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November 6, 2015

Mr. Jerry Wickham
Senior Hazardous Materials Specialist
Alameda County Health Care Services Agency
Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Re: Terradev Jefferson LLC Property
645 Fourth Street, Oakland, CA 94607
Fuel Leak Case No. RO0003001
Blue Rock Project No. ASE-1

Dear Mr. Wickham,

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

Sincerely,

Sara May
Director of Operations
Metrovation, LLC, managing agent for
Terradev Jefferson, LLC

Attachment:

Blue Rock Environmental, Inc.'s *Sub-Slab Vapor Point Installation and Sampling Report* dated November 6, 2015.

OAKLAND IRONWORKS BUILDING
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BLUE ROCK ENVIRONMENTAL, INC.

Mr. Jerry Wickham
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Alameda, CA 94502

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Re: Sub-Slab Vapor Point Installation and Sampling Report
Terradev Jefferson LLC Property
645 4th Street, Oakland, CA 94607
Fuel Leak Case No. RO0003001
Blue Rock Project No. ASE-1

Dear Mr. Wickham,

This report, prepared by Blue Rock Environmental, Inc. (Blue Rock) on behalf of Terradev Jefferson, LLC, presents a results of the installation and sampling of two additional sub-slab vapor sampling points within the buildings of 645 4th Street and 380 Martin Luther King Jr. Way (MLK Jr. Way), which was proposed in the *Workplan for Additional Site Characterization, Sub-Slab Vapor Sampling, and Indoor Air Sampling* dated June 17, 2015, which was approved by the Alameda County Environmental Health Services (ACEHS) in a letter dated July 13, 2015.

Background

Site Description and UST Discovery / Removal

The site is located southeast of the intersection of 4th Street and MLK Jr. Way in Oakland, California (Figures 1 and 2a). The site consists of a single story commercial building, bounded closely on the sides and back by other commercial buildings. One single-walled steel underground storage tank (UST) was discovered beneath the sidewalk immediately adjacent to the front of the building during renovation in 2006 (Figure 2a/b).

Phase I Environmental Site Assessments completed in support of the purchase (1999) and for refinancing (2006) indicated that no sign of a UST was observed during associated site inspections. The Phase I author also interviewed persons knowledgeable with the property from the 1950s until the time of the Phase I, and the interviewees could recollect no UST being used during the period of their familiarity.

A review of Sanborn Fire Insurance Maps revealed no evidence of subject site use that would potentially require a UST, and as such it is difficult to discern precisely when the tank was installed or operated. Based on the Phase I interviews, it is assumed the tank was installed and last used prior to the 1950s. State and local regulations require the proper abandonment of tanks that are no longer used to store or dispense fuels, thus the tank abandonment work was performed after its discovery in 2006.

According to Golden Gate Tank Removal, Inc. (Golden Gate), after consultation with the City of Oakland, it was determined that building structural considerations prohibited physical tank removal and that in-place abandonment was the appropriate means to close the subject UST. Therefore, Golden Gate abandoned the UST in-place by triple washing followed by filling it to capacity with concrete slurry on September 5, 2006. Abandonment was performed with the permission and under the oversight of the City of Oakland Fire Prevention Bureau. Details of this event are presented in Golden Gate's *Tank Closure Report* dated September 21, 2006.

Golden Gate reported that the UST contained gasoline with an approximate holding capacity of 1,000-gallons, measuring approximately 10 feet in length and 4 feet in diameter. The bottom of the UST was estimated to be located 7.5 to 8 feet below ground surface (ft bgs). The fill port was reported to be located at the west end of the tank.

At the direction of the Oakland Fire Department, two holes were cored in the bottom of the cleaned tank prior to its abandonment to enable the collection of samples of underlying material. Golden Gate reported that the soil beneath the tank was wet, but that groundwater was not encountered. Soil samples were collected at a depth of 9 ft bgs. The samples were analyzed for concentrations of total petroleum hydrocarbons as diesel (TPHd), gasoline (TPHg), benzene, toluene, ethylbenzene, and xylenes (BTEX), and the five fuel oxygenates (MTBE, TBA, ETBE, DIPE, and TAME). Results of analysis indicated the presence of residual fuel hydrocarbons in both samples, with concentrations higher in the sample collected from the western end of the tank. This sample contained TPHg at 10,000 mg/kg and benzene at 130 mg/kg.

<u>Geophysical Survey for Other Potential Tanks</u>
In August 2014, Blue Rock supervised Norcal Geophysical Consultants, Inc. (Norcal) in performance of the geophysical survey of the sidewalk area around the subject UST to evaluate the presence of other potential UST(s). The area investigated was approximately 90 feet long by 17 feet wide encompassing the location of the subject UST. Techniques employed consisted of electromagnetic survey and ground penetrating radar. No anomalous survey results suggestive of additional USTs were found in the search area. The results of that work were presented in Blue Rock's *Report for Geophysical Survey and Additional Site Characterization Workplan* dated September 18, 2014.

Summary of Investigation Activities

Subsurface investigation began in 2009. A total of 10 soil borings have been drilled (B-1 through B-6, CB-1, CB-2, SB-7, and SB-8) and nine passive sample modules deployed (S-1 through S-9). Additionally, three extraction wells (DPE-1 through DPE-3) and three sub-slab soil vapor points (VP-1 through VP-3) have been installed at the site (Figure 2a/b). A summary of well construction details is included in Table 1, and summaries of soil, groundwater, sub-slab soil vapor, and passive sample module analytical data are included in Tables 2, 3, 4, and 5, respectively.

Physiography and Hydrogeology

The subject site is located in a commercial/industrial neighborhood along the San Francisco Bay-Margin. The site is set at an elevation of approximately 16 feet above mean sea level (ft msl) and local topography dips gently in a southerly direction toward the Oakland Inner Harbor, which is located approximately 1,250 feet from the subject UST (Figure 1).

The site is underlain predominantly by varying gradations of sand. The upper six feet generally consists of a brown sand (SP-SM), which has been interpreted as fill material. Native soil underlying the fill consists of a gray and yellow-brown sandy clay (CL) unit from approximately 6 – 7 ft bgs and a mottled red-brown and gray clayey sand (SC) from approximately 7 – 14 ft bgs, a brown sand (SP) from approximately 14 – 16 ft bgs, and gray clayey sand (SC) from approximately 16 – 20 ft bgs, the maximum depth explored.

Groundwater is present in unconfined conditions at a depth of approximately 9 ft bgs. Based on data from the nearby Allen Property site, groundwater flows in a southerly direction towards the Oakland Inner Harbor, with calculated flow direction from individual monitoring events ranging from south-southwesterly, southerly, to south-southeasterly.

Potential Constituents of Concern

Gasoline range hydrocarbons are present in soil and groundwater proximal to the abandoned UST. Specific compounds that have been detected in soil or groundwater at the source area include: TPHd, TPHg, BTEX, MTBE, TBA, 1,2-dichloroethane (1,2-DCA), 1,2-dibromoethane (EDB), and naphthalene.

The addition of MTBE to gasoline began as early as 1979, and its use became ubiquitous in California by March 1996 to meet Clean Air Act standards at that time. However, its use in California was banned as of January 1, 2004. Although it is uncertain when the subject UST was removed from service, it is not expected to have been in service during MTBE's lifespan as a gasoline additive in California.

Nearby Leaking UST Sites and Other Potential Petroleum Sources

The "Grove Auto Repair" (Global ID T06000101350) case is located upgradient of the subject site at the southeast corner of 5th Street and MLK Jr. Way (Figure 2a). Sanborn maps indicate that property was used as a gasoline station from at least the early 1950s. ACEHS file documents indicate that five USTs (two 4,000-galllon, two 6,000-gallon, and one 550-gallon capacities) were removed in 1983. In 1988, approximately 1,000 cubic yards of soil were excavated from the former UST area and disposed off-site. The Grove Auto Repair case received regulatory closure in 1993. It is notable the area of the former southern dispenser island does not appear to have been investigated, nor was the southerly extent of dissolved-phase fuel hydrocarbons detected in former well MW-3 ever delineated in the direction of the subject site.

The "Allen Property" case (Global ID T0600108713) is located at the southwest corner of 4th Street and MLK Jr. Way. The Allen Property UST (10,000-gallon capacity) was abandoned in-place in 1993 (Figure 2a). The site received regulatory case closure in 2014. The lateral extent of the Allen Property dissolved-phase fuel plume was delineated in the direction of the subject site by Allen well MW-2.

A database records search map also shows an "Oil/Gas" pipeline running down the west side of MLK Jr. Way; however, the specific product conveyed in the pipeline is unknown. Additional research is needed to evaluate if this feature as a potential source of subsurface petroleum impact in the area of the site.

Secondary Source Removal

Amicus Environmental evaluated investigative and remedial options available at the site in their September 13, 2009 correspondence. It was noted that corrective actions would be necessarily constrained by the location of the abandoned UST relative to existing development - i.e. conventional soil and groundwater assessment proximally downgradient is prohibited, inadequate space to build a traditional fixed in-situ remediation system, and remedial excavation would undermine the existing building. Yet the persistence of elevated concentrations of gasoline range hydrocarbons in the subsurface merited remedial action. As a result, the use of mobile high-vacuum extraction (HVDPE) equipment was recommended as an aggressive approach to reduce the remaining gasoline mass in the vicinity of the UST for which details were proposed in the *Removal Action Workplan* dated February 3, 2010, which was conditionally approved by the ACEHS in a letter dated February 19, 2010.

First High-Vacuum Dual-Phase Extraction Event (September-October 2010)

An initial mobile HVDPE remedial event was performed at the site from September 28 to October 3, 2010 (5 days). The event was completed using a truck-mounted unit consisting of a 25-horsepower oil sealed liquid-ring pump capable of producing 29 "Hg vacuum, and a thermal oxidizer capable of treating an air flow of approximately 450 ACFM. Wells DPE-1, DPE-2, and DPE-3 were used as extraction wells. A stinger hose was lowered into each well through a vacuum tight cap and placed approximately one foot off the bottom of each well. Depth to water at the beginning of the event was approximately 9.5 ft bgs in all three wells. At the beginning of the event, influent TPHg levels at individual wells ranged from 1,700 ppmv to 3,530 ppmv; however, they dropped to less 1,000 ppmv by the end of the event. The total average hydrocarbon mass recovered was **174 lbs** (based on 122 lbs calculated from field PID data and 225 lbs calculated from lab data), which equates to an average removal rate of nearly 35 lbs/day.

Second High-Vacuum Dual-Phase Extraction Event (July 2012)

A second mobile HVDPE remedial event was performed at the site from July 9 to 24, 2012 (15 days). The event was completed using a truck-mounted unit consisting of a 25-horsepower oil sealed liquid-ring pump capable of producing 29 "Hg vacuum, and a thermal oxidizer capable of treating an air flow of approximately 450 ACFM. Wells DPE-1 and DPE-2 were used as primary extraction wells, as they proved to be the most productive. A stinger hose was lowered into each well through a vacuum tight cap and placed approximately one foot off the bottom of each well. Depth to water at the beginning of the event was approximately 9 ft bgs, and the no free-product was observed in any of the wells. At the start of event, the total influent TPHg level was 1,200 ppmv and declined to 430 ppmv by the end. The ending mass removal rate was estimated to be approximately 11 lbs/day. Blue Rock estimated the total average hydrocarbon mass recovered was approximately **249 lbs** (based on 199 lbs calculated from field PID data and 298 lbs calculated from lab data). The HVDPE unit provider (CalClean) estimated the total average hydrocarbon mass recovered was approximately **166 lbs** (based on 130 lbs calculated from field PID data and 191 lbs calculated from lab data). The difference between the mass removal estimates appears to be due to the fact that Blue Rock used flowrates from the manufacturer's blower curve based on the measured vacuum and Calclean used flowrates measured in the field with an inline flowmeter.

Cumulative Secondary Source Removal Efforts

A total hydrocarbon mass of approximately **340 to 423 lbs** has been removed by both the 2010 and 2012 events. At the beginning of the 2010 event, total inlet concentrations were 1,660 ppmv resulting in an extraction rate of approximately 90 lbs/day. By the end of the 2012 event, total inlet concentrations had declined to 430 ppmv and the extraction was approximately 10 lbs/day. Based on these data, it appears the use mobile HVDPE may have reached its effective limit and the mass appears to have been removed to the extent practicable. Additional use of mobile HVDPE may not be cost effective.

Free-Product Occurrence and Removal

Free-product was measured once in DPE-3 at a thickness of 0.13-feet in January 2011. However, following the second HVDPE event, no measurable thicknesses of free product have been observed in any of the wells.

Evaluation of Secondary Source Removal / Reduction

As presented in Blue Rock's March 11, 2013 report, a comparison of pre- and post-remedial soil quality proximal to the abandoned UST was intended to serve as a proxy for removal / reduction of the secondary source mass. The results of confirmation soil sampling are shown below.

West Side of UST			
Sample ID	Pre-remedial TPHg (mg/kg)	Post-Remedial TPHg (mg/kg)	CB-1 Sample ID
DPE-1-7.5'	6,500	<1.0	CB-1-7.5'
EX-W-9'	10,000	1,200	CB-1-9'
DPE-1-12'	2,300	14,000	CB-1-12'
DPE-1-15'	770	1,000	CB-1-15'

East Side of UST			
Sample ID	Pre-remedial TPHg (mg/kg)	Post-Remedial TPHg (mg/kg)	CB-2 Sample ID
DPE-2-6'	1.2	No sample	
EX-E-9'	920	840	CB-2-9'
DPE-2-11'	160,000	2,700	CB-2-11'
DPE-2-15'	430	380	CB-2-15'

TPHg concentrations in the upper 11 feet of soil were lower compared to pre-remedial levels, while concentrations at a depth of 12 feet and below were similar to, or higher, than pre-remedial levels. The reduction in concentrations in the upper 11 feet is expected based on historical depth to water and temporary local dewatering during the HVDPE events. Static depth to water is approximately 9 ft bgs and the intake hoses were placed at a depth of approximately 14 ft bgs in DPE-3 and 14 ft bgs in DPE-1 / DPE-2 during HVDPE extraction (i.e. one foot off the bottom of the well casing). The combined effect of the naturally occurring vadose zone and depressed water levels in each extraction well likely facilitated better vapor flow, and therefore mass removal, in the upper 11 feet of the soil column relative to soil deeper in the saturated zone. These results are indicative of secondary source reduction primarily in the upper 11 feet of the soil column.

Previous Evaluation of Risk to Potentially Sensitive Receptors

In September 2012 and January 2014, Blue Rock sampled three sub-slab soil vapor points (VP-1 through VP-3) inside the building adjacent to the closed UST (Figure 2a/b). The points are located between approximately 6 and 38 feet south to southeast of the UST. Tracer gas (helium) leakage was minimal (i.e. equal to or less than 1%) during these events. Neither TPHg, BTEX, MTBE, naphthalene, 1,2-DCA, nor EDB were detected in any of the three samples. The results are shown on Table 4 relative to sub-slab soil gas screening levels, derived from indoor air screening levels using the attenuation factor recommended in the current guidance documents. The basis for the indoor air screening levels from the *User's Guide: Derivation of and Application of Environmental Screening Levels – Interim Final (SFBRWQCB 2013)* and *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties (CALEPA 2005)*. The method reporting limits for the sub-slab soil vapor samples from VP-1 through VP-3 are generally below or within one of magnitude of the lowest calculated screening level. Based on this, and the fact that all constituents were non-detect in the subject samples, Blue Rock interprets that there is no risk to indoor air in the area of VP-1, VP-2, and VP-3.

Groundwater beneath this area of Oakland is not presently used for beneficial purposes (consumption or irrigation). Additionally, it is reasonable to assume that the shallowest water-bearing zone in the vicinity of the subject site will plausibly not be used for beneficial consumption for the indeterminate future, if ever (in terms of City habitation). The residual hydrocarbons in groundwater do not, therefore, pose a threat to human health via consumption. Drinking water is supplied to the site vicinity by East Bay Municipal Utility District.

Evaluation of Potential Preferential Pathways

As requested in the ACEHS letter of April 22, 2015, Blue Rock researched the locations and depths of subsurface utilities in the area of closed UST and 4th Street that may serve as preferential pathways for plume migration.

The locations of utilities proximal to the closed UST were previously identified by subsurface investigation work and survey for potential nearby USTs (discussed above). The utilities mapped below the sidewalk adjacent to 645 4th Street are all located within the upper 5 feet based on the limitations of the geophysical survey equipment used. Utility burial depth within the upper 5 feet is typical for lateral or service utility lines below sidewalks. The depth to groundwater is approximately 9 ft bgs and the shallowest significant soil impact in the area of the closed tank is deeper than 5 ft bgs; therefore, the utility conduits below the sidewalk do not appear to serve as preferential pathways for plume migration.

Several utility lines run below 4th Street and the northern sidewalk, which include water, electrical, high pressure natural gas, communication, and sanitary sewer lines. Due to the fact that the petroleum affected soil and groundwater interval in the area of SB-7 and SB-8 is greater than 5 ft bgs and that depth to groundwater is approximately 9 ft bgs, the details of the sanitary sewer lines were further researched because these are typically the deepest utility lines. City of Oakland maps show a sanitary sewer main line below the center of 4th Street, with flow direction indicated as west-northwesterly to toward MLK Jr. Way. Information on maps suggests that the depth of the sewer main along 4th Street may range from approximately 10 to 15 ft bgs. It appears that the sanitary sewer line in 4th Street may intersect the petroleum affected soil and groundwater encountered in the area of SB-7 and SB-8.

Extent of Remaining Subsurface Impacts

Gasoline range hydrocarbons remain in soil and groundwater in the location of the subject UST. The upgradient extent of this impact remains undelineated beyond the center of 4th Street, where samples collected 30 to 40 feet upgradient of the closed UST contained TPHg concentrations of 250,000 μg/L (SB-7) and 180,000 μg/L (SB-8) (Figure 3). The ACEHS interpreted these concentrations to be the result of free-product that originated from the subject UST spreading laterally along the water table surface. While this mechanism of transport is possible, the observation that there is no attenuation of dissolved-phase concentrations from the subject UST to locations 30 to 40 feet ungradient suggests the possibility of a gasoline source further upgradient. Additional soil and groundwater sampling is planned on the BART property upgradient of the site to resolve this Conceptual Site Model uncertainty.

Information gathered from the passive soil gas sample survey appear to indicate that gasoline impact to the subsurface extends uninterrupted from the middle of 4th Street (i.e. SB-7 and SB-8) southerly (as documented by S-6, S-5, and S-3) to the interior atrium (where B-6 is located). Based on the widespread gasoline detections observed in the passive samplers, Blue Rock interprets this to be representative of gasoline plume in shallow groundwater, and possibly associated soil impact at the vadose zone/water table interface. The extent of this impact remains undefined south and southwest of boring B-6. Additional soil and groundwater sampling is planned in 3rd Street and within the Oakland Metro Operahouse to define the extent of subsurface impacts in that direction.

The lateral extent of groundwater impact has been defined to the southeast of the subject UST by grab groundwater samples from borings B-3, B-4, and B-5, which were drilled inside interior service hallways with concrete floors, and to the northwest by Allen Property well MW-2.

Additional Sub-Slab Vapor Point Installation, Sampling, and Analysis

Purpose and Scope
The purpose of the installation and sampling of additional sub-slab vapor points was to evaluate sub-slab vapor quality in locations where the highest concentrations of benzene were detected during an earlier phase of site characterization, which included the areas of (1) passive sample points S-2, S-3, and S-5, and (2) passive sample point S-8. Sub-slab vapor point VP-4 was installed in center of 645 4th Street interior space, centered within the locations of passive sample points S-2, S-3, and S-5, and sub-slab vapor point VP-5 was installed in the center of 380 MLK Jr. Way interior space, adjacent to passive sample point S-8. These points are located within buildings currently occupied by commercial tenants. Therefore, sample point installation and sampling activities occurred on the weekends, so as to minimize disruption to their businesses.

Sub-Slab Vapor Point Installation
On August 29, 2015, Blue Rock installed the sub-slab vapor points VP-4 and VP-5. A 1-5/8-inch diameter hole was drilled through the concrete slab in each location. Slab thickness was found to be approximately 5.5 inches. The vapor probes consist of ¼-inch diameter stainless steel tubing with a 3-inch long stainless steel screened interval at the bottom. Total probe depths were approximately 9 inches below surface. A 3-inch layer of hydrated bentonite was placed in the annular space above the screen, and a 2-inch layer of neat cement was placed in the annular space above that to seal the point. The surface of each probe is protected by a flush-mounted, tamper-resistant stainless steel top cap. The vapor points were allowed to equilibrate for one week prior to sampling.

Sub-Slab Vapor Point Purging and Sampling
On September 6, 2015, Blue Rock purged and sampled the two new sub-slab vapor points VP-4 and VP-5. During the previous five days no significant rainfall occurred (defined as an event of a half inch or greater).

The sample train for soil vapor sampling consisted of tubing, connectors, valves, and vacuum canisters (Figure 3). All gauges and canisters were connected by laboratory-supplied stainless steel tubing and dedicated flexible Teflon or nylon tubing. The sample train was assembled using dedicated ¼-inch (outer diameter) tubing for all vapor sampling. Swagelok® connectors were used for all connections between tubing and other sampling components. A flow regulator of 100 – 200 mL/min was placed in-line between the manifold and the downhole side Swagelok® valve. Sampling equipment was inspected to ensure tight fittings between all components. A transparent shroud was placed over each vapor point and sampling train to create an atmosphere with elevated helium concentrations for leak checking.

Leak Testing and Tracer Gas

The sampling manifold was leak tested by inducing a vacuum on the manifold. In preparation for manifold leak testing, the downhole side Swagelok® valve remained closed, as did the valves going to the purge and sample ends of the sample train. To commence leak testing, an electric air pump was connected to the purge valve end of the sample train. The purge valve was opened and the air pump turned on to induce a vacuum of approximately 30" Hg on the assembly, and the purge valve was closed again. The vacuum on the manifold assembly was monitored for at least 15 minutes. The manifold was considered to have passed the leak test if vacuum was maintained for at least 15 minutes with <0.2" Hg vacuum loss. After ensuring that all connections between the purge and sample valves, flow controller, and sample manifold were tight, soil vapor purging and sampling activities were performed.

During sample collection, helium (He) was used as a tracer gas to test for air leakage into the sampling system. The inner-shroud environment was enriched with helium supplied by a cylinder. The helium concentration inside the shroud was maintained at a minimum of 5% to 10%, so as to have detectable levels of tracer gas should leakage into the sampling train occur.

Sub-Slab Vapor Point Purging

Prior to collecting a vapor sample, the sub-slab vapor points were purged to ensure that the vapor samples are representative of actual sub-slab concentrations. The dead-space volume for each vapor probe is approximately 0.02-liters (i.e. the total volume of casing, annular pore space, and sample train tubing). Although a purge step-test is recommended by guidance documents, it cannot be practically completed in a single field day with these sub-slab vapor points due to the comparatively small dead-space volume of 0.02-liters relative to the sample canister volume of 1-liter. In other words, the collection of a single sample volume is significantly greater than the commonly used step-test purge volumes. For the purpose of this sampling, approximately three dead-space volumes (or 0.06–liters) were purged using an electric air pump and known flow limits of the manifold regulators. Based on the flow limiter parameters described above, three dead-space volumes were purged from each point after approximately 30 seconds. After purging was completed, the sample train purge valve was closed in preparation for sample collection.

Sub-Slab Vapor Point Sampling

The laboratory supplied the flow controller and sample canisters. The initial and final vacuum, start and finish times, and helium tracer gas percentages inside the shroud were documented (see attached field sheets).

All samples were collected in clean, laboratory-supplied 1-liter Summa® canisters immediately after purging. Each sample canister had a starting vacuum of approximately 29.5 to 30 "Hg. To collect a sample, the valve on the sample Summa® canister was opened and the time and initial vacuum documented. As the canister was being filled, the vacuum gauge on the flow controller was observed to ensure that the vacuum in the canister was decreasing over time. When the vacuum on the sample canister decreased to approximately 5 "Hg, the valve was closed and sampling ended. Helium tracer gas concentrations were monitored inside the shroud during sample collection using a field meter. Helium concentrations in the shroud for this entire sampling event ranged from 5.8% to 8.2%.

Sub-Slab Vapor Sample Analysis

The samples were labeled, documented on a chain-of-custody form, and transported to Analytical Sciences for analysis.

The soil vapor samples were analyzed by Analytical Sciences for concentrations of:

- TPHg, BTEX, and MTBE by modified EPA Method TO-15
- Naphthalene, 1,2-DCA, EDB by modified EPA Method TO-15
- Helium, Oxygen, Carbon Dioxide, and Methane by Modified ASTM D-1946

Vapor Point Air Sample Analytical Results

Concentrations of TPHg were detected in samples from VP-4 and VP-5, and BTEX was detected in the sample from VP-5 only (Table 4). Neither MTBE, naphthalene, 1,2-DCA, nor EDB were detected in either sample (Table 4). It is noteworthy that the reporting detection limits were elevated for both samples.

Helium tracer gas was only detected in the sample from VP-4 at a concentration of 0.004%. The concentration of helium in the sample divided by the concentration of helium in the shroud provides a measure of the proportion of the sample attributable to leakage (multiplied by 100 to convert to percent). In this case that equates to a leak of 0.06% for VP-4 - is well below the acceptable upper limit of 5%. Therefore, the results are considered reliable for the purpose of evaluating potential VI risk. Sub-slab vapor sampling data are shown in Table 4, and copies of the laboratory report and chain-of-custody form are attached.

Data Evaluation

As recommended in the CalEPA/DTSC *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* dated October 2011, sub-slab vapor data should be evaluated using an attenuation factor for potential migration to indoor air. The attenuation factor (α) of sub-slab soil gas to indoor air concentrations is defined by the following equation:

$$\alpha = \text{Concentration (indoor air)} / \text{Concentration (sub-slab soil gas)}.$$

The guidance document identifies an attenuation rate of 0.05 for both residential and commercial scenarios. Therefore, the resulting screening level for sub-slab soil gas samples is defined by the following equation:

$$\text{Screening level (sub-slab soil gas)} = \text{Screening level (indoor air)} / 0.05$$

The indoor air screening levels shown in the *User's Guide: Derivation of and Application of Environmental Screening Levels – Interim Final (SFBRWQCB 2013)* and *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties (CALEPA 2005)* were used to calculate sub-slab vapor screening levels using the attenuation rate of 0.05. The indoor air screening levels and calculated sub-slab soil vapor screening levels are shown in Table 4.

The constituents detected in VP-4 and VP-5 exceed the calculated sub-slab vapor screening levels, and reporting limits for compounds not detected were also above the calculated screening levels.

Recommendations

Based on the exceedance of the calculated sub-slab vapor screening levels in VP-4 and VP-5, Blue Rock recommends initiating the contingency plan for indoor air sampling, as proposed in the workplan dated June 15, 2015. Blue Rock proposes to collect indoor air samples from the interior spaces of 645 4th Street, 380 MLK Jr. Way, and 638 3rd Street in addition to an ambient outdoor air sample from an upwind location on the roof of the building.

Concurrently, other approved investigation activities will be undertaken, as permits are obtained. This includes additional soil and groundwater sampling on the BART property north of the site, on the 3rd Street right-of-way, and within the interior space of Oakland Metro Operahouse.

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Certification

This report was prepared under the supervision of a California Professional Geologist at Blue Rock. All statements, conclusions, and recommendations are based upon published results from past consultants, field observations by Blue Rock, and analyses performed by a state-certified laboratory as they relate to the time, location, and depth of points sampled by Blue Rock. Interpretation of data, including spatial distribution and temporal trends, are based on commonly used geologic and scientific principles. It is possible that interpretations, conclusions, and recommendations presented in this report may change, as additional data become available and/or regulations change.

Information and interpretation presented herein are for the sole use of the client and regulating agency. The information and interpretation contained in this document should not be relied upon by a third party.

The service performed by Blue Rock has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the area of the site. No other warranty, expressed or implied, is made.

If you have any questions regarding this project, please contact us at (650) 522-9292.

Sincerely,
Blue Rock Environmental, Inc.

PROFESSIONAL GEOLOGIST
BRIAN M. GWINN
No 6505
Exp. 4/30/17
STATE OF CALIFORNIA

Brian Gwinn, PG
Principal Geologist

Attachments:

Figure 1: Site Location Map
Figure 2a: Site Plan
Figure 2b; Detailed Site Plan with Utility Lines
Figure 3: Soil Gas Sampling Apparatus

Table 1: Well Construction Data
Table 2: Soil Sample Analytical Data
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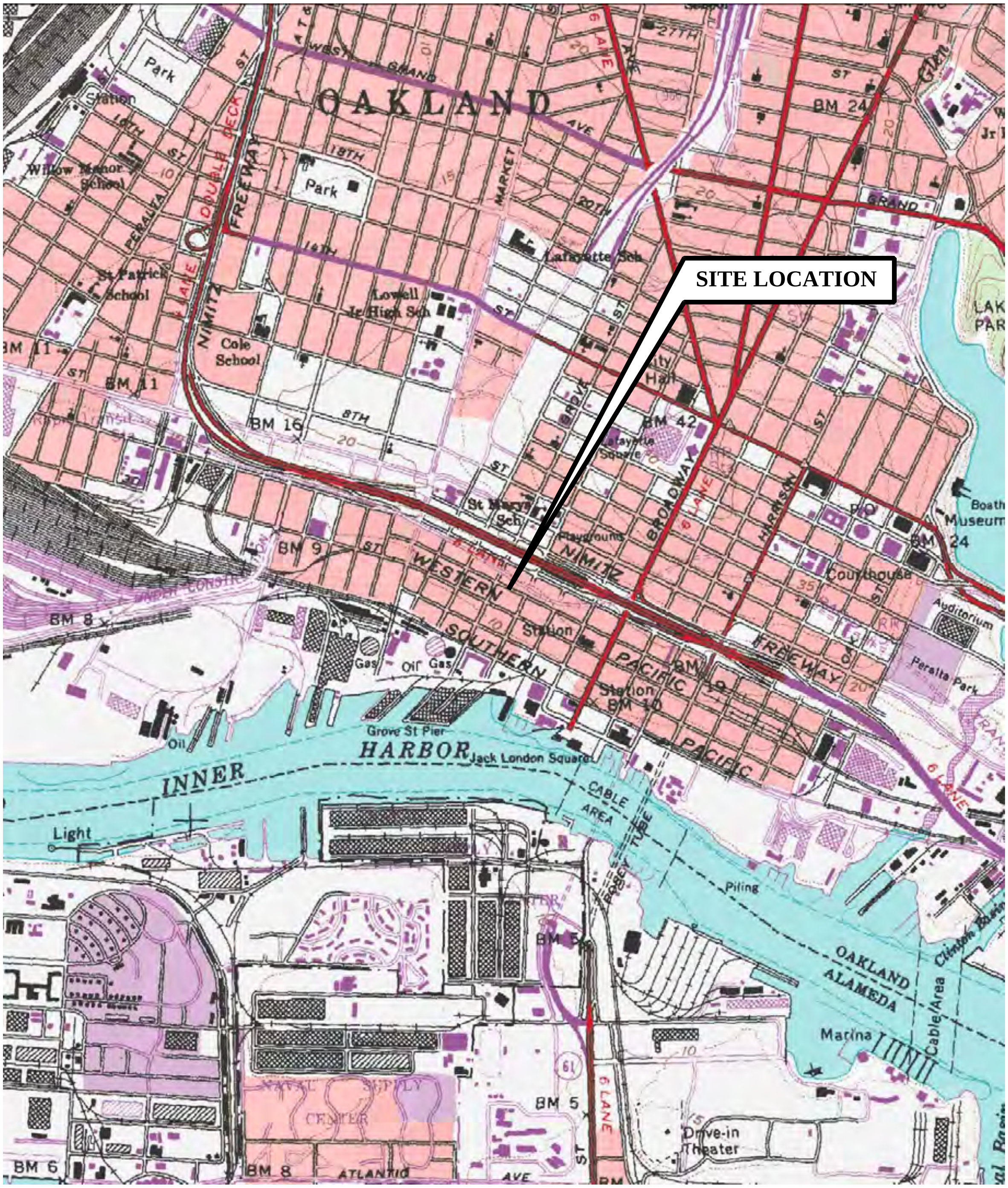
Blue Rock Sub-Slab Soil Gas Field Sampling Notes (10/6/15)

Laboratory Report and Chain-of-Custody Form

Distribution:

Ms. Sara May, Metrovation, 580 Second St. Suite 260, Oakland, CA 94607



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APPROX. SCALE IN FEET

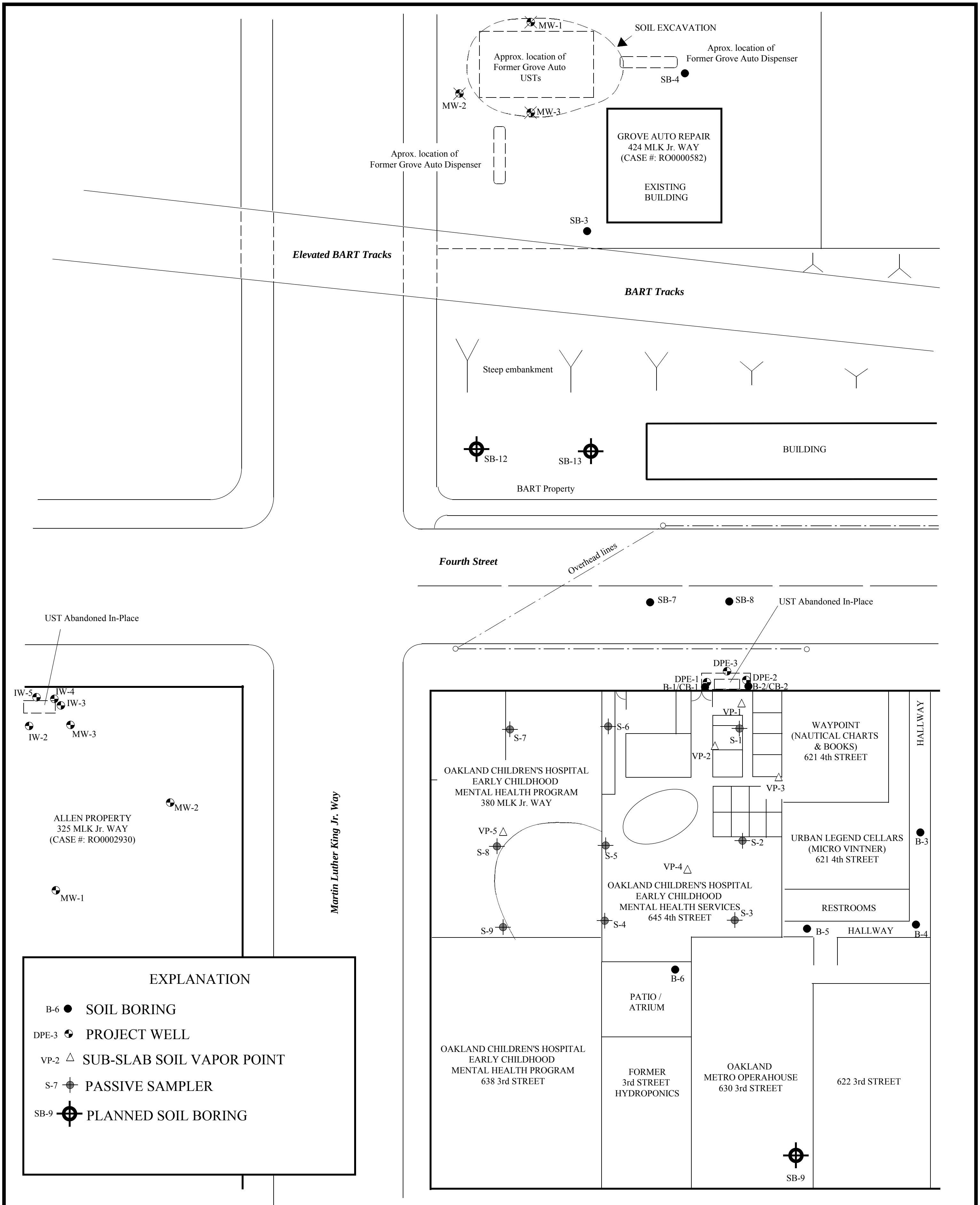
N

SOURCE: MyTopo.com

SITE LOCATION MAP
Terradev Jefferson LLC Property
645 Fourth St.
Oakland, CA

BLUE ROCK
ENVIRONMENTAL, INC.

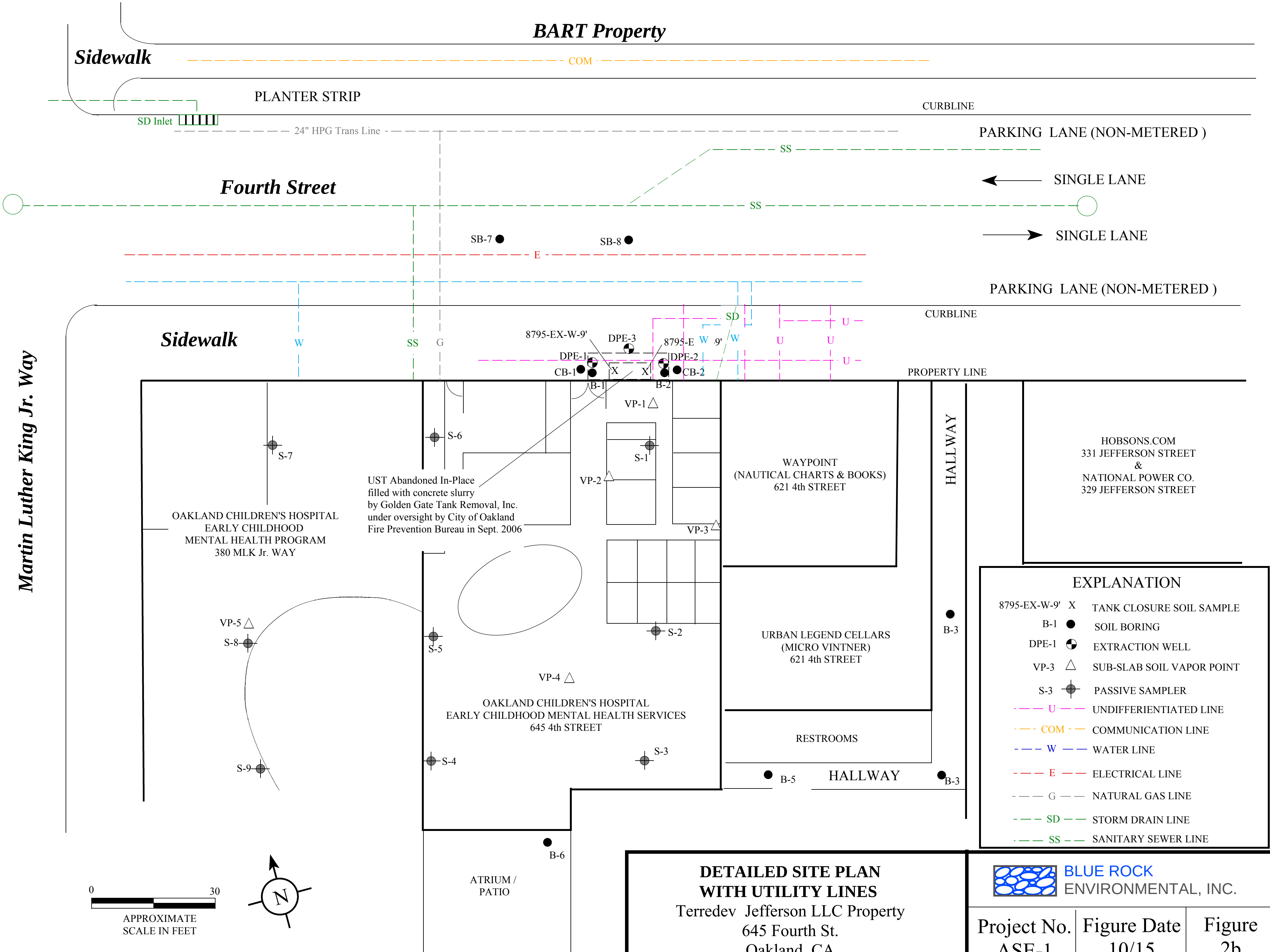
Project No.	Figure Date	Figure
ASE-1	10/10	1



SITE PLAN
Terredev Jefferson LLC Property
645 Fourth St.
Oakland, CA

BLUE ROCK
ENVIRONMENTAL, INC.

Project No.	Figure Date	Figure
ASE-1	10/15	2a

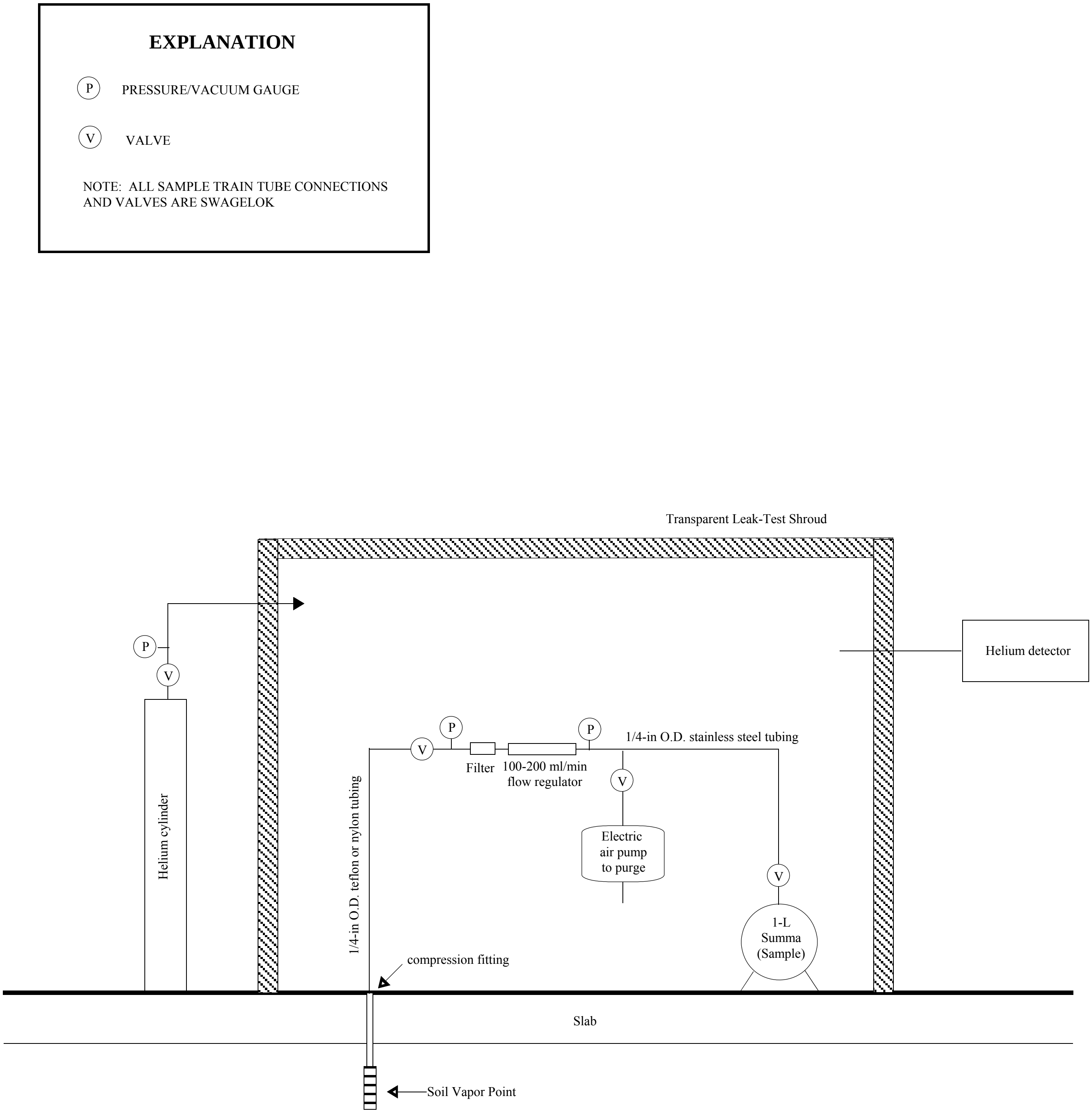


DETAILED SITE PLAN WITH UTILITY LINES

Terredev Jefferson LLC Property
645 Fourth St.
Oakland, CA

BLUE ROCK ENVIRONMENTAL, INC.

Project No.	Figure Date	Figure
ASE-1	10/15	2b



NOT TO SCALE

SOIL GAS SAMPLING APPARATUS
Terradev Jefferson LLC
645 4th St.
Oakland, California

BLUE ROCK ENVIRONMENTAL, INC.

Project No.	Figure Date	Figure
ASE-1	10/15	3

TABLE 1
Well Construction Data
Terradev Jefferson, LLC Property
645 Fourth Street
Oakland, CA

Extraction Wells

Well ID	Date Installed	Total Boring Depth (ft bgs)	Casing Diameter (inches)	Screen Depth (ft bgs)	Sandpack Depth (ft bgs)	Bentonite Depth (ft bgs)	Cement Grout Depth (ft bgs)
DPE-1	9/20/10	15	2	8 - 15	7 - 15	5 - 7	0 - 5
DPE-2	9/20/10	15	2	8 - 15	7 - 15	5 - 7	0 - 5
DPE-3	9/20/10	10	2	6 - 10	5 - 10	3 - 5	0 - 3

Vapor Probes

Well ID	Date Installed	Total Probe Depth (in bgs)	Tubing Diameter (inches)	Slab Thickness (in bgs)	Screen Depth (in bgs)	Rubber Plug / Bentonite (in bgs)	Cement Depth (in bgs)
VP-1	6/16/12	9	0.25	6.0	6 - 9	5.0 - 6.0	0 - 5
VP-2	6/16/12	9	0.25	4.5	6 - 9	3.5 - 4.5	0 - 3.5
VP-3	6/16/12	9	0.25	4.0	6 - 9	3.0 - 4.0	0 - 3
VP-4	8/29/15	9	0.25	5.5	6 - 9	3.0 - 6.0	0 - 3
VP-5	8/29/15	9	0.25	5.5	6 - 9	3.0 - 6.0	0 - 3

Notes:
ft bgs — Feet below ground surface.
in bgs — Inches below ground surface.

TABLE 2
Soil Sample Analytical Data
Terradev Jefferson, LLC Property
645 Fourth Street
Oakland, CA

Sample ID	Depth (ft bgs)	Sample Date	TPHd (mg/kg)	TPHd w/SGCU (mg/kg)	TPHg (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	MTBE (mg/kg)	TBA (mg/kg)	DIPE, ETBE, TAME (mg/kg)	1,2-DCA (mg/kg)	EDB (mg/kg)	Napht. (mg/kg)
UST Removal Samples															
8795-EX-W-9'	9	8/23/06	<120	---	10,000	130	1,000	230	1,200	<12	<100	all<12	---	---	---
8795-EX-E-9'	9	8/23/06	<25	---	920	6.8	55	18	110	<1.2	<10	all<1.2	---	---	---
Investigation Samples															
DPE-1-7.5	7.5	9/20/10	810^	---	6,500	14	320	180	980	<0.50	<2.5	---	<0.50	0.50	---
DPE-1-12	12	9/20/10	260^	---	2,300	26	160	45	240	0.71	<1.5	---	<0.30	<0.30	---
DPE-1-15	15	9/20/10	92^	---	770	10	53	15	80	0.39	<0.50	---	0.11	<0.090	---
DPE-2-6	6	9/20/10	15	---	1.2	<0.0050	0.0054	<0.0050	0.021	<0.0050	<0.0050	---	<0.0050	<0.0050	---
DPE-2-11	11	9/20/10	1,200^	---	160,000	1,400	10,000	3,300	19,000	<0.25	<1.5	---	<0.25	1.8	---
DPE-2-15	15	9/20/10	66^	---	430	3.8	25	8.3	47	<0.50	<2.5	---	<0.050	<0.50	---
DPE-3-7	7	9/20/10	260^	---	860	2.1	37	19	100	<0.10	<0.50	---	<0.10	<0.10	---
DPE-3-10	10	9/20/10	800^	---	8,900	78	580	180	980	<0.25	<1.5	---	<0.25	0.82	---
CB-1-7.5	7.5	2/18/13	1.2*	---	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	---	---	<0.0050	<0.0050	---
CB-1-9	9	2/18/13	110^	---	1,200	2.8	55	27	150	<0.25	---	---	<0.25	<0.25	---
CB-1-12	12	2/18/13	880^	---	14,000	100	850	180	1,400	0.53	---	---	<0.25	0.86	---
CB-1-15	15	2/18/13	89^	---	1,000	8.4	62	15	100	<0.050	---	---	<0.050	<0.050	---
CB-2-9	9	2/18/13	120^	---	840	0.44	17	20	110	<0.15	---	---	<0.15	<0.15	---
CB-2-11	11	2/18/13	110^	---	2,700	23	160	48	260	<0.40	---	---	<0.40	<0.40	---
CB-2-15	15	2/18/13	45^	---	380	3.9	18	6.6	34	<0.050	---	---	<0.050	<0.050	---
B-6-6'	6.5	1/11/14	340^	350^	1,700	0.13	8.0	12	91	<0.050	<0.25	---	<0.050	<0.050	---
B-6-10.5'	10.5	1/11/14	280^	280^	1,500	4.1	48	26	130	<0.25	<1.5	---	<0.25	<0.25	---
SB7-8.5/9	8.5-9	12/29/14	1.2^	---	4.0	0.16	0.50	0.081	0.50	<0.0050	<0.0050	---	<0.0050	0.0070	0.043
SB7-10.5/11	10.5-11	12/29/14	1,400^	---	19,000	150	1,100	330	1,800	<0.25	<1.5	---	<0.25	2.5	99
SB7-12.5/13	12.5-13	12/29/14	310^	---	3,600	29	200	59	330	<0.090	<1.5	---	<0.090	0.46	23
SB-8-8.5/9	8.5-9	12/29/14	750^	---	6,600	30	290	120	580	<0.25	<1.5	---	<0.25	0.38	38
SB-8 11.5/12	11.5-12	12/29/14	170^	---	1,400	6.4	54	22	130	<0.25	<1.5	---	<0.25	<0.25	10
SB-8 14.5	14.5	12/29/14	<1.0	---	<1.0	0.026	0.060	0.011	0.065	<0.0050	<0.0050	---	<0.0050	<0.0050	<0.0050

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
TPHd	total petroleum hydrocarbons as diesel by EPA Method 8015M or 8015B, w/SCGCU = analysis performed after silica-gel clean-up.
TPHg	total petroleum hydrocarbons as gasoline by EPA Method 8260B
BTEX	benzene, toluene, ethylbenzene, and xylenes by EPA Method 8260B
MTBE, TBA, ETBE, DIPE, TAME	methyl tert-butyl ether, tert-butanol, ethyl tert-butyl ether, di-isopropyl ether, tert-amyl methyl ether by EPA Method 8260B,
1,2-DCA, EDB	1,2-dichloroethane, 1,2-dibromoethane by EPA Method 8260B.
µg/L	Micrograms per liter.
<###	Not detected at or above the indicated reporting limit.
^	Laboratory Flag: Hydrocarbons are lower-boiling than typical Diesel Fuel
*	Laboratory Flag: Hydrocarbons are higher-boiling than typical Diesel Fuel
---	Data not available, not monitored, or not sampled

TABLE 3
Groundwater Analytical Data
Terradev Jefferson, LLC Property
645 Fourth Street
Oakland, CA

Sample ID	Sample Date	TOC (ft MSL)	DTW (ft)	LNAPL (ft)	GWE (ft MSL)	TPHd (µg/L)	TPHd w/SGCU (µg/L)	TPHg (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	Napht. (µg/L)
Grab Groundwater Samples																	
B-1-GW*	7/10/09	--	~9.5	--	--	**5,300**	--	**78,000**	**15,000**	**13,000**	**1,700**	**10,500**	**570**	--	--	--	--
B-2-GW*	7/10/09	--	~9.5	--	--	**2,300**	--	**60,000**	**13,000**	**13,000**	**890**	**4,800**	**120**	--	--	--	--
B-3	1/10/14	--	~12	--	--	**58#**	<50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	--
B-4	1/10/14	--	~12	--	--	**67#**	<50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	--
B-5	1/10/14	--	~12	--	--	**110#**	<50	**110**	**1.2**	**1.4**	**0.65**	**4.5**	**2.7**	**200**	**43**	<0.50	--
B-6 (2)	1/11/14	--	~11	--	--	**5,200^**	**360^**	**84,000**	**1,800**	**7,600**	**2,400**	**12,000**	**5,100**	**180J**	**110**	<20	--
SB-7	12/29/14	--	~9	--	--	**60,000^**	--	**250,000**	**15,000**	**34,000**	**4,000**	**20,000**	<40	<200	**130**	**240**	**1,000**
SB-8	12/29/14	--	~9	--	--	**16,000^**	--	**180,000**	**9,100**	**22,000**	**3,000**	**16,000**	<40	<200	**130**	**140**	**1,200**
Monitoring Well Data																	
DPE-1	9/22/10	15.81	9.21	0.00	6.60	<4,000 (1)	--	**120,000**	**25,000**	**18,000**	**3,300**	**17,000**	**320**	**320**	**620**	<40	--
Screen	9/28-10/3/10	15.81	--	--	--	5-day HVDPE Remedial Event											
~8' - 15'	10/18/10	15.81	9.26	sheen	6.55	<4,000 (1)	--	**97,000**	**15,000**	**20,000**	**1,600**	**11,000**	**490**	**270**	**390**	<40	--
	1/20/11	15.81	8.56	sheen	7.25	<3,000 (1)	--	**83,000**	**12,000**	**16,000**	**2,000**	**11,000**	**270**	<200	**220**	<40	--
	7/6/12	15.81	8.85	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--
	7/9-7/24/12	15.81	--	--	--	15-day HVDPE Remedial Event											
	8/12/12	15.81	9.03	0.00	6.78	<2,000 (1)	--	**71,000**	**7,500**	**9,800**	**1,000**	**6,500**	**280**	**89**	**190**	<15	--
	2/11/13	15.81	8.74	0.00	7.07	<3,000 (1)	--	**81,000**	**9,400**	**14,000**	**1,800**	**10,000**	**240**	**110**	**210**	<15	--
	1/10/14	15.81	9.84	0.00	5.97	**1,600^**	**56^**	**98,000**	**14,000**	**13,000**	**2,100**	**12,000**	**270**	**200**	**270**	<25	--
DPE-2	9/22/10	16.01	9.44	0.00	6.57	<4,000 (1)	--	**110,000**	**21,000**	**18,000**	**3,100**	**14,000**	**200**	**260**	**540**	**110**	--
Screen	9/28-10/3/10	16.01	--	--	--	5-day HVDPE Remedial Event											
~8' - 15'	10/18/10	16.01	9.48	sheen	6.53	<5,000 (1)	--	**84,000**	**11,000**	**16,000**	**1,600**	**9,200**	**77**	<200	**220**	**77**	--
	1/20/11	16.01	8.77	sheen	7.24	<5,000 (1)	--	**94,000**	**12,000**	**19,000**	**2,500**	**13,000**	**64**	<200	**220**	**88**	--
	7/6/12	16.01	9.06	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--
	7/9-7/24/12	16.01	--	--	--	15-day HVDPE Remedial Event											
	8/12/12	16.01	9.27	0.00	6.74	<2,000 (1)	--	**70,000**	**9,900**	**16,000**	**1,700**	**9,600**	**54**	<200	**160**	**56**	--
	2/11/13	16.01	8.95	0.00	7.06	<4,000 (1)	--	**60,000**	**7,300**	**9,500**	**1,400**	**7,000**	**34**	<90	**120**	<20	--
	1/10/14	16.01	10.08	0.00	5.93	**2,800^**	<50	**100,000**	**17,000**	**15,000**	**2,400**	**11,000**	**120**	**100**	**220**	**27**	--
DPE-3	9/22/10	15.87	9.43	0.00	6.44	insufficient water column for sampling (i.e. <0.5-ft)											
Screen	9/28-10/3/10	15.87	--	--	--	5-day HVDPE Remedial Event											
~6' - 10'	10/18/10	15.87	9.35	0.00	6.52	insufficient water column for sampling (i.e. <0.5-ft)											
	1/20/11	15.87	8.51	**0.13**	7.36	no groundwater sample collected, LNAPL present.											
	7/6/12	15.87	8.65	0.00	--												
	7/9-7/24/12	15.87	--	--	--	15-day HVDPE Remedial Event											
	8/12/12	15.87	9.02	sheen	6.85	<200,000 (1)	--	**190,000**	**1,400**	**7,800**	**3,700**	**29,000**	**27**	**120**	**40**	**130**	--
	2/11/13	15.87	8.34	sheen	7.53	<40,000 (1)	--	**130,000**	**4,700**	**9,000**	**1,900**	**25,000**	<40	<200	**54**	**80**	--
	1/10/14	15.87	Dry	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Screen	Well screen depth interval.
TOC	Top of casing relative to feet above mean sea level (ft MSL) (ref NAVD88).
DTW	Depth to water (for borings DTW shows "depth to water" and "depth to bottom of boring")
LNAPL	Light non-aqueous phase liquid petroleum, "sheen" is an immeasurable thickness (i.e. <0.01-ft)
GWE	Groundwater Elevation (TOC-DTW) in ft MSL. (This does not account for LNAPL thickness, if present).
TPHd	Total petroleum hydrocarbons as diesel by EPA Method 8015M, *8015B. SGCU = Silica-gel cleanup prior to analysis.
TPHg	Total petroleum hydrocarbons as gasoline by EPA Method 8260B, *8015B.
BTEX	Benzene, toluene, ethylbenzene, and xylenes by EPA Method 8260B, *8021B.
	Note: total xylenes equal the sum of sepearate isomers reported for the 7/09 samples.
MTBE	Methyl tert-butyl ether by EPA Method 8260B, * 8021B.
TBA	Tert-butanol by EPA Method 8260B.
1,2-DCA, EDB	1,2-dichloroethane, 1,2-dibromoethane by EPA Method 8260B.
µg/L	Micrograms per liter.
<###	Not detected at or above the indicated reporting limit.
---	Data not available, not monitored, or not sampled
^	Laboratory Flag: Hydrocarbons are lower-boiling than typical Diesel Fuel
#	Laboratory Flag: Discrete peaks in Diesel range, atypical for Diesel Fuel
J	Laboratory Flag: TBA concentration may be biased slightly high due to conversion of a small fraction of MTBE to TBA during water sample analysis.
(1)	Method detection limit increased due to ineterference from gasoline range hydrocarbons
(2)	Repeat analysis by Method 8260B yielded inconsistent results. The concentrations appear to vary between bottles. The highest valid result is reported.

Table 4
SUB-SLAB VAPOR SAMPLE ANALYTICAL DATA
Terradev Jefferson LLC Property
645 Fourth St.
Oakland, CA

			Consituent Concentrations									Soil Gas Concentrations			Tracer Gas			Sample Can Vacuum	
															In Shroud	In Sample	Leak Percent^	End of	Arrival
Sample I.D.	Sample Date	sample container	TPHg (µg/m^3)	B (µg/m^3)	T (µg/m^3)	E (µg/m^3)	X (µg/m^3)	MTBE (µg/m^3)	Naphthalene (µg/m^3)	1,2-DCA (µg/m^3)	EDB (µg/m^3)	O_2 (%)	CO_2 (%)	CH_4 (%)	He - Avg (%)	He (%)	Leak (%)	Sampling ("Hg)	at Lab ("Hg)
VP-1	6/16/12	1-L	1,300	38	120	21	138	7.3	<0.09	<0.14	<0.050	15	0.096	<0.008	22.2	2.4	10.8%	~8	~6
VP-1	9/22/12	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	19	0.78	<0.008	20.0	0.19	1.0%	~5	~6
VP-1	1/25/14	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	14	4.7	<0.008	5.7	0.023	0.40%	~5	~5
VP-2	6/16/12	1-L	1,200	66	25	2.6	8.2	<6.3	<0.090	<0.14	<0.050	11	1.3	<0.009	13.8	<0.003	<0.02%	~8	~7
VP-2	9/22/12	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	14	4.0	<0.008	19.0	<0.003	<0.02%	~7	~6
VP-2	1/25/14	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	12	7.4	<0.008	6.6	<0.003	<0.05%	~5	~5
VP-3	6/16/12	1-L	960	16	19	2.9	20	<5.8	<0.08	<0.13	<0.050	16	0.029	<0.008	23.6	2.6	11%	~5	~5
VP-3	9/22/12	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	20	0.46	<0.008	15.7	0.036	0.23%	~5	~6
VP-3	1/25/14	1-L	<330	<8.0	<9.4	<11	<22	<9.0	<13	<10	<3.8	19	1.5	<0.008	6.6	0.012	0.18%	~5	~5
VP-4	9/6/15	1-L	5,600,000	<58,000	<69,000	<79,000	600,000	<66,000	<95,000	<74,000	<140,000	7.5	0.37	<0.009	6.5	0.004	0.06%	~5	~2
VP-5	9/6/15	1-L	5,000,000	180,000	140,000	110,000	1,390,000	<54,000	<78,000	<60,000	<110,000	2.7	3.3	<0.007	7.0	<0.003	<0.04%	~5	~3

Subslab Soil Gas Sceening Levels Calculated as: Screening level (subslab soil gas) = Screening level (indoor air) / 0.05

ESLs Residential Indoor Air divided by 0.05	*2,000*	*1.68*	*6,200*	*19.4*	*2,000*	*188*	*1.44*	*2.4*	*0.68*
ESLs Comm/Indus Indoor Air divided by 0.05	*2,000*	*8.4*	*26,000*	*98*	*8,800*	*940*	*7.2*	*11.6*	*3.4*
CHHSLs Residential Indoor Air divided by 0.05	*NA*	*1.68*	*6,260*	*NA*	*14,600*	*187*	*1.44*	*2.32*	*NA*
CHHSLs Comm /Indus Indoor Air divided by 0.05	*NA*	*2.82*	*8,760*	*NA*	*20,400*	*314*	*2.4*	*3.9*	*NA*

Indoor Air Screening Levels

ESLs Residential Indoor Air	*100*	*0.084*	*310*	*0.97*	*100*	*9.4*	*0.072*	*0.12*	*0.034*
ESLs Comm/Indus Indoor Air	*100*	*0.42*	*1,300*	*4.9*	*440*	*47*	*0.36*	*0.58*	*0.17*
CHHSLs Residential Indoor Air	*NA*	*0.084*	*313*	*NA*	*730*	*9.4*	*0.072*	*0.116*	*NA*
CHHSLs Comm /Indus Indoor Air	*NA*	*0.141*	*438*	*NA*	*1,020*	*16*	*0.12*	*0.195*	*NA*

Notes:

TPHg	Total Petroluem Hydrocarbons as gasoline by EPA Method TO-15
BTEX, MTBE	Benzene, Toluene, Ethylbenzene, and Total Xylenes, Methyl tert-Butyl Ether by EPA Method TO-15(M) GC/MS (note: Xylene number shown in table is the sum of xylene isomers reported by lab)
Naphthalene	Naphthalene by EPA Method TO-15
1,2-DCA, EDB	1,2-dichloroethane, 1,2-dibromoethane by EPA Method TO-15
O_2, CO_2, CH_4, He	Oxygen, Carbon Dioxide, Methane, and Helium by modified ASTM D-1946
µg/m^3	Micrograms per cubic meter
<#.##	Compound not detected at or above the reported laboratory detection limit
ESLs	Environmental Screening Levels for Soil Vapor in Commercial/Industrial or Residential setting (SFBRWQCB 2013)
CHHSLs	California Human Health Screening Levels for Soil Vapor in Commercial/Industrial or Residential setting (CalEPA/OEHHA 2005)
Tracer Gas in Shroud	Concentration range of tracer gas in shroud recorded during sample collection. Average = (Max + Min) / 2
Tracer Gas in Sample	Concentration of tracer gas in sample as detected by lab analysis.
Tracer Gas Leak into Sample	If helium was detected in the sample, the concentration measured in the sample was divided by the average concentration in the shroud (and multiplied by 100 to convert to percent).
	^ a leak of less than 5% is considered acceptable for data evaluation.
	Shaded samples indicate a tracer gas leak of more than 5%.

TABLE 5
Passive Soil Gas Sample Analytical Data
Terradev Jefferson, LLC Property
645 Fourth Street
Oakland, CA

Sample ID	Sample Depth (ft bgs)	Install Date	Retrieval Date	TPH (µg)	DRPH (µg)	GRPH (µg)	B (µg)	T (µg)	E (µg)	X (µg)	MTBE (µg)	1,2-DCA (µg)	Napht. (µg)
S-1	~2 - 3	2/7/15	2/14/15	**13.33**	**2.90**	**10.86**	**0.04**	**0.03**	**0.02**	**0.17**	**0.25**	**0.13**	**0.20**
S-2	~2 - 3	2/7/15	2/14/15	**273.77**	**59.21**	**223.55**	**48.01**	**209.52**	**123.77**	**505.33**	<0.02	**3.97**	**35.44**
S-3	~2 - 3	2/7/15	2/14/15	**183.36**	**72.98**	**115.01**	**33.38**	**127.13**	**113.16**	**367.48**	<0.02	**2.35**	**37.35**
S-4	~2 - 3	2/7/15	2/14/15	**1.00**	<0.50	**0.66**	**0.02**	**0.02**	<0.02	**0.18**	<0.02	**2.35**	<0.50
S-5	~2 - 3	2/7/15	2/14/15	**220.53**	**107.91**	**117.33**	**20.23**	**90.58**	**24.79**	**369.71**	<0.02	**2.01**	**30.63**
S-6	~2 - 3	2/7/15	2/14/15	**169.75**	**54.69**	**119.88**	**15.94**	**29.38**	**31.45**	**337.65**	<0.02	**0.90**	**2.45**
S-7	~2 - 3	2/7/15	2/14/15	**1.03**	**0.74**	<0.50	**0.07**	**0.15**	**0.06**	**0.59**	<0.02	<0.02	<0.50
S-8	~2 - 3	2/7/15	2/14/15	**245.41**	**106.20**	**145.04**	**32.86**	**103.45**	**76.32**	**421.35**	<0.02	**2.53**	**36.09**
S-9	~2 - 3	2/7/15	2/14/15	<0.50	<0.50	<0.50	**0.36**	**0.36**	**0.03**	**0.16**	<0.02	**0.02**	<0.50

Notes:

ft bgs	feet below ground surface
µg	micrograms
TPH	Total petroleum hydrocarbons by SPG-WI-0292
DRPH	Diesel range petroleum hydrocarbons by SPG-WI-0292
GRPH	Gasoline range petroleum hydrocarbons by SPG-WI-0292
BTEX	benzene, toluene, ethylbenzene, and xylenes by SPG-WI-0292
MTBE	methyl tert-butyl ether by SPG-WI-0292
1,2-DCA	1,2-dichloroethane by SPG-WI-0292
Naphthalene	Naphthalene by SPG-WI-0292
<###	Not detected at or above the indicated reporting limit.

Date: 9/6/15
Technician: LT
Job No.: ASE-1

WELL ID: VP-4	Manifold ID#: 5	
Purge Suma ID#: 1013	Volume: 1L	Start Presure: 30
Sample Suma ID#:	Volume:	Start Presure:
Shut-in Test Start Time/Pressure 1 0720/30" 0735/29"	Shut-in Test Start Time/Pressure 2 0745/30; 0805/30	

	Time (24 Hr)	Pre-Regulator Presure (-"Hg)	~~Post-Regulator Presure (-"Hg)~~	He Tracer (%)
Purge	0832	24"	Purge for 30 seconds	
Sample	0839	29.7		6.2
	0842	24		7.0
	0844	19		6.1
	0846	~~12~~ 14		6.6
	0848	10		5.9
	0850	8		6.7
end	0852	5		6.1

Notes:

Date: 9-6-15
Technician: ZT
Job No. ASE-1

WELL ID: VP-5		Manifold ID#: 26
Purge ~~Suma ID#~~: Pump	Volume: NA	Start Presure: NA
Sample Suma ID#: 301	Volume: 1L	Start Presure: 30"Hg
Shut-in Test Start Time/Pressure: 0730/29.5 0745/29.5		Shut-in Test Start Time/Pressure:

	Time (24 Hr)	Pre-Regulator Presure (-"Hg)	Post-Regulator Presure (-"Hg)	He Tracer (%)
	0925	24" Purge for 30 seconds ~0.06L		
sample	0929	29.5		8.2
	0932	21		7.6
	0934	18		6.9
	0936	10		6.6
end	0938	5		5.8

Notes:

Analytical Sciences

Report Date: October 15, 2015

Laboratory Report

Loren Taylor
Blue Rock Environmental
1157 Chess Drive, Ste. 107
Foster City, CA 94404

Project Name: **Terradev Jefferson LLC** **ASE-1**

Lab Project Number: **5090906**

This 6 page report of analytical data has been reviewed and approved for release.

Mark A. Valentini, Ph.D.

Laboratory Director

Volatile Hydrocarbons by GC/MS in Air (µg/m³)

Lab#	Sample ID	Compound Name	Result (µg/m³)		RDL (µg/m³)
5090906-01	**VP-4**	1,2-Dibromoethane (EDB)	ND	VA	140000
		1,2-Dichloroethane (EDC)	ND		74000
		Gasoline	5600000		2400000
		Benzene	ND		58000
		Toluene	ND		69000
		Ethylbenzene	ND		79000
		m,p-Xylene	600000		79000
		o-Xylene	200000		79000
		Naphthalene	ND		95000
		Methyl tert-Butyl Ether (MTBE)	ND		66000
		Tertiary Butyl Alcohol (TBA)	ND		55000

Surrogates	Result (µg/m³)	% Recovery	Acceptance Range (%)
Dibromofluoromethane	158	101	70-130
4-Bromofluorobenzene	178	115	70-130

Date Sampled:	09/06/15	Date Analyzed:	10/13/15	QC Batch: B015117
Date Received:	09/09/15	Method:	EPA TO-15	

Volatile Hydrocarbons by GC/MS in Air (µg/m³)

Lab#	Sample ID	Compound Name	Result (µg/m³)		RDL (µg/m³)
5090906-02	**VP-5**	1,2-Dibromoethane (EDB)	ND	VAa	110000
		1,2-Dichloroethane (EDC)	ND		60000
		Gasoline	5000000		1900000
		Benzene	180000		48000
		Toluene	140000		56000
		Ethylbenzene	110000		65000
		m,p-Xylene	1100000		65000
		o-Xylene	290000		65000
		Naphthalene	ND		78000
		Methyl tert-Butyl Ether (MTBE)	ND		54000
		Tertiary Butyl Alcohol (TBA)	ND		45000

Surrogates	Result (µg/m³)	% Recovery	Acceptance Range (%)
Dibromofluoromethane	158	101	70-130
4-Bromofluorobenzene	165	107	70-130

Date Sampled:	09/06/15	Date Analyzed:	10/13/15	QC Batch: B015117
Date Received:	09/09/15	Method:	EPA TO-15	

Fixed Gases (%)

Lab#	Sample ID	Compound Name	Result (%)	RDL (%)
5090906-01	**VP-4**	Oxygen (O2)	7.5	0.009
		Carbon Dioxide (CO2)	0.37	0.009
		Methane	ND	0.009
		Helium	0.004	0.004

Date Sampled:	09/06/15	Date Analyzed:	10/14/15	QC Batch: B015118
Date Received:	09/09/15	Method:	ASTM 1946 D	

Fixed Gases (%)

Lab#	Sample ID	Compound Name	Result (%)	RDL (%)
5090906-02	**VP-5**	Oxygen (O2)	2.7	0.007
		Carbon Dioxide (CO2)	3.3	0.007
		Methane	ND	0.007
		Helium	ND	0.003

Date Sampled:	09/06/15	Date Analyzed:	10/14/15	QC Batch: B015118
Date Received:	09/09/15	Method:	ASTM 1946 D	

Quality Assurance Report

Volatile Hydrocarbons by GC/MS in Air (µg/m³)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015117 - Air prep GC/MS										
Blank (B015117-BLK1)				Prepared & Analyzed: 10/13/15						
1,2-Dichloroethane (EDC)	ND	4.0	µg/m³							
1,2-Dibromoethane (EDB)	ND	7.7	µg/m³							
Gasoline	ND	330	µg/m³							
Benzene	ND	8.0	µg/m³							
Toluene	ND	9.4	µg/m³							
Ethylbenzene	ND	11	µg/m³							
m,p-Xylene	ND	11	µg/m³							
o-Xylene	ND	11	µg/m³							
Naphthalene	ND	13	µg/m³							
Methyl tert-Butyl Ether (MTBE)	ND	9.0	µg/m³							
Tertiary Butyl Alcohol (TBA)	ND	7.6	µg/m³							

Fixed Gases (%)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B015118 - Air prep GC										
Duplicate (B015118-DUP1)		**Source: 5090906-02**		Prepared & Analyzed: 10/14/15						
Oxygen (O2)	2.7	0.007	%		2.7			2	20	
Carbon Dioxide (CO2)	3.1	0.007	%		3.3			5	20	
Methane	ND	0.007	%		ND				20	
Helium	0.002	0.003	%		0.002			15	20	

Notes and Definitions

VAa	The sample canister was received by the laboratory with a vacuum gauge reading of 3 inches of mercury.
VA	The sample canister was received by the laboratory with a vacuum gauge reading of 2 inches of mercury.
RDL	Reporting Detection Limit
ND	Analyte NOT DETECTED at or above the reporting detection limit (RDL)
RPD	Relative Percent Difference
NR	Not Reported

Analytical Sciences
P.O. Box 750336, Petaluma, CA 94975-0336
110 Liberty Street, Petaluma, CA 94952
(707) 769-3128
Fax (707) 769-8093

CHAIN OF CUSTODY

Lab Project Number: 5090906
Client's Project Name: Terradar Jefferson LLC
Client's Project Number: ASE-1

CLIENT INFORMATION

Company Name: Blue Rock Environmental
Address: 1157 Chess Dr., Suite # 107
Foster City, CA 94404
Contact: Loren Taylor
Phone #: (650) 522-9292
Fax #: (650) 522-9259
e-mail: Loren/orBrian@blue rockenv.com

TURNAROUND TIME (check one)

Same Day ______
48 Hours ______ 24 Hours ______
5 Days ______ Normal X

GeoTracker Required Yes No
GeoTracker Number:

Page ______ of ______

Item	Client Sample ID	Date	Matrix	Canister ID #	Regulator ID #	Sample Start Time	Sample End Time	TPHg by TO-3	TO-15 - BTEX 1,2 DCA, EDB	TO-15 Napthalene	He, O_2, CO_2 & Methane ASTM D-1943						Comments	Lab Sample #
1	VP-4	9/6/15	Air	1013	5	0839	0852	X	X	X	X						5090906	-01
2	VP-5	9/6/15	Air	301	26	0929	0938	X	X	X	X						Please Measure & Report Vacuum @ time of Analysis if <5" Hg Notify Blue Rock.	-02
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

SIGNATURES

Relinquished By: [signature]
Signature

Sampled By: Loren Taylor [signature]

9/8/15 0545
Date Time

Received By: Gail Harmann
Signature

9/9/15 1300
Date Time