofluorobenzene	100	80-120

Type: BSD Lab ID: QC450100

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
tert-Butyl Alcohol (TBA)	125.0	112.7	90	55-158	15	20
MTBE	25.00	25.14	101	60-136	1	20
Isopropyl Ether (DIPE)	25.00	24.28	97	63-122	1	20
Ethyl tert-Butyl Ether (ETBE)	25.00	24.00	96	62-133	3	20
Methyl tert-Amyl Ether (TAME)	25.00	25.57	102	69-137	2	20

Surrogate	%REC	Limits
Dibromofluoromethane	98	80-123
1,2-Dichloroethane-d4	107	76-138
Toluene-d8	103	80-120
Bromofluorobenzene	98	80-120

RPD= Relative Percent Difference



## Batch QC Report

Gasoline Oxygenates by GC/MS			
Lab #:	204493	Location:	USTCF Claim #018639
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	2005-65	Analysis:	EPA 8260B
Matrix:	Water	Batch#:	140199
Units:	ug/L	Analyzed:	07/11/08
Diln Fac:	1.000		

Type: BS Lab ID: QC450345

Analyte	Spiked	Result	%REC	Limits
tert-Butyl Alcohol (TBA)	125.0	132.6	106	55-158
MTBE	25.00	23.37	93	60-136
Isopropyl Ether (DIPE)	25.00	24.78	99	63-122
Ethyl tert-Butyl Ether (ETBE)	25.00	24.67	99	62-133
Methyl tert-Amyl Ether (TAME)	25.00	23.65	95	69-137

Surrogate	%REC	Limits
Dibromofluoromethane	97	80-123
1,2-Dichloroethane-d4	104	76-138
Toluene-d8	96	80-120
Bromofluorobenzene	100	80-120

Type: BSD Lab ID: QC450346

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
tert-Butyl Alcohol (TBA)	125.0	143.1	114	55-158	8	20
MTBE	25.00	25.06	100	60-136	7	20
Isopropyl Ether (DIPE)	25.00	25.12	100	63-122	1	20
Ethyl tert-Butyl Ether (ETBE)	25.00	25.59	102	62-133	4	20
Methyl tert-Amyl Ether (TAME)	25.00	24.81	99	69-137	5	20

Surrogate	%REC	Limits
Dibromofluoromethane	95	80-123
1,2-Dichloroethane-d4	104	76-138
Toluene-d8	97	80-120
Bromofluorobenzene	101	80-120

RPD= Relative Percent Difference

**APPENDIX D**

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**HISTORICAL GROUNDWATER  
ELEVATION DATA**



**TABLE A**  
**Historical Groundwater Monitoring Well Elevation Data**  
**2836 Union Street, Oakland, California**

MW-1A			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	dry	dry
2	Jan-07	9.80	2.45
3	Apr-07	7.49	4.76
4	Jul-07	7.16	5.09
5	Oct-07	7.29	4.96
6	Jan-08	6.82	5.70
7	Apr-08	6.32	5.70
8	Jul-08	8.25	4.00

MW-1B			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	7.44	4.56
2	Jan-07	6.40	5.65
3	Apr-07	6.42	5.63
4	Jul-07	7.19	4.86
5	Oct-07	7.10	4.95
6	Jan-08	5.81	6.67
7	Apr-08	6.82	5.23
8	Jul-08	7.62	4.43

MW-2A			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	7.93	4.87
2	Jan-07	6.58	6.24
3	Apr-07	6.52	6.30
4	Jul-07	7.37	5.45
5	Oct-07	7.33	5.49
6	Jan-08	5.50	7.56
7	Apr-08	6.86	5.96
8	Jul-08	7.70	5.12

Notes:

(a) Feet below top of well casing.

(b) Relative to mean sea level.

MW-2B			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	7.90	5.06
2	Jan-07	6.59	6.37
3	Apr-07	6.20	6.76
4	Jul-07	7.33	5.63
5	Oct-07	7.12	5.84
6	Jan-08	5.51	7.65
7	Apr-08	6.56	6.40
8	Jul-08	7.78	5.18

MW-3A			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	dry	dry
2	Jan-07	6.32	5.27
3	Apr-07	5.75	5.84
4	Jul-07	6.19	5.40
5	Oct-07	6.50	5.09
6	Jan-08	5.69	6.07
7	Apr-08	6.56	6.40
8	Jul-08	6.73	4.86

MW-3B			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	7.34	4.61
2	Jan-07	6.41	5.54
3	Apr-07	6.39	5.56
4	Jul-07	7.15	4.80
5	Oct-07	7.11	4.84
6	Jan-08	5.60	6.50
7	Apr-08	6.77	5.18
8	Jul-08	7.50	4.45

Notes:

(a) Feet below top of well casing.

(b) Relative to mean sea level.

MW-4A			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	9.74	1.28
2	Jan-07	5.64	5.38
3	Apr-07	5.34	5.68
4	Jul-07	5.71	5.31
5	Oct-07	6.09	4.93
6	Jan-08	5.53	5.72
7	Apr-08	5.56	5.46
8	Jul-08	6.30	4.34

MW-4B			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	6.63	4.41
2	Jan-07	5.55	5.49
3	Apr-07	5.45	5.59
4	Jul-07	6.28	4.76
5	Oct-07	6.13	4.91
6	Jan-08	4.81	6.44
7	Apr-08	5.90	5.14
8	Jul-08	6.70	4.34

MW-5A			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	9.60	2.82
2	Jan-07	6.72	6.10
3	Apr-07	5.74	6.68
4	Jul-07	6.98	5.44
5	Oct-07	8.32	4.10
<i>Well Destroyed November 2007</i>			

MW-5B			
Sampling Event No.	Date Measured	Water Level Depth (a)	Water Level Elevation (b)
1	Oct-06	9.07	3.31
2	Jan-07	6.45	5.93
3	Apr-07	6.45	5.93
4	Jul-07	7.15	5.23
5	Oct-07	7.28	5.10
6	Jan-08	4.94	7.63
7	Apr-08	6.51	5.87
8	Jul-08	7.64	4.74

Notes:

(a) Feet below top of well casing.

(b) Relative to mean sea level.

## **APPENDIX E**

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# **HISTORICAL ANALYTICAL RESULTS**

**TABLE B**  
**Historical Groundwater Monitoring Well Groundwater Analytical Results**  
**Petroleum and Aromatic Hydrocarbons (µg/L)**  
**2836 Union Street, Oakland, California**

MW-1A							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	790	94	< 0.5	8.6	< 0.5	100
3	Apr-07	760	63	<0.5	1.9	<0.5	150
4	Jul-07	NS	NS	NS	NS	NS	NS
5	Oct-07	830	28	<0.7	13	<0.7	110
6	Jan-08	720	8.1	< 0.5	< 0.5	< 0.5	130
7	Apr-08	NS	NS	NS	NS	NS	NS
8	Jul-08	120	1.0	<0.5	<0.5	<0.5	86

MW-1B							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	350	<1.3	<1.3	<1.3	<1.3	2.7
2	Jan-07	350	<1.3	<1.3	<1.3	<1.3	3.6
3	Apr-07	320	<0.5	<0.5	<0.5	<0.5	4.2
4	Jul-07	200	<1.3	<1.3	<1.3	<1.3	3.2
5	Oct-07	230	<0.7	<0.7	<0.7	<0.7	6.0
6	Jan-08	400	< 0.5	< 0.5	< 0.5	< 0.5	6.2
7	Apr-08	350	<0.5	<0.5	<0.5	<0.5	7.8
8	Jul-08	300	<0.5	<0.5	<0.5	<0.5	8.4

MW-2A							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	80	<0.5	<0.5	<0.5	<0.5	<0.5
2	Jan-07	490	<0.5	<0.5	<0.5	<0.5	<0.5
3	Apr-07	83	<0.5	<0.5	<0.5	<0.5	<0.5
4	Jul-07	<50	<0.5	<0.5	<0.5	<0.5	<0.5
5	Oct-07	<50	<0.5	<0.5	<0.5	<0.5	<0.5
6	Jan-08	<50	<0.5	<0.5	<0.5	<0.5	<2.0
7	Apr-08	160	<0.5	<0.5	<0.5	<0.5	3.0
8	Jul-08	97	<0.5	<0.5	<0.5	<0.5	5.5

MW-2B							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	2,000	<0.5	1.1	6.7	0.8	19
3	Apr-07	84	<0.5	<0.5	<0.5	<0.5	18
4	Jul-07	580	<0.5	<0.5	<0.5	<0.5	6.0
5	Oct-07	1,700	<0.5	<0.5	<0.5	<0.5	83
6	Jan-08	780	< 0.5	< 0.5	< 0.5	< 0.5	32
7	Apr-08	92	<0.5	<0.5	<0.5	<0.5	2.4
8	Jul-08	570	<0.5	<0.5	<0.5	0.72	17

MW-3A							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	NS	NS	NS	NS	NS	NS
3	Apr-07	<50	<0.5	<0.5	<0.5	<0.5	75
4	Jul-07	NS	NS	NS	NS	NS	NS
5	Oct-07	<50	<0.5	<0.5	<0.5	<0.5	<0.5
6	Jan-08	<50	< 0.5	< 0.5	< 0.5	< 0.5	70
7	Apr-08	<50	<0.5	<0.5	<0.5	<0.5	77
8	Jul-08	<50	<0.5	<0.5	<0.5	<0.5	56

MW-3B							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	1,900	<10	<10	<10	<10	<10
2	Jan-07	1,900	<8.3	<8.3	<8.3	<8.3	<8.3
3	Apr-07	1,900	<0.5	<0.5	<0.5	<0.5	<0.5
4	Jul-07	1,200	<2.0	<2.0	<2.0	<2.0	<2.0
5	Oct-07	2,100	<7.1	<7.1	<7.1	<7.1	<7.1
6	Jan-08	2,100	< 0.5	< 0.5	< 0.5	< 0.5	<2.0
7	Apr-08	1,800	<0.5	<0.5	<0.5	<0.5	<2.0
8	Jul-08	1,700	<0.5	<0.5	<0.5	<0.5	<2.0

MW-4A							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	<50	<0.5	<0.5	<0.5	<0.5	72
3	Apr-07	<50	<0.5	0.6	<0.5	0.6	77
4	Jul-07	<50	<0.5	<0.5	<0.5	<0.5	64
5	Oct-07	<50	<0.5	<0.5	<0.5	<0.5	73
6	Jan-08	NS	NS	NS	NS	NS	NS
7	Apr-08	<50	<0.5	<0.5	<0.5	<0.5	61
8	Jul-08	<50	<0.5	<0.5	<0.5	<0.5	46

MW-4B							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	1,100	<2.5	<2.5	<2.5	<2.5	<2.5
2	Jan-07	1,300	<4.2	<4.2	<4.2	<4.2	<4.2
3	Apr-07	1,300	<0.5	<0.5	<0.5	<0.5	<0.5
4	Jul-07	1,000	<4.2	<4.2	<4.2	<4.2	<4.2
5	Oct-07	1,400	<4.2	<4.2	<4.2	<4.2	<4.2
6	Jan-08	1,500	<0.5	<0.5	<0.5	<0.5	<2.0
7	Apr-08	1,500	<0.5	<0.5	<0.5	<0.5	<2.0
8	Jul-08	1,200	<0.5	<0.5	<0.5	<0.5	<2.0

MW-5A							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	NS	NS	NS	NS	NS	NS
3	Apr-07	1,000	6.6	<0.5	29	7.6	79
4	Jul-07	NS	NS	NS	NS	NS	NS
5	Oct-07	820	6.6	<0.5	6.6	1.8	78
<i>Well Destroyed in November 2007</i>							

MW-5B							
Sampling Event No.	Date Sampled	TVH-g	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
1	Oct-06	13,000	9.6	0.6	21	1.9	37
2	Jan-07	6,600	4.0	<0.5	10	1.0	22
3	Apr-07	3,300	0.7	<0.5	2.7	<0.5	<0.5
4	Jul-07	2,000	1.1	<0.5	2.2	<0.5	26
5	Oct-07	1,200	<0.5	<0.5	<0.5	<0.5	45
6	Jan-08	1,200	<0.5	<0.5	4.1	<0.5	69
7	Apr-08	240	<0.5	<0.5	<0.5	<0.5	65
8	Jul-08	310	<0.5	<0.5	<0.5	<0.5	68

Notes:

All concentrations reported in micrograms per liter.

TVH-g = Total volatile hydrocarbons – gasoline range.

NS = Not sampled

**TABLE C**  
**Historical Groundwater Monitoring Well Groundwater Analytical Results**  
**Lead Scavengers and Fuel Oxygenates (µg/L)**  
**2836 Union Street, Oakland, California**

MW-1A							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
6	Jan-08	NA	NA	NA	NA	NA	NA
7	Apr-08	NA	NA	NA	NA	NA	NA
8	Jul-08	<0.5	<0.5	<0.5	<0.5	1	<10

MW-1B							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	3.1	<1.3	<1.3	<1.3	<1.3	<25
2	Jan-07	3.3	<1.3	<1.3	<1.3	<1.3	<25
3	Apr-07	4.8	<0.5	<0.5	<0.5	<0.5	<10
4	Jul-07	3.4	<1.3	<1.3	<1.3	<1.3	<25
5	Oct-07	3.3	<1.3	<1.3	<1.3	<1.3	<25
6	Jan-08	4.7	<1.3	<1.3	<1.3	<1.3	<25
7	Apr-08	4.7	<1.3	<1.3	<1.3	<1.3	<25
8	Jul-08	5.4	<0.5	<0.5	<0.5	<0.5	<10

MW-2A							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	<0.5	<0.5	<0.5	<0.5	<0.5	<10
2	Jan-07	NA	NA	NA	NA	NA	NA
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	NA	NA	NA	NA	NA	NA
6	Jan-08	NA	NA	NA	NA	NA	NA
7	Apr-08	NA	NA	NA	NA	NA	NA
8	Jul-08	<0.5	<0.5	<0.5	<0.5	<0.5	<10

MW-2B							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	4.1	<0.5	<0.5	<0.5	<0.5	<10
3	Apr-07	6.9	<0.5	<0.5	<0.5	<0.5	<10
4	Jul-07	1.4	<0.5	<0.5	<0.5	<0.5	<10
5	Oct-07	4.1	<0.5	<0.5	<0.5	<0.5	<10
6	Jan-08	3.9	<0.5	<0.5	<0.5	<0.5	<10
7	Apr-08	3.9	<0.5	<0.5	<0.5	<0.5	<10
8	Jul-08	1.3	<0.5	<0.5	<0.5	<0.5	<10



MW-3A							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	NS	NS	NS	NS	NS	NS
3	Apr-07	0.9	<0.5	<0.5	<0.5	<0.5	14
4	Jul-07	NS	NS	NS	NS	NS	NS
5	Oct-07	NS	NS	NS	NS	NS	NS
6	Jan-08	0.8	<0.5	<0.5	<0.5	<0.5	<10
7	Apr-08	0.8	<0.5	<0.5	<0.5	<0.5	<10
8	Jul-08	0.8	<0.5	<0.5	<0.5	<0.5	<10

MW-3B							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	<10	<10	<10	<10	<10	<200
2	Jan-07	NA	NA	NA	NA	NA	NA
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	NA	NA	NA	NA	NA	NA
6	Jan-08	NA	NA	NA	NA	NA	NA
7	Apr-08	NA	NA	NA	NA	NA	NA
8	Jul-08	<6.3	<6.3	<6.3	<6.3	<6.3	<130

MW-4A							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	NA	NA	NA	NA	NA	NA
6	Jan-08	NS	NS	NS	NS	NS	NS
7	Apr-08	NS	NS	NS	NS	NS	NS
8	Jul-08	<0.5	<0.5	<0.5	<0.5	<0.5	<10

MW-4B							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	<2.5	<0.5	<1	<1	<2.5	<50
2	Jan-07	NA	NA	NA	NA	NA	NA
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	NA	NA	NA	NA	NA	NA
6	Jan-08	NA	NA	NA	NA	NA	NA
7	Apr-08	NA	NA	NA	NA	NA	NA
8	Jul-08	<4.2	<4.2	<4.2	<4.2	<4.2	<83

MW-5A							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	NS	NS	NS	NS	NS	NS
2	Jan-07	NS	NS	NS	NS	NS	NS
3	Apr-07	<0.5	<0.5	<0.5	<0.5	4.3	<10
4	Jul-07	NS	NS	NS	NS	NS	NS
5	Oct-07	NS	NS	NS	NS	NS	NS
<i>Well Destroyed in November 2007</i>							

MW-5B							
Sampling Event No.	Date Sampled	EDC	EDB	ETBE	DIPE	TAME	TBA
1	Oct-06	<0.5	<0.5	<0.5	<0.5	1.5	<10
2	Jan-07	<0.5	<0.5	<0.5	<0.5	<0.5	<10
3	Apr-07	NA	NA	NA	NA	NA	NA
4	Jul-07	NA	NA	NA	NA	NA	NA
5	Oct-07	<0.5	<0.5	<0.5	<0.5	<0.5	<10
6	Jan-08	NA	NA	NA	NA	NA	NA
7	Apr-08	NA	NA	NA	NA	NA	NA
8	Jul-08	<0.5	<0.5	<0.5	<0.5	3.3	<10

Notes:

NA = Not analyzed for this constituent. NS = Not sampled

EDB = Ethylene dibromide (1,2-dibromoethane). EDC = Ethylene dichloride (1,2-dichloroethane).

DIPE = isopropyl ether. ETBE = Ethyl-terbutyl ether. TAME = Tert-amylmethylether

TBA = Tertiary butyl alcohol