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SOIL VAPOR SAMPLING ASSESSMENT  
Former Gasoline Service Station  
2547 East 27<sup>th</sup> Street  
Oakland, California

**File No. 0396**

Date:  
April 13, 2010

Prepared for:  
Tomorrow Development  
Oakland, California

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Former Gasoline Service Station  
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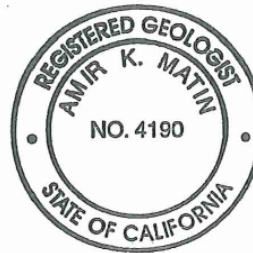
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## 1.0 INTRODUCTION

This report summarizes the Soil Vapor Sampling Assessment conducted on March 23, 2010 by Ceres Associates and its subcontractor at the site of the former Gasoline Service Station, located at 2547 East 27<sup>th</sup> Street, Oakland, California (Property).

The Property is currently undeveloped. There are plans for future development to include a small multi-family housing project. The general area of the Property is developed with single and multi-family residences.

The Property was formerly occupied by a gasoline fueling and automotive service station between 1927 and 1994. In 1994 the station building was demolished and underground storage tanks, and fuel distribution pumps and pipes were removed.

During removal of the gasoline service station one 100-gallon waste oil underground storage tank (UST), and four 500-gallon gasoline USTs were excavated and removed from the Property. The 500-gallon USTs were reported to contain gasoline and diesel. The contractor responsible for removal of the USTs collected soil samples and found that soil in the area of UST removal had been impacted by petroleum hydrocarbons. After the USTs were removed, the excavation pits were lined with visqueen plastic and backfilled with the excavated material. Through various soil and groundwater assessment activities, it was found that both soil and groundwater were impacted by leaks from the USTs. Subsequently, removal of contaminated soil and monitoring of groundwater was conducted. After several quarterly monitoring events, groundwater monitoring was discontinued due to low contamination concentrations on authority of the Alameda County Environmental Health Department (EHD).

Contaminated soil was excavated and removed from the Property on ???. Reportedly clean backfill was placed in the excavation. Subsequently, confirmation soil sampling and soil vapor sampling were conducted to ascertain if the Property had been appropriately cleaned. One soil vapor sample was found to be in excess of regulatory guidelines for trichloroethene (TCE). Upon request for closure, Alameda County EHD requested an additional soil vapor survey to evaluate the potential that some residual contamination may be remaining at the Property.

The regulatory risk criteria utilized for this report are Environmental Screening Levels (ESLs) established by the San Francisco Bay Regional Water Quality Control Board (RWQCB) for Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns for Lowest Residential Exposure.

## 1.1 Background

Soil and groundwater contamination at the Property appears to have originated from the historic use of the Property as a vehicle fueling and service station.

Underground storage tanks were used at the Property for the purposes of storing gasoline, diesel, and waste oil. The service station ceased operation in 1994 when four 500-gallon capacity USTs that reportedly contained gasoline at the time of excavation were removed, and one 100-gallon capacity UST that contained waste oil was removed. The Property has been the subject of several previous assessment and remediation efforts.

The following environmental assessments have been conducted at the Property:

- 1 Tank Removal Report, September 1994, Aqua Science Engineers
- 2 Phase I ESA, May 2001, M.L. River Group
- 3 Soil and Groundwater Sampling, August 2002, Kleinfelder
- 4 Soil and Groundwater Sampling, January 2005, Ceres Associates
- 5 Soil and Groundwater Sampling and Monitoring Well Installation, February 2006, Ceres Associates
- 6 Well Survey, May 2006, Ceres Associates
- 7 Deeper Groundwater Sampling, October 2006, Ceres Associates
- 8 Quarterly Groundwater Monitoring, 2006 – 2007, Ceres Associates
- 9 Soil Excavation Report, August 2007, Ceres Associates
- 10 Soil Vapor Sampling and Backfill Soil Sampling Report, February 2008, Ceres Associates.

A summary of these reports can be found in Appendix A – Summary of Previous Reports

## 2.0 METHOD AND SCOPE OF SAMPLING

On March 23, 2010, a total of six soil vapor sampling points were advanced at the undeveloped lot located at 2547 East 27<sup>th</sup> Street in Oakland, Alameda County, California (refer to Figure 2 – Soil Vapor Sampling Location Map). Field work was supervised onsite by Amir Matin, PG, CEG, HG, of Ceres Associates.

### 2.1 PRE-FIELD WORK ACTIVITIES

Prior to conducting sampling activities, Ceres Associates marked the surface of the Property for Underground Services Alert (USA) with the approximate locations of sampling locations. USA, in turn, notified a database of companies with the potential to have underground facilities in the area to ascertain the potential that subsurface exploration might impact their subsurface facilities. Subsurface utilities were not noted by the USA database companies that would be thought to impact subsurface sample collection.

A Health and Safety Plan (HASP), prepared by Ceres Associates, was used to facilitate a pre-drilling safety meeting prior to conducting work. The HASP detailed potential risks and hazards involved in the drilling process.

Ceres Associates contracted with TEG of Rancho Cordova, California to advance soil vapor samplings points using a Stratoprobe® drill rig. The Stratoprobe® uses a hydraulically driven direct push technology. In addition, TEG provided an onsite mobile analytical laboratory to provide timely analysis of soil vapor samples that might be useful in directing sample locations in the event that contamination was detected.

#### **Weather Condition**

Alameda County Environmental Health Department requires that soil vapor surveys be conducted with at least five dry days following a rain storm with precipitation equaling or exceeding 0.5 inches. The field work for this assessment was conducted on March 23, 2010, based upon information obtained from the website [weatherunderground.com](http://weatherunderground.com) there had been no previous precipitation since March 12, 2010, when there was a storm wherein 0.67 inches of rain had accumulated in Oakland

### 2.2 SOIL VAPOR SAMPLING AND ANALYSIS

The Property had formerly been the location of a gasoline service station. The purpose of the sampling was to assess if concentrations of trichlorethene (TCE) remained in the soil following previous remediation activities. A prior soil vapor assessment found a concentration of TCE of 8.7 µg/L in a sample collected from the area of a former UST excavation. This sampling was



conducted under directive from Alameda County Environmental Health Department to assess if there might be a health concern with respect to potential vapor intrusion of TCE into the proposed condominium development at the Property.

### **2.2.1 SOIL VAPOR SAMPLE LOCATIONS**

A map of soil vapor sample locations is provided as Figure 2. The soil vapor sampling points were positioned as closely as practical to those suggested by Alameda County Environmental Health Department in its approval letter of the work plan that proceeded this investigation.

Ceres Associates supervised the collection of six samples of soil vapor in the near vicinity of sample location SV-04 from the previous soil vapor sampling assessment (refer to Figure 2 – Soil Vapor Sample Location Map), as directed by Alameda County Environmental Health Department. The location of SV-04 was measured on the Property as accurately as possible from the Soil Vapor Sample Location Map in the previous report. SV-8 was placed as close to SV-04 as could be determined from the map and measurements in the field. Soil vapor samples, SV-9, SV-10, SV-11, SV-12, and SV-13 were each placed within less than 10 feet surrounding SV-04 (Figure ??).

The February 2008 soil vapor investigation conducted by Ceres Associates and TEG found that soil at a depth of five feet was too “tight” to facilitate the collection of vapor samples. Samples for that investigation were collected from a depth of about three feet, where sufficient vapor could be extracted from the soil for sampling. Similarly, each sample for the March 23, 2010 soil vapor sampling assessment was collected from a depth of about three feet.

### **2.2.2 Soil Vapor Sampling and Laboratory Analysis Methodology**

Ceres Associates prepared a work plan detailing the scope of work necessary to conduct this soil vapor sampling assessment. The work plan was uploaded to the Alameda County website, as required, on September 14, 2009. Approval of the work plan was granted, with minor changes, by the Alameda County Environmental Health Department with a letter dated October 16, 2009.

#### **Soil Vapor Sampling Methodology**

Ceres Associates subcontracted with TEG of Rancho Cordova, California to provide soil vapor sampling service and onsite laboratory analysis of the collected samples. TEG conducted the sampling in strict accordance with the California Environmental Protection Agency Department of Toxic Substances Control (DTSC) guidelines for soil vapor sampling.

Soil vapor samples were collected using low-dead volume soil vapor sampling system (performed by TEG), which has been inspected and endorsed by regulatory agencies, including the U.S. EPA and Cal-EPA DTSC. This system effectively eliminates air leakage down the soil vapor probe, ensures sample collection from the tip, and its design supports decontamination

between samples. The soil vapor probes are constructed of one-inch outer diameter chrome-moly steel and are equipped with a steel drop-off tip. The STRATAPROBE™ can also use a larger diameter probe if needed. An inert 1/8-inch tube runs through the center of the probe and is attached to the sampling port with a stainless steel post run fitting.

The probe was driven into the ground by the STRATAPROBE™ and once the desired depth was reached, the probe was retracted slightly, opening the tip and exposing the vapor sampling port. This design prevents clogging and cross-contamination from soil. Once the probe rod was in place, the sample was collected after the probe equilibrated for at least 20 minutes. The soil gas sample was then withdrawn from the inert tubing using a calibrated syringe, which couples into a sampling valve.

A purge volume test was conducted by sampling the first soil vapor location three times after sequentially collecting and discarding one, three, and seven tubing volumes of soil gas. The purge volume (i.e., one, three, or seven tubing volumes) corresponding to the highest chemical concentration (which is determined by analyzing samples corresponding to all three purge volumes) was used for all subsequent sampling.

After purging, the next 20 cubic centimeters (cc) to 50 cc of soil vapor was withdrawn into the syringe, plugged, and immediately transferred to the mobile lab for analysis within the specified holding time. During sampling, a leak check gas (1,1-difluoroethene) was used to confirm that the sample train and probe rod were tight and leak free. To minimize the potential for cross-contamination between sampling locations, all external probe components were cleaned of excess dirt and moisture prior to insertion. The internal inert tubing was replaced with fresh tubing between samples to prevent cross contamination. If water, dirt, or any material is observed in the tubing, the tubing was discarded and replaced with fresh tubing.

### **Laboratory Analysis Methodology**

Soil vapor samples collected from each probe were transferred directly to the state-certified, on-site mobile laboratory and analyzed immediately. There was minimal lag time between sample collection and analysis, ensuring that the integrity of the sample was maintained. Samples were analyzed using a gas chromatograph equipped with capillary columns, and a combination of mass spectrometer (GC/MS). This combination of columns and detectors ensures compound separation, recognition, and detection at the required concentrations. These detectors enable on-site analysis for volatile organic compounds (VOCs) using U.S. EPA Method 8260B.

TEG provided Ceres Associates with the preliminary results of the sampling immediately upon obtaining results to help choose additional sample locations, or duplicate sample analysis, if required. The preliminary results of the analysis were then taken back to the TEG office in Rancho Cordova, California for reconfirmation.



## 3.0 RESULTS

### 3.1 Soil Vapor Survey Results

Concentrations of contaminants above the method reporting limits were found in only two of the six soil vapor samples collected during this assessment: SV-9 and SV-10. The method reporting limit for all contaminants was 0.10 micrograms per liter ( $\mu\text{g/L}$ ) of vapor using US EPA method 8260B. SV-9 was reported by the laboratory to have ethylbenzene in the soil vapor at a concentration of 0.17  $\mu\text{g/L}$  and m, p, xylenes at a concentration of 0.47  $\mu\text{g/L}$ . The laboratory reported that contaminants found in the soil vapor of SV-10 were ethylbenzene at a concentration of 0.25  $\mu\text{g/L}$ , m, p, xylenes; 0.67  $\mu\text{g/L}$ , and o xylenes at a concentration of 0.13  $\mu\text{g/L}$ .

Ceres Associates compared the results of the soil vapor sampling with Residential ESL values for assessing potential human health risk.

### 3.2 Comparison Of Analytical Results To Environmental Screening Limits

Concentrations reported to Ceres Associates by the state-certified analytical laboratory were compared to the residential-use ESLs published by the State of California, San Francisco Bay Regional Water Quality Control Board.

The ESLs for Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns for Lowest Residential Exposure were used for comparison to onsite soil vapor results. The designated ESL concentrations are given in micrograms per cubic meter ( $\mu\text{g/m}^3$ ). The ESL threshold numbers for ethylbenzene and total xylenes are 980  $\mu\text{g/m}^3$  and 21,000  $\mu\text{g/m}^3$  respectively. It should be noted that the ESL for xylenes does not break down various xylenes isomers but is for all three xylene isomers combined: m, p, and o.

To convert  $\mu\text{g/L}$  to  $\mu\text{g/m}^3$ , one needs to multiply the former by 1,000. Using this calculation ethylbenzene concentrations in soil vapor were 170  $\mu\text{g/m}^3$  and 250  $\mu\text{g/m}^3$  in SV-9 and SV-10, respectively. Total xylenes concentrations were 470  $\mu\text{g/m}^3$  and 800  $\mu\text{g/m}^3$  in SV-9 and SV-10, respectively.

## 4.0 DISCUSSION AND RECOMMENDATIONS

### 4.1 Discussion

A previous soil vapor survey reported that one sample (SV-04) contained a concentration of TCE above regulatory guidelines. TCE was not reported in the six soil vapor samples collected for this assessment. Soil vapor sample SV-8, which was collected on March 23, 2010 from a location, as close to SV-04 as could be determined from measurements taken from the sample location map, indicated no TCE.

Concentrations of reported chemicals found in the laboratory analysis conducted for this assessment fall significantly below the conservative concentrations of Environmental Screening Limits as designated by the SF RWQCB.

### 4.2 Conclusions and Recommendations

Based upon the lab results from this assessment and their comparison to applicable regulatory guidelines, it does not appear that there is a potential for soil vapor intrusion concern to the future residents of the Property or surrounding area. Hence, Ceres Associates does not recommend additional sampling or any further investigation at this time.

The site-specific data generally show that petroleum hydrocarbon impact to soil and groundwater is minimal and risk of exposure to these petroleum hydrocarbons appears to be unlikely.

#### Recommendations

Because groundwater monitoring has been discontinued and there does not appear to be significant onsite or offsite residual contamination, Ceres Associates recommends that a work plan be written to properly abandon the two groundwater monitoring wells installed at the Property, and the three groundwater monitoring wells installed offsite. Upon approval of the work plan the work should be conducted as quickly as possible in order to ready the Property for potential development. A report will then be delivered to the AC EHD as proof of proper well abandonment.

In addition, Ceres Associates recommends producing a summary report of assessment and remediation activities that have occurred at the Property, and their results in preparation for a request for site closure from AC EHD.

## 5.0 LIMITATIONS

This Environmental Site Assessment (ESA) was conducted according to accepted industry standards and guidelines for similar assessments conducted in this geographic region at this time. The purpose of this assessment was to compare laboratory results from collected soil vapor samples with published regulatory guidelines; these comparisons are what guide the discussion and recommendations. This report is not an assessment of geologic or hydrogeologic conditions at the site and should not be construed as such.

This assessment cannot fully eliminate the possibility of the Property having environmental impairments. In today's technology, no amount of assessment can certify that the Property is completely free of environmental concern. It is possible undocumented or concealed conditions of the Property could exist beyond what was found during this soil and grab groundwater investigation.

**Appendix A**

**SUMMARY OF PREVIOUS REPORTS**

## **September 1994 Aqua Science Engineers Tank Removal Report**

An Underground Storage Tank Removal Report, dated September 15, 1994, was prepared for the Property by Aqua Science Engineers, Inc. According to the report four 500-gallon and one 100-gallon steel underground storage tanks were removed from the Property on August 30 and 31, 1994 (*refer to Figure 2 – Previous USTs and Developments*). All four of the 500-gallon tanks were reported to have contained gasoline; the 100-gallon tank was reported to have contained waste oil.

### *Soil Sample Results*

Soil samples collected from the bottom of the excavations indicated detectable concentrations of TPHg and BTEX (*refer to Table 1: Soil Sampling during UST Removal – August 1994*). Detectable concentrations of oil and grease were identified in the soil directly beneath the former waste oil tank. Concentrations ranged from a low of 0.2 mg/Kg to a high of 930 mg/Kg of TPHg beneath the four former gasoline USTs. Concentrations of petroleum hydrocarbons were not found beneath the former pump islands above method detection limits.

Upon completion of the soil sample collection, the excavations were lined with visqueen and backfilled immediately with the stockpiled material. According to the report, this re-filling was meant only as a temporary measure and this plan was verbally discussed at the time, and approved by Mr. Barney Chan of the ACHCSA.

### *Recommendations*

Aqua Science Engineers, Inc. recommend removal and stockpiling of the material that had been placed back into the excavations as temporary backfill; collecting samples and analyzing for profiling and acceptance into an off-site recycling facility, then off-hauling; over-excavating, stockpiling and sampling the residual contaminated soil; backfilling the excavation with clean, imported, compactable material to grade; and, conducting subsurface soil and groundwater investigations as requested by local the regulatory agency.

## **May 2001 M.L. River Group Phase I ESA**

A Phase I ESA report, dated May 10, 2001, was conducted for the Property by M.L. River Group Environmental Consultants. According to the report, the Property was first developed sometime between 1900 and 1920, and was operated as a gasoline service station and/or garage from 1927 through 1994. At the time of the report, the Property was not occupied and no structures or building materials remained on the site.

Neither hazardous materials nor electrical transformers were observed on the Property. However, the report did summarize the above referenced UST Removal Report, noting that soil sampling conducted during the UST removal indicated subsurface contamination.

No further site study or remediation had been done at the Property between the time of the tank removal and the preparation of this Phase I ESA Report. The case had been referred to the Alameda County District Attorney's Office shortly before the Phase I ESA's publication. Prior to granting closure for the site, the ACHCSA reportedly required remediation of the contaminated soil and additional studies of the soil and groundwater. The Phase I ESA report concluded that "soil remediation and subsurface investigation of the Subject Site must be performed before redeveloping the Property".

### **August 2002 Kleinfelder Soil and Groundwater Sampling**

A Soil and Groundwater Sampling report, dated August 2, 2002, was prepared for the Property, by Kleinfelder, Inc. The report cited the Phase I history noted above. Kleinfelder advanced three soil borings (EB-1, EB-2 and EB-3) on the Property on June 19, 2002 (refer to Figure 3 – Boring Location Map). At that time, monitoring wells were installed in each of the three borings. According to the boring logs (refer to Appendix for a copy of the boring logs), between two and five feet of screen was inserted into the borings and the remainder of the borings were backfilled with grout. These wells are no longer operational.

#### *Soil Sample Results*

According to the report, reported concentrations of TPHg, TPHd, TPHmo and BTEX compounds were detected in at least one of the soil samples collected from each soil boring exceeding regulatory action limits (refer to Table 2: Kleinfelder Soil and Groundwater Sampling - June 2002). TPHg was detected at 1,200 mg/Kg in EB-1 and 1,800 mg/kg in EB-2. TPHd was detected at 650 mg/kg in a soil sample collected from EB-1 and 1,500 mg/kg in a soil sample collected from EB-2. TPHmo was detected in concentrations above laboratory reporting limits only in the soil sample from boring EB-1 at 14 mg/kg. Further, the laboratory described the detected TPHg as strongly aged gasoline, and the TPHd was described as Stoddard solvent. A soil sample collected from EB-1 had reported concentrations of ethylbenzene at 1.6 mg/kg, toluene at 0.62 mg/Kg, and xylenes of 3.3 mg/kg. A soil sample collected from EB-2 had reported concentrations of ethylbenzene at 3.1 mg/kg and xylenes at 4.9 mg/kg. Concentrations of MTBE were not reported above the method reporting limit for any of the soil samples submitted for analysis.

#### *Groundwater Sample Results*

Groundwater samples were collected from each of the three onsite groundwater monitoring wells. Groundwater samples reportedly contained concentrations of TPH from each of the three groundwater wells. TPHd was reported in monitoring well EB-1 at a concentration of 56 micrograms per liter ( $\mu\text{g/l}$ ). The groundwater sample collected from monitoring well EB-2 was reported to contain TPHg at 82  $\mu\text{g/l}$ , TPHd at 360  $\mu\text{g/L}$ , and TPHmo at 310  $\mu\text{g/l}$ . A groundwater sample from monitoring well EB-3 reportedly contained concentrations of TPHd at 270  $\mu\text{g/l}$  and TPHmo at 540  $\mu\text{g/l}$ . Only EB-2 had reported concentrations of BTEX compounds. This well had concentrations of benzene at 0.97  $\mu\text{g/L}$ , toluene at 1.3  $\mu\text{g/l}$ , and xylenes at 1.3  $\mu\text{g/l}$ . Ethylbenzene and MTBE were not reported above their laboratory reporting limits.

### *Recommendations*

Kleinfelder recommended conducting further soil and groundwater sampling to determine the extent of soil contamination and to confirm the groundwater results from their initial study. Kleinfelder suggested a program of shallow drilling in a grid pattern in order to help delineate the extent of the impacted soil and that additional groundwater samples be collected to further study the potential impacts to groundwater.

### **January 2005 Ceres Associates Soil and Groundwater Sampling**

To further assess the extent of soil and groundwater impacts at the Property, Ceres Associates collected soil and groundwater samples on January 7, 2005 (project CA1264-1, report dated January 28, 2005) (refer to Figure 3 – Boring Location Map). Ten soil borings were drilled at the Property to a maximum depth of 10 feet bgs (labeled SB-1 through SB-10); soil samples were collected at five and 10 feet bgs from each boring. Grab groundwater samples were collected from each soil boring, and from six additional Hydro-punch® borings (labeled GW-1 through GW-6). Soil and grab groundwater samples were analyzed for TPHg, TPHd, BTEX, and MTBE (refer to Table 3: Ceres Associates Soil and Groundwater Sampling – January 2005).

### *Soil Sample Results*

The only soil samples collected from five feet bgs reported to contain concentrations of the target analytes above reporting limits were collected from soil boring SB-6, and had reported concentrations of benzene of 0.024 mg/kg and ethylbenzene of 0.031 mg/kg; and SB-9 which had reported concentrations of TPHg of 32 mg/kg, TPHd of 52 mg/kg, ethylbenzene of 0.017 mg/kg, and xylenes of 0.013 mg/kg.

The 10-foot bgs samples from SB-1, SB-2, and SB-8 were reported by the laboratory to not contain concentrations of the target analytes above their respective reporting limits. The highest concentrations of the target analytes were reported as 61 mg/kg of TPHg (sample SB5-10), 46 mg/kg of TPHd (sample SB5-10), 0.007 mg/kg of benzene (sample SB5-10), 0.045 mg/kg of ethylbenzene (sample SB5-10), and 0.027 mg/kg of xylenes (sample SB5-10).

Although target analytes were detected in several of the analyzed soil samples the reported concentrations of the target analytes in the soil samples analyzed from soil borings SB-1 through SB-10 did not exceed regulatory action limits.

### *Groundwater Sample Results*

Target analytes were reported above method reporting limits in all but one of the grab groundwater samples. Concentrations of TPHg were as high as 90,000 µg/l (SB-9); 750,000 µg/L for TPHd (SB-9); 140 µg/l for benzene (SB-9); 1.5 µg/l for toluene (SB-1); 77 µg/l for ethylbenzene (SB-9); and 20 µg/l for xylenes. MTBE was not reported above the method limits in any grab groundwater samples. Benzene concentrations exceeded the regulatory limit of 1 µg/l in eight of the 16 samples submitted for analysis, set by the State of California Department of Health Services (CDHS) Maximum Contaminant Level (MCL). While the CDHS has not

created MCLs for TPHg and TPHd, the RWQCB had established an ESL for both TPHg and TPHd of 100 µg/L.

### *Recommendations*

Based on these results, Ceres Associates recommended the installation of additional monitoring wells both on and off the Property to help define the limits of contamination and to assess groundwater flow direction. This additional work was conducted in February 2006.

## **February 2006 Ceres Associates Soil and Groundwater Sampling**

Ceres Associates collected on and off-site soil and groundwater samples on February 16 and 17, 2006 (Ceres Associates Project CA1264-3, report dated February 28, 2006, revised July 2006). A total of 14 borings were advanced in an effort to confirm the concentrations of contaminants at the Property as well as assess off-site migration of target compounds (labeled SB-11 through SB-24). These borings were advanced to between 8 and 20 feet bgs. Soil samples were collected every two feet, and one grab groundwater sample was collected from each boring.

Three soil samples and the grab groundwater sample from each boring were analyzed for target compounds. The soil samples were chosen for analysis according to observed field conditions (odors, colorations, capillary fringe location, and PID readings). Samples were analyzed for TPHg, TPHd, TPHmo, TPHho, VOCs, and lead (*refer to Table 4: Ceres Associates Soil and Groundwater Sampling – February 2006*).

### *Groundwater Monitoring Well Installation*

Additionally, Ceres Associates installed five groundwater monitoring wells (MW-1 through MW-5) and one extraction well that was intended for potential future remediation purposes (EX-1). The groundwater monitoring wells were installed to 15 feet bgs, with screened intervals between 5 and 15 feet bgs (except for MW-2, which was installed to 8 feet bgs, with screened interval between 3 and 8 feet bgs, this is because at 8-foot depth the drill rig operator said that there was subsurface concrete obstruction). The extraction well was similarly installed to 15 feet bgs, with a screened interval between 5 and 15 feet bgs.

### *Soil Sample Results*

Laboratory results indicated that target analyte concentrations in soil samples fell below the Residential ESL for TPHg and TPHd in all but two samples: SB12-14 at 250 mg/kg of TPHg and SB21-12 at 490 mg/kg of TPHd. Concentrations of TPHg in soil samples ranged from ND to 250 mg/kg (SB12-14); concentrations of TPHd in soil samples ranged from ND to 490 mg/kg (SB21-12); and, concentration of TPHho or TPHmo in soil samples ranged from ND to 38 mg/kg (SB20-12). Concentrations of BTEX compounds were not reported by the laboratory above the method reporting limits, except for one sample (SB14-14) at 0.0074 mg/Kg. Other VOCs were not reported above the method reporting limits for submitted soil samples. Lead concentrations were reported by the laboratory to range from ND to 51 mg/Kg.



### *Grab Groundwater Sample Results*

Hydrocarbon-affected groundwater was detected east of the Property in most of the off-site sample points. Concentrations of TPHg above the method reporting limits were reported in three grab groundwater samples: 1,500 µg/l in SB-21 (on the Property), 74 µg/l in SB-14 (east of the Property), and 51 µg/l in SB-19 (south of the Property). However, points between these sample locations were not reported above ND. The highest concentrations of TPHd were reported off-site at SB-22 at 3,600 µg/l immediately south of the Property; and at SB-13 at 1,300 µg/l, east of the Property. On-site TPHd contamination was reported as high as 910 µg/L at SB-21 located along the southern boundary of the Property. Samples further south and east of SB-21 were also reported above ND at concentrations exceeding the ESL for TPHd. Concentrations of TPHmo were detected both on and off-site (SB-13, SB-15, SB-17, SB-20, and SB-22). The highest concentration detected was 28,000 µg/l in SB-22. Concentrations of VOCs were not reported by the laboratory above their respective method reporting limits. Concentrations of lead were reported by the laboratory between ND and 17 µg/l.

Fuel oxygenates EDB and 1,2-DCA were reported as ND for all grab groundwater and soil samples submitted to the laboratory. Concentrations of BTEX compounds fell below the Maximum Contaminant Levels (MCLs) in all grab groundwater samples collected (SB-11 through SB-24).

### *Monitoring Well Sample Results*

Samples were not collected from the monitoring wells during this sampling event; however, groundwater samples were collected as part of quarterly groundwater monitoring activities (see Quarterly Groundwater Monitoring Summary below for further information regarding the results of such sampling).

### *Recommendations*

Based on the concentrations of the target analytes detected during this investigation, it was recommended that one deeper boring be advanced to 40 feet bgs to assess potential vertical contamination migration, preparing a corrective action plan, and preparing a risk assessment. This work was completed in October 2006.

## **May 2006 Ceres Associates Well Survey**

Ceres Associates prepared a well survey, dated May 15, 2006 (project CA1264-3). The survey was conducted to locate groundwater wells within a 2,000-foot radius of the Property. A total of 19 wells were identified in the search area, generally located between 1,000 and 2,000 feet from the Property. The Property is located to the west of Sausal Creek; however, all of the wells identified within the search radius are located east of Sausal Creek.

Recommendations were not made in the report, as the well survey was meant to compliment other on-going investigation reports.

## **October 2006 Ceres Associates Deeper Groundwater Sampling**

Ceres Associates advanced one soil boring (SB25) at the Property to 27 feet bgs on September 20, 2006 (refer to Figure 3 – Boring Location Map). SB25 was placed in close proximity to extraction well EX-1. The sampling was conducted per the request by the ACHCSA in a letter dated May 18, 2006. The purpose of this boring was to assess soil stratigraphy beneath the Property and to collect depth-discrete grab groundwater samples to assess the vertical extent of affected groundwater at the site.

Although the initial request by ACHCSA was to sample to 40 feet bgs, the Geoprobe® 6600 met refusal at 27 feet bgs. Other attempts were made in nearby locations (still on the Property) to exceed this depth, however these attempts were unsuccessful and also resulted in shallow borings.

Continuous soil cores were collected during the advancement of SB-25 and analyzed in the field for potential depth-discrete groundwater sampling points. Based upon the soil data, depth-discrete sample locations were planned for 13 and 21 feet bgs. A Hydro-punch® was used to collect grab groundwater samples from these depth-discrete locations.

### **Groundwater Sample Results**

The results of the groundwater sampling indicated that only one concentration of target analytes was reported above the method reporting limits: 0.84 µg/l of benzene at 21 feet bgs. This result falls below the Residential ESL of 1 µg/l for benzene.

## **August 2006 to April 2007 Ceres Associates Quarterly Groundwater Monitoring Results**

Ceres Associates has monitored the six groundwater monitoring wells on the Property (five groundwater monitoring and one extraction well) since their installation in February 2006. Wells MW-1, MW-2, MW-3, MW-4, MW-5, and EX-1 have been sampled five times: August 2006, November 2006, January 2007, April 2007, and July 2007. These wells have been sampled using low-flow purging/sampling methods.

Samples have been analyzed for various fuel and fuel related compounds, including TPHg, TPHd, TPHmo, MTBE, and BTEX using US EPA methods 8015 and 8021 (*refer to Table 6: Ceres Associates Quarterly Groundwater Monitoring – August 2006 to April 2007*). The ACHCSA requested additional compound analysis for samples collected during the Second Quarter 2007 sampling event (per the April 26, 2007 letter to Tomorrow Development) as follows: 1,2-dibromoethane (EDB), ethylene dichloride (EDC), MTBE, tert-amyl methyl ether (TAME), ethyl tert-butyl ether (ETBE), di-isopropyl ether (DIPE), Tertiary Butanol (TBA), chlorinated hydrocarbons, carbon tetrachloride, ethylene dichloride, methylene chloride, tetrachloroethane, trichloroethylene, and chloroform. These additional analytes were reported as ND by the laboratory for the groundwater samples submitted for analysis. Among the new compounds that were required by the ACHCSA during the Second Quarter 2007, only

chloroform was detected above the method reporting limits. The only “new” analytes detected were in MW-2 at a concentration of 23 µg/l chloroform, 0.51 µg/l of bromoform, 0.55 µg/l of dichlorobromomethane, and 1.5 µg/l of bromochloromethane.

The source of VOCs in MW-2 is not known. MW-1, located between the Property and MW-2, did not have concentrations of these compounds above the method reporting limits. MW-2 is screened between 3 and 8 feet bgs, in an area of the soil horizon dominated by subsurface utility trenches and lines. It is possible that these minor VOC concentrations are a result of small releases associated with these utility lines, and not that of the Property.

Based upon quarterly groundwater monitoring, elevated concentrations of target compounds in on-site groundwater are generally limited to monitoring well EX-1. Only the two wells closest to the Property, MW-1 and MW-2, have had groundwater sample results reported by the laboratory above the method reporting limits for target analytes TPHg, TPHd, TPHmo, ethylbenzene and xylenes. The highest concentrations of target analytes reported by the laboratory for quarterly groundwater monitoring are in EX-1 at 2,200 µg/l of TPHg; 800 µg/l of TPHd; 270 µg/l of TPHmo (the ESL of each petroleum compound is 100 µg/L); 1.0 µg/l of benzene; 3.9 µg/l of ethylbenzene; and 3.2 µg/l of xylenes.

### **Revised Soil Excavation Report**

To address the contaminated soil remaining at the site, Ceres Associates observed the excavation and off-haul of the affected soil. At the direction of the ACHCSA, an interim CAP was prepared to remove the contaminated soil (considered a source of petroleum hydrocarbon contamination) and replace with imported fill materials. Excavation activities to remove the contaminated backfill materials and other affected soils were completed on December 1 and 2, 2006. A total of approximately 200 cubic yards of contaminated soil was excavated and removed from the Property.

Two sidewall samples were reported to have concentrations of target compounds above the ESLs remained in place in area I. Concentrations of TPHg were reported at 450 mg/kg in I-9-W and at 600 mg/kg in sample I-9-N. Concentrations of TPHd were reported at 420 mg/kg in I-9-N. These concentrations exceed the ESL of 100 mg/kg. The sidewall area of sample I-9-W could not feasibly be excavated further because it is adjacent to the public sidewalk of east 27th Street, and would have caused undermining; and, the sidewall area of sample I-9-N could not feasibly be excavated further due to shallow groundwater intrusion issues and stabilization of the excavation wall.

The ACHCSA expressed concern over the extent of excavations and their effectiveness with respect to source removal. Based upon this, Ceres Associates advanced a total of eight borings on the Property to confirm that the excavations were effective in remediating source material both horizontally (in areas I and III) and vertically (all areas), these borings were labeled CS-1 through CS-8.

#### *Vertical Delineation*

Each excavation was extended to 9.5 feet bgs. For each excavation area, one confirmation soil sample was collected at approximately 10 feet bgs from near the center of each excavation, in undisturbed soil. These samples were intended to reflect the “floor” of the December 2006 excavations. According to the laboratory report, target analytes were not reported above the method reporting limits. It would appear that the vertical extent the excavations were sufficient for effective source removal.

#### *Horizontal Delineation - Area I*

Ceres Associates collected two soil samples from one boring (CS-5) placed within three feet of former sample I-9-N. These two samples were analyzed for TPHg, TPHd, TPHmo, BTEX, and LUFT 5 metals. Only chromium, nickel, and zinc were reported above the method reporting limits; however, the reported concentrations were within anticipated background levels. Given these results, it would appear that the horizontal extent of area I was sufficient to remove affected material. The area of I-9-W is adjacent to an impervious surface in the form of a sidewalk and roadway, therefore it is not anticipated that any residual contamination would adversely impact future surface occupants.

Although petroleum hydrocarbons were identified at slightly elevated concentrations during the excavation and subsequent confirmation sampling, the more volatile compounds (BTEX compounds) were not identified above the ESLs. Further, concentrations of target compounds are not thought to pose a significant soil vapor intrusion risk to future buildings on the Property, based upon a comparison of soil and groundwater concentrations reported on-site to published screening levels. Residual contaminants were anticipated to naturally attenuate over time to concentrations below the ESLs.

#### *Horizontal Delineation - Former Waste Oil Area*

The ACHCSA requested additional analysis of the outer walls of excavation Area III, where a former waste-oil UST was located. In complying with the ACHCSA request, the laboratory analyzed the samples submitted from CS1 through CS4 (the 5 and 10-foot sample for each boring) for oil and grease, chlorinated hydrocarbons, 1,4-dioxane, EDB, EDC, MTBE, TAME, ETBE, DIPE, TBE, ethanol, LUFT 5 metals, PCBs, and PNAs. The laboratory did not report concentrations above the method reporting limits for these specified analytes, except for 5.9 mg/kg of TPHmo at 5 feet bgs in CS-4 (the southwest wall of excavation Area III). That concentration is below the Residential ESL of 500 mg/Kg for TPHmo. It would appear that the removal of source material in Area III was effective and sufficient.

### **February 2008, Ceres Associates Soil Vapor Sampling and Backfill Soil Sampling Report**

#### *Soil Vapor Sampling*

Ceres Associates advanced a total of six borings on the Property in the area of the proposed residences (SV-01 through SV-06); three from the footprint of each planned residence. A duplicate sample was taken of sample SV-04, (SV-04DUP) to verify the laboratory results. Each of the samples was collected from a depth of three feet.

Ceres Associates advanced a total of two borings on the Property using hand auger equipment in the area of the backfilled materials

Soil vapor samples were collected from a depth of three feet below ground surface. The original intent was to collect vapor from five beet bgs, however, it was found that soil was either too “tight” to collect an adequate sample or that groundwater was present at that depth. One vapor sample (SV-02) was reported to contain 8.4  $\mu\text{g/l}$  of TPHg. This concentration falls below the ESL for residential land use scenarios of 10.0  $\mu\text{g/l}$  for TPHg. Concentrations of MBTEX compounds and TPHd were reported as ND in all borings advanced on the Property.

The analytical laboratory reported that VOCs (8260B list) were all ND except for SV-04, which was reported to contain 5.7  $\mu\text{g/l}$  of trichloroethene (TCE). This concentration exceeds the ESL for residential land use scenarios of 1.2  $\mu\text{g/l}$ . Based upon initial analysis, Ceres Associates collected a duplicate sample from the same boring, which was reported by the laboratory to contain 3.4  $\mu\text{g/l}$ . Boring SV-04 was placed in close proximity to the former waste oil tank excavation (to the southwest of the former excavation).

#### *Backfill Soil Samples*

Using a hand auger, two soil borings were advanced in the backfill material. Soil sample results were reported well below their respective ESLs for those analytes requested by ACHCSA for the backfill soil material.

**Appendix B**

**LABORATORY  
ANALYTICAL DATA REPORT**