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Ms. Dilan Roe
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

RECEIVED
By Alameda County Environmental Health 8:27 am, Mar 14, 2017

Re: 1233 Bockman Road – Acknowledgement Statement
San Lorenzo, California
ACEH Case No. 3217

Dear Ms. Roe:

PaulsCorp, LLC, has retained the environmental consultant referenced on the attached report for the project referenced above. The attached report is being submitted on PaulsCorp's, LLC, behalf.

I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document or report submitted on my behalf to ACDEH's FTP server and the State Water Resources Control Board's GeoTracker website.

Sincerely,

Scott Schoeman
Development Associate

March 13, 2017

Scott Schoeman
PAULS Corporation, LLC
100 Saint Paul Street
Denver, Colorado 80206

Re: **Data Gap Field Investigation Workplan**
Bockman Road Property
1233 Bockman Road
San Lorenzo, California 94577
ACDEH Case # RO003239

Dear Mr. Schoeman:

On behalf of PAULS Corporation, LLC, PANGEA Environmental Services, Inc. (PANGEA) prepared this *Data Gap Field Investigation Workplan* for the subject property. This workplan was prepared to further delineation contamination at the subject site as discussed with Alameda County Department of Environmental Health (ACDEH) in meetings on January 9, and March 2, 2017. As required by ACDEH, data gap investigation results will help refine the corrective action approach to be documented in a Remedial Action Implementation Report for the Site.

If you have any questions or comments, please call me at (510) 435-8664 or email briddell@pangeaenv.com.

Sincerely,
PANGEA Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

Attachment: *Data Gap Field Investigation Workplan*

DATA GAP FIELD INVESTIGATION WORKPLAN

Bockman Road Property
1233 Bockman Road
San Lorenzo, CA 94577

March 13, 2017

Prepared for:

PaulsCorp, LLC
100 Saint Paul Street
Denver, Colorado 80206

Prepared by:

PANGEA Environmental Services, Inc.
1710 Franklin Street, Suite 200
Oakland, California 94612

Written by:

Ron Scheele, P.G.
Principal Geologist

Bob Clark-Riddell, P.E.
Principal Engineer

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ATTACHMENTS

1.0 INTRODUCTION

On behalf of PAULS Corporation, LLC, PANGEA Environmental Services, Inc. (PANGEA) prepared this *Data Gap Field Investigation Workplan* (Workplan) for the property located at 1233 Bockman Road in San Lorenzo, California (Site). This Workplan was prepared to further delineate chemicals of concern at the Site as requested by Alameda County Department of Environmental Health (ACDEH) during meetings on January 9, and March 2, 2017. As required by ACDEH, data gap investigation results will help refine the corrective action approach to be documented in a *Remedial Action Implementation Report* for the Site.

2.0 SITE BACKGROUND

The Site is located in a commercial and residential area along Bockman Road in San Lorenzo, California (Figure 1). The Site is currently under construction and being redeveloped into residential housing. Prior site assessment activities have identified volatile organic compounds (VOCs) in the subsurface. The VOC impact is apparently due a historic dry cleaner at 1269 Bockman Road (eastern portion of Site), a former auto shop at 1415 Bockman Road (western portion of the Site), and potential offsite sources of petroleum hydrocarbons from 1210 Bockman (former Impulse Motors fueling station/auto repair facility) and 17093 Via Chiquita (commercial street sweeping business).

2.1 Site Description and History

The Site consists of an approximately 3.87-acre lot along Bockman road in San Lorenzo, California (Figure 2). The property is owned and being redeveloped by PaulsCorp, LLC into 53 two-story residential units. The assessor parcel number (APN) for the Site is 411-63-17. The subject property is relatively flat and lies at an elevation of about 20 feet above mean sea level. There are currently no buildings on site but historically the Site consisted of a strip mall and associated parking lot. The Site is surrounded in all directions by single and multi-family residences.

According to a Phase I Environmental Site Assessment (ESA) prepared on June 3, 2016, by ENGEO Incorporated (ENGEO), the Site was used a strip mall until the buildings were demolished in 2007. Two former tenants of note were identified: a dry cleaner that operated between approximately 1960 and 1979; and an automotive repair shop that operated hydraulic lifts. The report also noted that a gasoline service station previously existed on the adjacent parcel located south of the Site across Bockman Road at 1210 Bockman Road.

2.2 Chemicals of Potential Concern

The chemicals of potential concern at this Site primarily include tetrachloroethene (PCE) and its potential breakdown products, and include petroleum hydrocarbons. The following chemicals have been detected in shallow *soil gas* in excess of conservative residential soil vapor environmental screening levels (ESLs)

established by the San Francisco Bay Region Water Quality Control Board (RWQCB) and were identified as chemicals of concern (COCs): *benzene, ethylbenzene, and PCE*. The following additional VOCs have been detected at the Site below ESLs: acetone; chloroform; 1,2-dichloroethane; naphthalene; 1,1,1-trichloroethylene (TCE); toluene; xylenes; and gas-range, diesel-range, and motor oil-range total petroleum hydrocarbons. No significant VOC impact has been detected in soil or groundwater based on data comparison to ESLs.

2.3 Summary of Previous Site Investigations

The following provides a general overview of previous environmental investigations at the Site. All available historical Site assessment data is summarized on Tables 1 through 3.

- **November 18, 2004, Phase I Environmental Site Assessment, Secor International Inc. (Secor):** A Phase 1 ESA revealed that the auto repair shop located on the western portion of the Site may have formerly had a fuel dispenser island and that an oil/water separator existed within the building. The possibility of a dry cleaner was noted but it was not determined if operations were on-site or if the business was just a drop-off location. A former gasoline station/automotive repair facility located at 1210 Bockman Road (adjacent to the Site to the south) was also indicated as an environmental concern due to the elevated levels of petroleum hydrocarbons detected in confirmation samples during tank removal activities in 2004.

- **December 21, 2004, Phase II Environmental Site Assessment, Secor:** A total of eight soil borings were advanced on site to a depth of 10 to 15 feet below ground surface (bgs), but sample data was not reported.

- **June 30, 2015, Phase I Environmental Site Assessment, ENGEO:** A Phase 1 ESA revealed the same three environmental concerns as the Phase 1 ESA completed in 2004: possible historical dry cleaner operations, the gas station adjacent and south of the Site, and the former automotive repair facility located on the western portion of the Site. Based on these findings and the lack of data from the Phase II ESA completed in 2004, ENGEO recommended completion of a new Phase II ESA.

- **July 2, 2015, Phase II Environmental Site Assessment, ENGEO:** Soil, groundwater, and soil gas were sampled to identify potential concerns related to the aforementioned historic operations. Three soil borings were advanced (S-1 through S-3) to a depth of 10 feet bgs in the vicinity of the former dry cleaner (S-1) and the former automotive repair facility (S-2 and S-3). Soil samples were collected at depths of 1, 5, and 10 feet bgs from each boring. Grab groundwater samples (GW-1 through GW-3) were also collected from three separate borings at depths ranging from 15 to 25 feet bgs depending on where groundwater was first observed. Soil and groundwater samples were analyzed for VOCs, CAM-17 metals, and total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and motor oil (TPHmo). While VOCs, TPHg, and metals were detected in groundwater samples, all analytes were

below screening levels except arsenic (which likely represents background conditions). For the two analyzed soil gas samples (SG-1 and SG-2), no VOCs were reported above environmental screening levels.

- **October 1, 2015, Geotechnical Investigation (Langan Treadwell Rollo):** A geotechnical investigation was conducted for the Site. The report concluded that from a geotechnical standpoint, the site can be developed as planned, provided the recommendations presented in this section of the report are incorporated into the design and contract documents. Criteria for foundation design, together with recommendations for site preparation, floor slabs, fill placement and seismic design were presented the report.

- **June 3, 2016, Phase I Environmental Site Assessment Update, ENGEO:** The Phase 1 ESA completed in 2015 was updated to include the results of an environmental record search. No new environmental concerns were recognized.

- **August 2, 2016, Revised Phase II Environmental Site Assessment, ENGEO:** Additional Site assessment activities including installing and sampling six new temporary soil gas wells (SG-5 through SG-10) and collecting four grab groundwater samples (GW-1 through GW-4). The soil gas wells were installed to depths of 7 feet bgs (SG-6, SG-8, and SG-9) and 10 feet bgs (SG-5, SG-7, and SG-10) and sampled for TPHg and VOCs. PCE was detected in SG-6 and SG-9 at an identical concentration of 256 micrograms per cubic meter ($\mu g/m^3$). Grab groundwater borings GW-1 through GW-3 were advanced in close proximity to the borings by the same identity in 2015. All four borings were advanced to a depth of 16 to 17 feet bgs depending on where first encountered groundwater was observed. A sample was collected from each boring and analyzed for VOCs, TPHg, TPHd, TPHmo, and CAM-17 metals. VOCs, TPHg, and metals were detected below screening levels except for arsenic.

- **August 17, 2016, Site Management Plan Supplement, PANGEA:** A Site Management Plan Supplement was prepared to facilitate grading work at the western portion of the Site.

- **August 26, 2016, Site Assessment Report, PANGEA:** A dynamic site assessment was conducted involving the sampling of soil, groundwater, and shallow soil gas. Pangea employed MiHPT, a high resolution site characterization technique, to help delineate the extent of contaminants in the subsurface and to evaluate hydrogeologic conditions, primarily in the vicinity of the former drycleaners. No significant VOC impact was detected in soil and groundwater, but shallow soil gas in the eastern portion of the Site is impacted with concentrations of PCE, benzene, and ethylbenzene that exceed their respective residential shallow soil gas ESLs.

- **October 7, 2016, Pilot Study Workplan, PANGEA:** A Pilot Study Workplan was prepared to outline procedures to test the effectiveness of a proposed soil excavation approach, prior to full implementation. The pilot study area targeted VOC impact near planned Buildings 5 and 8.

- **October 14, 2016, Draft Corrective Action Plan, PANGEA:** A Draft Corrective Action Plan (CAP) was prepared to provide an approach to remediate VOC impact and help mitigate potential vapor intrusion issues in conjunction with development at the Site. The CAP proposed soil excavation, an excavation pilot study, and addition site assessment in conjunction with remediation and mitigation efforts for the eastern site area (Buildings 5 through 10).

- **October 26, 2016 Interim Remediation Report – Former Auto Repair Area, PANGEA:** The report documents soil excavation activities in the area of the former auto repair facility (Buildings 1 and 2 of the site development). Approximately 690 cubic yards of impacted soil was excavated from the vicinity of the former auto repair facility. Confirmation soil sampling data indicated that remaining residual impact was well below regulatory screening levels.

- **November 16, 2016, Data Gap Investigation Report - Buildings 3 & 4, PANGEA:** Site assessment activities involved the installation and sampling of four soil gas probes (SV-51 through SV-54) to assess VOC levels within the footprint of proposed Buildings 3 and 4. No PCE or benzene were detected above their respective residential shallow soil gas ESLs. Based on the soil gas sampling data, ACDEH concurred that no remediation was required near Buildings 3 and 4 and vapor mitigation could involve subslab ventilation and a contingent post-slab engineered vapor barrier.

- **November 29, 2016 (Revised January 18, 2017), Vapor Intrusion Mitigation System (VIMS) Basis of Design Report for Buildings 1 through 4, PANGEA:** The report described construction of a proposed vapor intrusion mitigation system (VIMS) and related Operations & Maintenance (O&M) Plan for Buildings 1 through 4. The proposed VIMS consisted of SSV piping and a contingent post-slab construction engineered vapor barrier.

- **February 13, 2017, Vapor Intrusion Mitigation System (VIMS) Basis of Design Report for Buildings 5 & 8, PANGEA:** The report described construction of proposed VIMS and related O&M Plan for Buildings 5 and 8. The proposed VIMS consisted of SSV piping and a subslab engineered vapor barrier.

- **February 17, 2017, Pilot Study Report, PANGEA:** The report documents soil excavation activities and associated soil and groundwater sampling, along with post-excavation soil gas sampling. The pilot study was conducted to confirm the effectiveness of the excavation and soil reuse approach presented in PANGEA's *Draft Corrective Action Plan* (CAP) dated October 7, 2016 prior to full CAP implementation.

2.4 Potential Offsite Sources of VOCs

1210 Bockman: A fueling station/auto repair facility (Impulse Motors, B.P.) was formerly located across the street from the Site and operated from the 1950s until 2004. In 2004, three fuel USTs, and two dispensers with associated piping were removed. Elevated levels of TPHg, TPHd and BTEX were detected in soil, groundwater and soil gas. The environmental case was granted closure by ACDEH in 2013. The case closure summary with historical maps and data is included in Appendix A. The 1210 Bockman property is located directly upgradient of the Site and may be the source or contributing source of select petroleum hydrocarbon compounds at the eastern boundary of the Site, where ethylbenzene concentrations in soil gas exceed ESLs. In 2013, dissolved-phased TPHd concentrations were reported in an irrigation well at a residential property (17109 Via Chiquita) located 155 feet north of the 1210 Bockman property.

17093 Via Chiquita: This property, immediately adjacent the Site's eastern property boundary, is currently occupied by a street sweeping business (Midnight Sweepers) with several commercial vehicles parked periodically at the property. PANGEA understands that historically numerous automotive vehicles are stored at this property. This property may be the source or contributing source of select petroleum hydrocarbon compounds at the eastern boundary of the Site, where ethylbenzene concentrations in soil gas exceed ESLs.

2.5 Site Geology and Hydrogeology

The Site property is located within the East Bay Plain subbasin, which is part of the larger Santa Clara Valley Groundwater Basin. The East Bay Plain subbasin is a northwest trending alluvial plain bounded to the north by San Pablo bay, to the east by the contact with Franciscan Basement rock, and to the south by the Niles Cone Groundwater basin. The basin extends beneath San Francisco Bay to the west. Groundwater is generally found very near the surface throughout the basin.

The East Bay Plain subbasin aquifer system consists of unconsolidated sediments of Quaternary age. The Early Holocene Temescal Formation is the most recently deposited and consists of primarily silts and clays with some gravel layers.

The relatively flat Site lies at an elevation of approximately 20 feet above mean sea level to the east of San Francisco Bay (Figure 1). Soil beneath the site consists of sandy gravel fill (likely baserock material) to approximately 1 ft bgs underlain by 2 to 3 feet of moderately plastic clay. The clay layer is underlain by silt and a discontinuous, one-foot thick sand lens observed intermittently between 6 and 10 feet bgs. Pangea observed groundwater between 7 and 9 feet bgs, while others reported first encountered groundwater deeper. Based on data from neighboring sites, static groundwater was approximately 8 ft bgs (1201 Bockman) and groundwater flows to the northwest.

2.6 Site Development Phases

Development of the Site is expected to be completed in three main phases, moving from west to east across the Site. Construction began with Buildings 1 through 4 in the west sector of the Site, which will be surveyed for a new legal description (Figure 3). Construction would then proceed to Building 5 and 8 in the center of the Site, and then commence to Buildings 6, 7, 9 and 10 in the east sector of the Site; the eastern area of Buildings 5 through 10 which will be surveyed for a new legal description (Figure 3). This splitting of the Site was described during a February 2, 2017 meeting with ACDEH. A new agency case is planned for the western portion of the Site, with the current case applying to the eastern portion of the Site. The Site would remain as one parcel for sale to one homeowner's association in the future.

2.7 Agency Direction

During meetings on January 9 and March 2, 2017, ACDEH requested this *Data Gap Field Investigation Workplan* to further delineate contamination in the east portion of the Site. As required by ACDEH, data gap investigation results will be used to help refine the corrective action approach of the *Draft CAP* dated October 14, 2016, and will be documented in a *Remedial Action Implementation Report* for the Site.

3.0 RESULTS FROM RECENT DATA GAP SAMPLING AND PILOT TESTING

Results from recent soil, soil gas, and groundwater sampling relevant to pending site remediation are described below.

3.1 Data Gap Field Investigation – September and October 2016

Recent soil and soil gas sampling was conducted during implementation of PANGEA's *Data Gap Field Investigation Workplan* dated October 17, 2016. All onsite soil and soil gas sampling within the footprint of future Buildings 1, 2, 3, 4 and 10 was completed; however, the offsite soil gas sampling (four locations) was delayed for Site access. Also, the onsite resampling of soil gas probes outside the PCE soil gas plume was postponed in light of PCE found in shallow groundwater in the east sector. As described in Section 3.2, the detection of PCE in shallow groundwater improved the understanding of the site conceptual model and identified a possible source of PCE to soil gas. Our revised approach for re-sampling of soil gas probes in the east sector is described in Section 4.7 of this Workplan.

On October 20, 2016, three soil borings (SB-14 through SB-16) were advanced to further evaluate potential VOC impact in soil. As shown on Figure 3, the three soil borings were drilled along the south and east sides of the Site where elevated benzene and/or ethylbenzene were previously detected in soil gas. Soil samples will be collected between 3 and 7 ft bgs and analyzed for VOCs by EPA Method 8260B by a California-certified laboratory. No VOCs were detected in any of the soil samples. Soil analytical results are presented in Table 1.

Soil sampling procedures and results will be documented further in the future *Remedial Action Implementation Plan*.

On September 19 and October 20, 2016, fourteen soil gas samples (SV-43 through SV-56) were collected to evaluate soil gas conditions within the footprint of future Buildings 1, 2, 3, 4 and 10 (Figure 2). No PCE or benzene were detected above their respective residential shallow soil gas ESLs in soil gas samples from future Buildings 1, 2, 3, and 4; however, elevated benzene levels were detected in soil gas samples SV-55 and SV-56 collected from the footprint of future Building 10 as shown on Figure 4. Soil gas analytical results are summarized on Table 3. Additional soil gas sampling to assess the extent of benzene near Building 10 is presented in Section 4.7 of this Workplan. Soil gas sampling procedures and results from Buildings 1 & 2 are presented in PANGEA's *Interim Remediation Report – Former Auto Repair Area* dated October 26, 2016. Sampling procedures and results from Buildings 3 and 4 are presented in PANGEA's *Data Gap Investigation Report - Buildings 3 & 4* dated November 1, 2016 (revised January 18, 2017). Soil gas sampling procedures near Building 10 will be presented in the future *Remedial Action Implementation Plan*.

3.2 Pilot Study – September through December 2016

Soil and initial soil gas sampling was conducted in accordance with PANGEA's *Pilot Study Workplan* dated October 7, 2016. Due to the lack of VOCs in soil (based on lab data) or in soil gas (based on PID field screening), Pangea also collected shallow groundwater samples for VOC analysis. These partial pilot test results are provided as rationale for the additional groundwater and soil gas sampling proposed below in Section 4.0 of this Workplan.

On September 16 and October 3, 2016, seven soil borings (TP-1 through TP-7) were advanced to help profile the soil for disposal or reuse prior to soil excavation within the north and south pilot test excavations. This assessment also included soil boring TP-8 to evaluate conditions near the proposed vapor barrier along the east side of the Site. These eight soil boring locations are shown on Figure 4. Soil samples were collected between 1 and 6 ft bgs and analyzed for VOCs by EPA Method 8260B and other constituents by a California-certified laboratory. No VOCs were detected in any of the soil samples. In October and November 2016, several soil samples were collected and analyzed for VOCs from insitu or stockpiled soil from the pilot test excavation prior to site reuse or offsite disposal. No VOCs were detected in any of the soil samples. Soil analytical results are presented in Table 1. Soil sampling procedures and results from soil profiling and pilot testing will be presented in a future *Remedial Action Implementation Plan*.

On October 19 and November 1, 2016, four groundwater samples were collected from test pits completed within the two pilot test excavations. The four sample locations within pilot test north and pilot test south areas (PTN-w1, PTN-w2, PTS-w1, PTS-w2) are shown on Figure 8. No PCE, benzene, or ethylbenzene were detected above their respective Tier I ESLs in the groundwater samples, as summarized on Table 2. However, as shown on Figure 8, PCE was detected in groundwater at 0.5 µg/L and 0.6 µg/L within the two test pits in

the pilot test north area, with the higher concentration closer to the former dry cleaner location. Groundwater sampling procedures and results from pilot testing will be presented in the *Pilot Study Report*, requested by ACDEH.

On December 1, 2016, post-excavation soil gas samples were collected from all new soil gas wells/probes and select prior soil gas wells/probes within and near the two pilot test excavations. As shown on Figure 6, this included sampling of six new soil gas probes (SV-57 through SV-62) and existing soil gas probe SV-21. No benzene, PCE, or ethylbenzene were detected above residential shallow soil gas ESLs in post-excavation soil gas samples, as shown on Figures 5, 6 and 7, respectively. Soil gas analytical results are presented in Table 3. On January 16, 2017, a second post-excavation sampling event for these soil gas probes was conducted in January 2017 to assess VOC soil gas stability in the pilot test excavation area near Buildings 5 & 8. Soil gas sampling procedures and results from the pilot testing are presented in the *Pilot Study Report* dated February 17, 2017.

4.0 PROPOSED DATA GAP FIELD INVESTIGATION

During meetings with ACDEH on January 9 and March 2, 2017, additional site assessment was discussed to fill remaining data gaps to improve understanding of the contaminant distribution for remediation planning and case closure pursuit without a deed notice or restriction. As discussed during the March 2, 2017 meeting, this workplan presents a *flexible* work scope to achieve the specific assessment objectives listed below. Consistent with the March 2, 2017 meeting, the proposed work scope involves an initial exploration of the former sewer location, collection of initial data, followed by contingent additional sample collection based on results of the sewer investigation and initial data. Results of this assessment will be incorporated into a Remedial Action Implementation Plan.

4.1 Investigation Objectives

The specific objectives of the proposed data gap field investigation are to:

- Investigate subsurface sewer laterals/trenches related to the former dry cleaners that may represent a residual source of PCE, or may act as a preferential pathway for PCE migration within shallow soil gas or groundwater.

- Delineate the extent of PCE in shallow *groundwater* relative to any discovered sewer laterals and relative to the elevated PCE soil gas concentrations in the east sector.

- Provide trend data for PCE, benzene and ethylbenzene levels in *soil gas*, especially under recent seasonally wet conditions that likely raised the Site's groundwater table.

- Further delineate the extent of benzene in soil gas near future Building 10 in the northeast corner of the Site.

- For benzene and ethylbenzene soil gas hotspots, collect data to evaluate site conditions with respect to the RWQCB's Low Threat Closure Policy (LTCP). The LTCP pertains to petroleum hydrocarbon impact and uses different screening levels depending on the presence of a bioattenuation zone within shallow (0-5 ft) soil.

4.2 Summary of Proposed Investigation Work Scope

To achieve the data gap assessment objectives, the proposed flexible work scope includes the following task sequence in the east sector of the site:

- Task 1 – Exploratory Excavation near the Former Sewer Laterals and Soil and Groundwater Sampling.

- Task 2a– Soil and/or Groundwater Sampling to Delineate the Extent of PCE.

- Task 2b– Soil and/or Groundwater Sampling to Evaluate Benzene and Ethylbenzene Hotspots with respect to LTCP Criteria.

- Task 3 – Soil Gas Sampling to Delineate Benzene near Future Building 10 and to Provide Trend Data for PCE, Benzene and Ethylbenzene levels in *soil gas.*

The planned and contingent/optional step-out sampling locations to achieve the data gap investigation objectives are shown on Figures 9 and 10. The proposed work scope includes 1) the completion of two exploratory trenches near the former sewer with soil and/or water sampling within each trench, 2) up to nine soil borings for groundwater sampling for PCE (with optional soil sampling), 3) soil sampling from five shallow borings to 5 ft depth for TPH analysis in benzene and ethylbenzene hotspots, and 4) soil gas sampling from three proposed soil gas wells near Building 10 and soil gas sampling from ten existing soil gas wells in the east sector. For the proposed resampling of existing soil gas wells, Pangea selected all existing soil gas probes/wells within the benzene and ethylbenzene hotspots above residential ESLs for CAP area (Buildings 6, 7, 9, & 10), one well (SV-11) within the elevated PCE plume near the former sewer, and one well (SV-3) near the northern boundary of the PCE plume. If a PCE source is identified in a sewer or in groundwater near SV-11, this resampling will not be conducted for cost control due to planned remediation of this area.

(Note that the above work scope excludes the resampling of the pilot test soil gas probes near Buildings 5 & 8 which were already resampled on January 16 and March 3, 2017 for the pilot study effort.. The above work scope also excludes select soil sampling that may be conducted to facilitate soil profiling for offsite soil disposal associated with proposed remedial soil excavation. The soil profiling effort was proposed in Section

7.3.6 of the Draft CAP dated October 14, 2016.)

4.3 Assessment Preparation

Prior to initiating field activities, the following tasks will be conducted:

- Obtain drilling permit from the Alameda County Public Works Agency;
- Pre-mark the excavation area with white paint and notify Underground Service Alert (USA) of the excavation activities at least 48 hours before work begins;
- Prepare a Site-specific health and safety plan to educate personnel and minimize their exposure to potential hazards related to Site activities; and
- Coordinate with excavation and laboratory contractors and with involved parties.

4.4 Task 1 - Exploratory Trenching for Sewer Laterals

Former subsurface sewer laterals potentially related to the former dry cleaners were identified on blueprints obtained by PaulsCorp from the Alameda County Building Department. As shown on Figure 9, two sewer laterals were identified trending northward from Bockman Road onto the eastern portion of the Site. It is possible that one of these sewer laterals connected to the former dry cleaner facility prior to its demolition in the 1970s. The sewer depth is approximately 9 ft bgs in Bockman Road and likely shallower within the property boundary. Using an excavator, DCI Construction Inc. of Walnut Creek, California will attempt to locate and physically inspect the sewer laterals by excavating an approximate 24-inch wide exploratory trenches/pits to a depth up to approximately 9 ft bgs. During exploratory trenching, soil will be collected and field screened for VOCs using visual and olfactory observations and a photo-ionization detector (PID). Pangea will also screen any encountered sewer piping materials with a PID.

If a sewer lateral or evidence of a sewer trench is encountered during trenching, soil and/or groundwater samples will be collected at those locations that exhibit signs of PCE impact. Select soil and groundwater samples will be submitted to a state certified laboratory and analyzed for VOCs by EPA Method 8260B. Soil samples will be collected using Method 5035 (e.g., TerraCore).

If a sewer lateral is found, additional inspection of the sewer could include geophysical tracing of the sewer piping or a video sewer of the piping.

Following exploratory trenching, all excavated soil will be returned into the trench. Excavated soil may be stockpiled, covered with plastic, and screened for VOC offgassing using a PID. To identify the exploratory trench backfill locations, DCI will line the excavation trench with plastic sheeting, geotextile or other material. Alternatively, DCI will stake the exploratory trench area. All field activities will follow procedures

outlined on PANGEA's Site Management Plan Supplement dated August 17, 2016 and the Site and Perimeter Air Monitoring and Dust Mitigation Plan dated November 16, 2016.

4.5 Task 2a -Soil and Groundwater Sampling to Evaluate PCE Extent

If merited based on results of the exploratory excavation and sampling near the sewer laterals, Pangea may collect grab groundwater samples from up to nine (9) optional/contingent boring locations shown on Figure 9. These locations were selected to further delineate the PCE extent in shallow groundwater within and near the boundary of the PCE soil gas plume exceeding residential ESLs. For example, if no sewer lateral or PCE impact is found in soil or groundwater in the exploration trenches, grab groundwater sampling would likely be conducted near the former dry cleaners, and extend outward as merited. If a sewer lateral is found and PCE groundwater impact, grab groundwater sampling could be conducted at shown locations near the boundary of the PCE soil gas plume above residential ESLs.

To conduct grab groundwater sampling, soil borings will be drilled using hand auger and/or a hollow stem auger to a depth of 8 ft bgs. (Direct push tools are not planned since this technique tends to inhibit groundwater infiltration into the open borehole via smearing of fine-grained soil and soil compression at the borehole interface). A groundwater sample will be collected for laboratory analysis from each boring. The grab groundwater samples will be collected using a disposal bailer or peristaltic pump with Teflon™ tubing inserted into temporary PVC well casing. Due to the low permeability of the anticipated fine-grained soil, the boring may be left open overnight to allow groundwater to infiltrate into the soil boring. The groundwater samples will be placed into a cooler filled with ice and delivered under chain-of-custody procedures to a State-certified laboratory. Completed borings will be tremie-grouted with cement from the bottom of the hole to the surface. Groundwater samples will be analyzed for VOCs by EPA Method 8260B.

Soil samples will be collected and classified according to the Unified Soil Classification System (USCS) and field screened for VOCs using visual and olfactory observations and a photo-ionization detector (PID). If merited based on soil screening and results of the sewer lateral exploratory excavation for finding PCE source in soil, soil samples may be collected via Method 5035 (e.g., TerraCore) and analyzed for VOCs by EPA Method 8260B.

All site investigation activities will be performed under the supervision of a California Registered Civil Professional Engineer (P.E.) and/or a California Registered Professional Geologist (P.G.) in general accordance with the Standard Operating Procedures (SOPs) provided in Appendix B.

4.6 Task 2b - Soil and Groundwater Sampling to Evaluate Benzene and Ethylbenzene Hotspots with Respect to LTCP Criteria

For benzene and ethylbenzene soil gas hotspots, Pangea will collect soil data (and optional groundwater data) to evaluate site conditions with respect to the RWQCB's Low Threat Closure Policy (LTCP). The LTCP pertains to petroleum hydrocarbon impact and uses different screening levels depending on the presence of a bioattenuation zone within shallow (0-5 ft) soil. Site oxygen concentrations in soil gas have been consistently below 4%. According to Scenario 3 (1 of 2) in Appendix 3 of the LTCP, a bioattenuation zone is present if the following conditions are met for sites with oxygen levels are less than 4% or oxygen data does not exist: 1) TPHg+TPHd concentrations in shallow soil (0-5 ft below foundation) is below 100 milligrams per kilogram (mg/kg), and 2) benzene concentrations in groundwater are below 100 micrograms per liter (µg/L) where groundwater is at least 5 ft below the building foundation. Based on historical Site data, Pangea anticipates that the collected data will meet the above LTCP criteria for a bioattenuation zone. ACDEH required shallow soil analysis for TPHg+TPHd. ACDEH did not require additional groundwater data based on lack of benzene detected within prior sampling in the eastern sector.

LTCP Scenario 3 (1 of 2) also states that a bioattenuation zone is present if groundwater is at least 10 ft below the building foundation and benzene concentrations in groundwater are less than 1,000 µg/L (and TPH is below 100 mg/kg). Since groundwater has been encountered shallower than 10 ft, this Scenario is not applicable to the Site. LTCP Scenario 3 (2 of 2) also states that a bioattenuation zone is present if oxygen is 4% or greater, and if benzene is less than groundwater below 1,000 µg/L with groundwater depth at least 10 ft below the building foundation (and TPH in soil is below 100 mg/kg). Since groundwater has been encountered shallower than 10 ft at the Site, this Scenario is not applicable to the Site.

At five (5) shallow boring locations shown on Figure 9, Pangea proposes to confirm that the site groundwater depth is below 5 ft and Pangea will collect soil samples for shallow (0-5 ft) soil. The proposed boring locations are within elevated benzene and ethylbenzene soil gas impact areas above residential ESLs and/or above the ethylbenzene LTCP criteria of 1,100 micrograms per cubic meter (µg/m^3). Note that the ethylbenzene residential ESL is 560 µg/m^3, which is approximately half the corresponding LTCP criteria. Also note that no benzene soil gas impact has been reported above the LTCP criteria of 85 µg/m^3. Finally, note that if a bioattenuation zone is present within the upper 5 ft, the LTCP criteria increases 1,000-fold, for a benzene LTCP criteria of 85,000 µg/m^3 and an ethylbenzene LTCP criteria of 1,100,000 µg/m^3. (The final remedial approach may consider construction of a bioattenuation zone using permeable soil/rock to help avoid a deed restriction for any elevated benzene and ethylbenzene areas of concern).

One shallow soil sample within each of the five borings will be analyzed for TPHg and TPHd by EPA Method 8015M. The shallow soil samples will be collected at 2.5 ft bgs unless field observations suggest hydrocarbon impact at another depth.

Optional groundwater sampling may be conducted from these borings. Groundwater sampling could help confirm that benzene concentrations in shallow groundwater are below the LTCP criteria of 100 µg/L, or to help evaluate the vertical distribution of benzene/ethylbenzene impact.

Additional soil and groundwater sampling procedures are described in Section 4.5 and in Pangea's SOPs in Appendix A.

4.7 Task 3 - Soil Gas Sampling for Trend Analysis and Delineation

To delineate benzene near future Building 10 and to provide VOC trend data in soil gas (for PCE, benzene and ethylbenzene) in the east sector, Pangea proposes the sampling of three new soil gas wells and resampling of ten existing soil gas wells. This includes sampling of all existing soil gas probes/wells within the benzene and ethylbenzene hotspots above residential ESLs for CAP area (Buildings 6, 7, 9, & 10). Pangea recently inspected these wells to confirm no apparent damage from site construction activity. As shown on Figure 9, PANGEA proposes soil gas sampling from the following specific locations:

- Near Building 10 in the northeastern corner of the Site, Pangea will sample soil gas from three (3) new soil gas probes/wells and existing wells SV-55 and SV-56.

- Within the other benzene and ethylbenzene hotspots, Pangea will sample soil gas from existing wells SV-23, SV-24 and SV-33 along the eastern boundary and existing wells SV-18, SV-19 and SV-27 along the southern boundary.

- Within the PCE soil gas plume, Pangea will sample soil gas from well SV-3 and SV-11. Well SV-3 is located near the northern boundary of the PCE plume, and well SV-11 is located within the elevated PCE plume and near the former sewer. If a PCE source is identified in a sewer or in groundwater near SV-11, this resampling will not be conducted for cost control due to planned remediation of this area.

The new soil gas probes will be installed and sampled according to the State *Advisory – Active Soil Gas Investigations* (CalEPA/DTSC, 2015). The soil gas probes will be constructed to a depth of 5.5 ft bgs using a 3.25-inch diameter hand auger. The probes will be constructed by setting a vapor implant attached to ¼-inch Teflon™ tubing at 5 ft bgs with six-inches of sand pack above and below it. Six inches of dry bentonite crumbles will be placed on top of the sand and the remaining annular space will be backfilled with hydrated bentonite. For the onsite soil gas probes, the Teflon™ tubing will be set in a 2-inch PVC riser pipe and capped to prevent moisture from entering. For the offsite soil gas probes, the Teflon™ tubing will be set within a 6-inch diameter, flush-mounted well box and capped to prevent moisture from entering.

At least 48 hours will be allowed to pass after installation before the soil gas probes are sampled to allow sufficient time for the subsurface soil gases to equilibrate. Three casing volumes will be purged from the soil

gas probe prior to sampling at rate of 100-200 milliliters per minute (ml/min). The probe will be connected to a certified 1-liter summa™ canister with a flow control manifold and placed in a sampling shroud. A quantitate leak check compound such as isopropanol will be introduced into the shroud at the time sampling begins. Isopropanol concentrations will be monitored by a photo ionization detector (PID) and maintained at a concentration of 10-20 parts per million (ppm).

Soil gas samples will be analyzed for select VOCs by EPA Method TO-15. For cost control, the laboratory will only quantify the following chemical of concern: PCE, benzene and ethylbenzene (and tracer gas isopropanol). A shroud sample will also be collected and analyzed for isopropanol by EPA Method TO-15. For soil gas wells within the benzene and ethylbenzene soil gas plumes, samples may also be analyzed for oxygen by ASTM D1946. Oxygen analysis could help evaluate the presence of a bioattenuation zone, but oxygen concentrations have been consistently below the LTCP criteria of 4% from prior analysis.

4.8 Investigation Derived Waste

Investigation derived waste (IDW) generated during field activities will be temporarily stored onsite on plastic sheeting. Following review of analytical results, the IDW will be transported to an appropriate facility for disposal or recycling in conjunction with CAP excavation activities.

4.9 Reporting

The sewer exploration and data gas assessment procedures and results will be incorporated into the *Remedial Action Implementation Plan*. This report will propose specific procedures for implementing the conceptual remediation approach presented in the *Draft Corrective Action Plan* dated October 14, 2016.

5.0 REFERENCES

CalEPA/DTSC, 2011, (CalEPA, 2011) *Vapor Intrusion Mitigation Advisory (VIMA),* October.

CalEPA/DTSC, 2015, (CalEPA, 2015) *Advisory – Active Soil Gas Investigations,* July.

ENGEO, 2015, *Phase I Environmental Site Assessment*, June 30.

ENGEO, 2015, *Phase II Environmental Site Assessment,* July 2.

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ENGEO, 2016, *Revised Phase II Environmental Site Assessment*, August 2.

PANGEA, 2016, *Site Management Plan Addendum,* August 17.

PANGEA, 2016, *Site Assessment Report,* August 26.

PANGEA, 2016, *Pilot Study Workplan,* October 7.

PANGEA, 2016, *Draft Corrective Action Plan*, October 14.

PANGEA, 2016, *Data Gap Field Investigation Workplan*, October 17.

PANGEA, 2016, *Interim Remediation Report*, October 26.

PANGEA, 2016, *Data Gap Investigation Report - Buildings 3 & 4*, November 16.

Secor, 2004, *Phase I Environmental Site Assessment*, November 2004.

Secor, 2004, *Phase II Environmental Site Assessment*, December 2004.

Figure 1

1233 Bockman Road
San Lorenzo, California

PANGEA

Vicinity Map

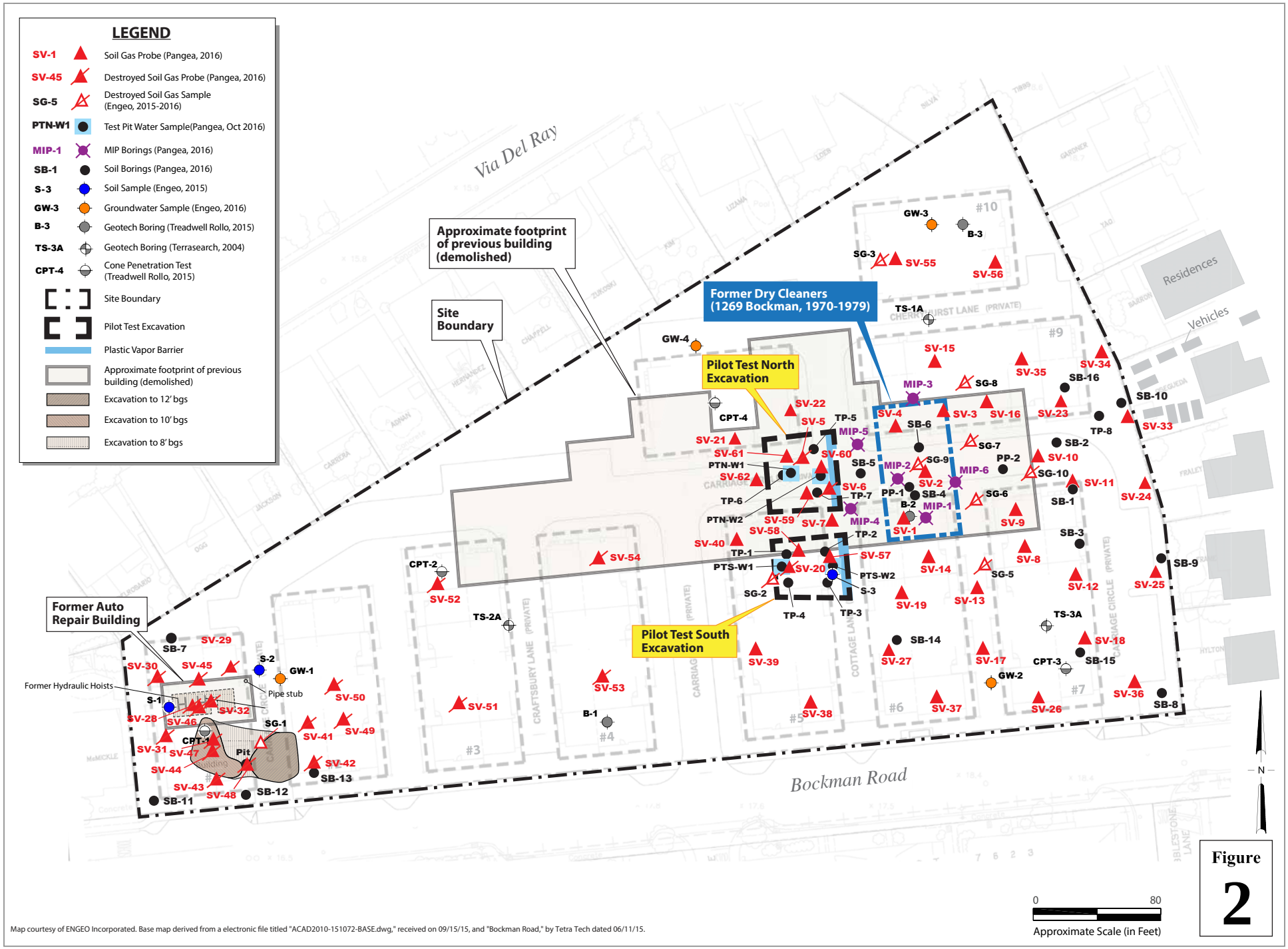


Figure 2

Map courtesy of ENGEO Incorporated. Base map derived from a electronic file titled "ACAD2010-151072-BASE.dwg," received on 09/15/15, and "Bockman Road," by Tetra Tech dated 06/11/15.

1233 Bockman Road
San Lorenzo, California

PANGEA

Site Map

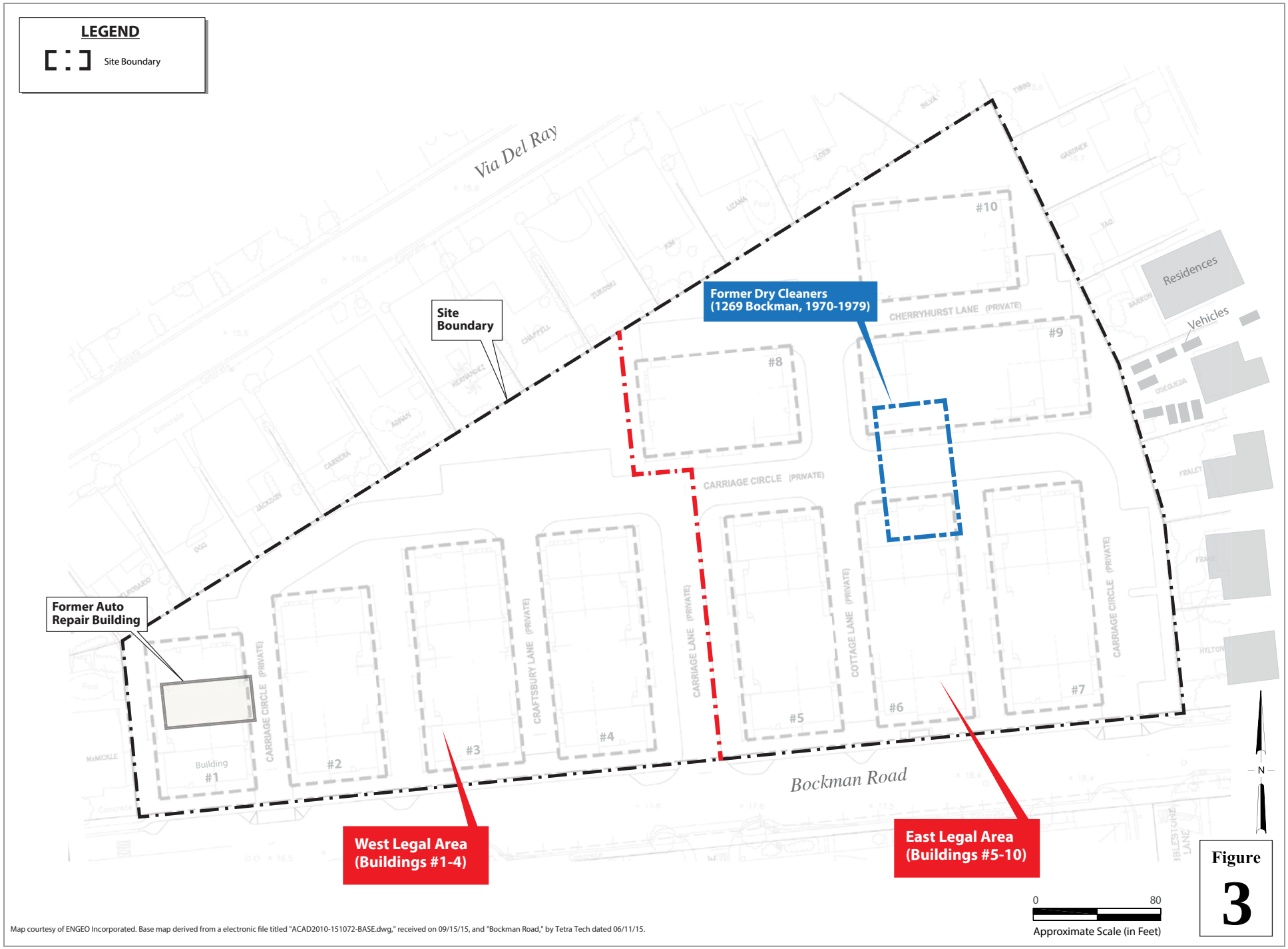


Figure 3

Map courtesy of ENGEO Incorporated. Base map derived from a electronic file titled "ACAD2010-151072-BASE.dwg," received on 09/15/15, and "Bockman Road," by Tetra Tech dated 06/11/15.

1233 Bockman Road
San Lorenzo, California

PANGEA

West and East Site Legal Areas

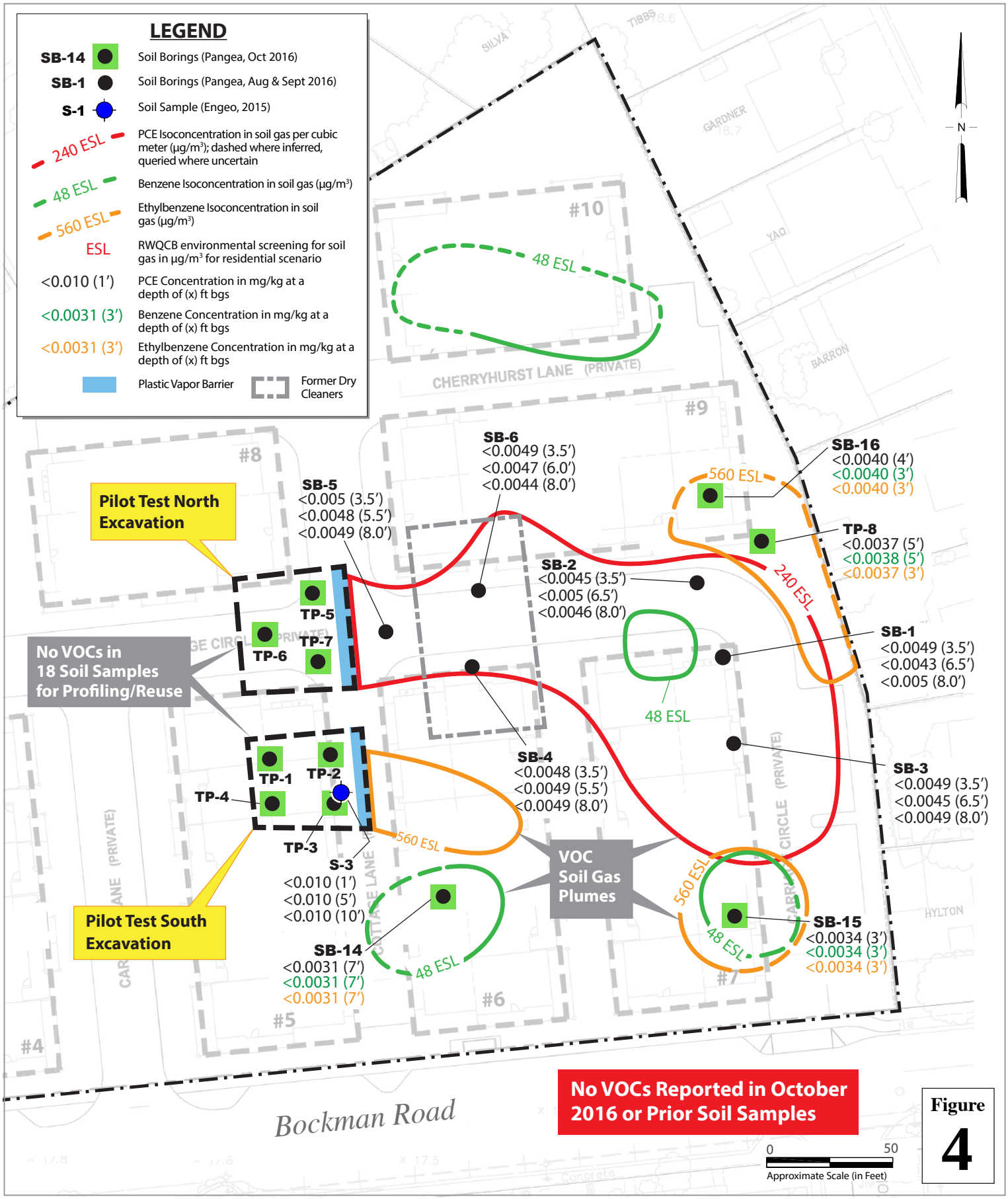


Figure 4

1233 Bockman Road
San Lorenzo, California

PANGEA

PCE in Soil

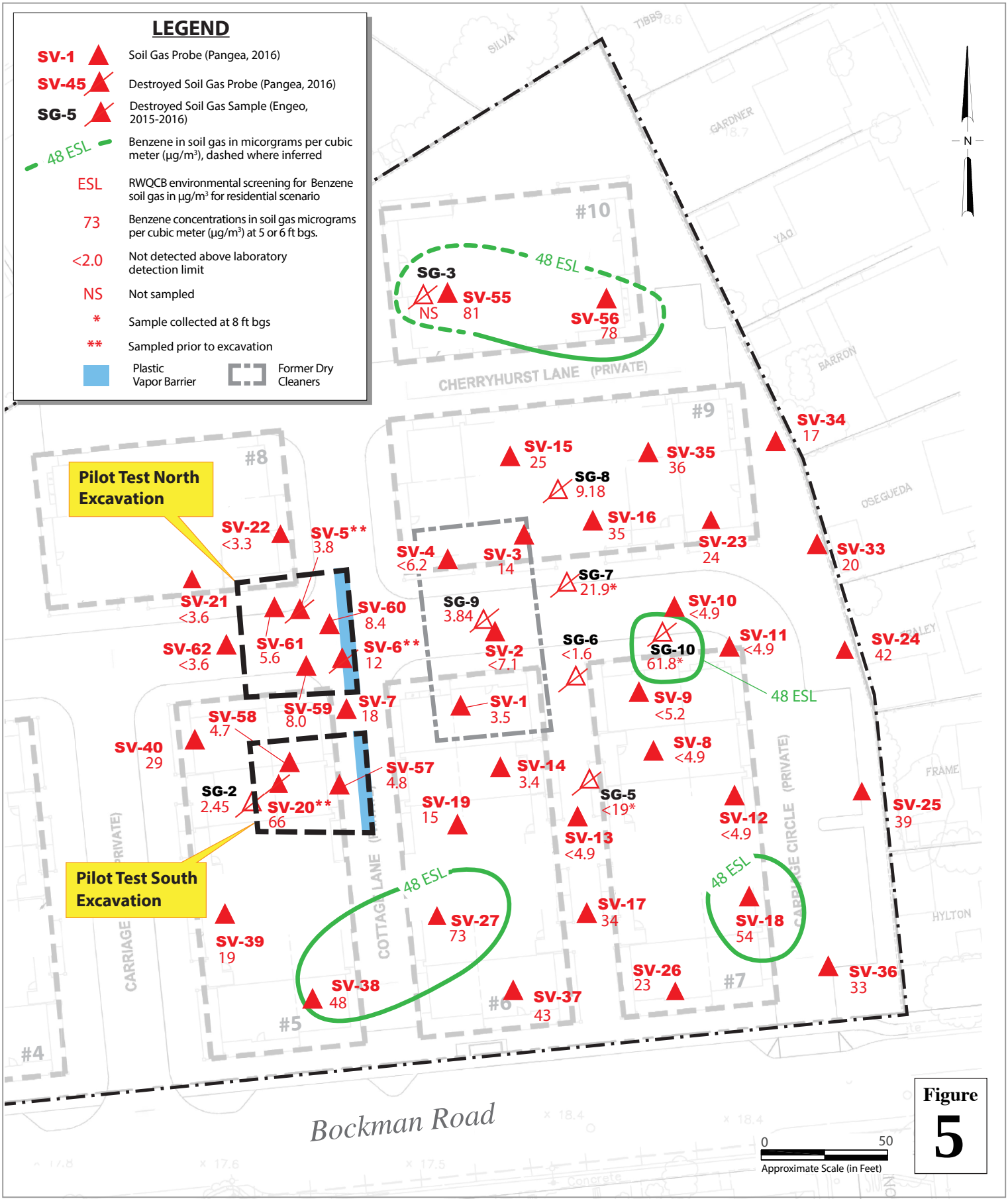


Figure 5

1233 Bockman Road
San Lorenzo, California

PANGEA

Benzene in Soil Gas

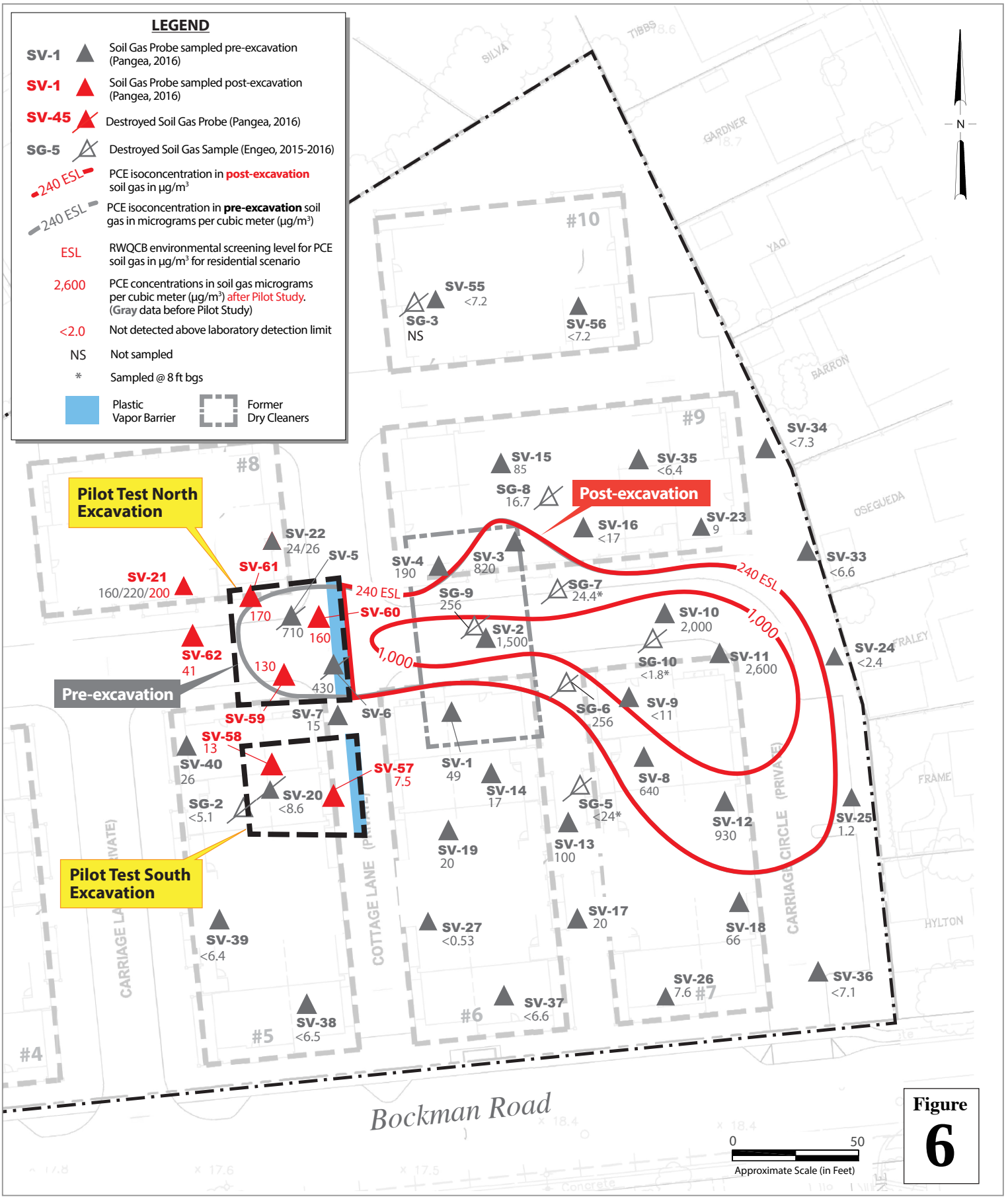


Figure 6

1233 Bockman Road
San Lorenzo, California

PANGEA

PCE in Soil Gas
(Pre- and Post-Excavation Pilot Study)

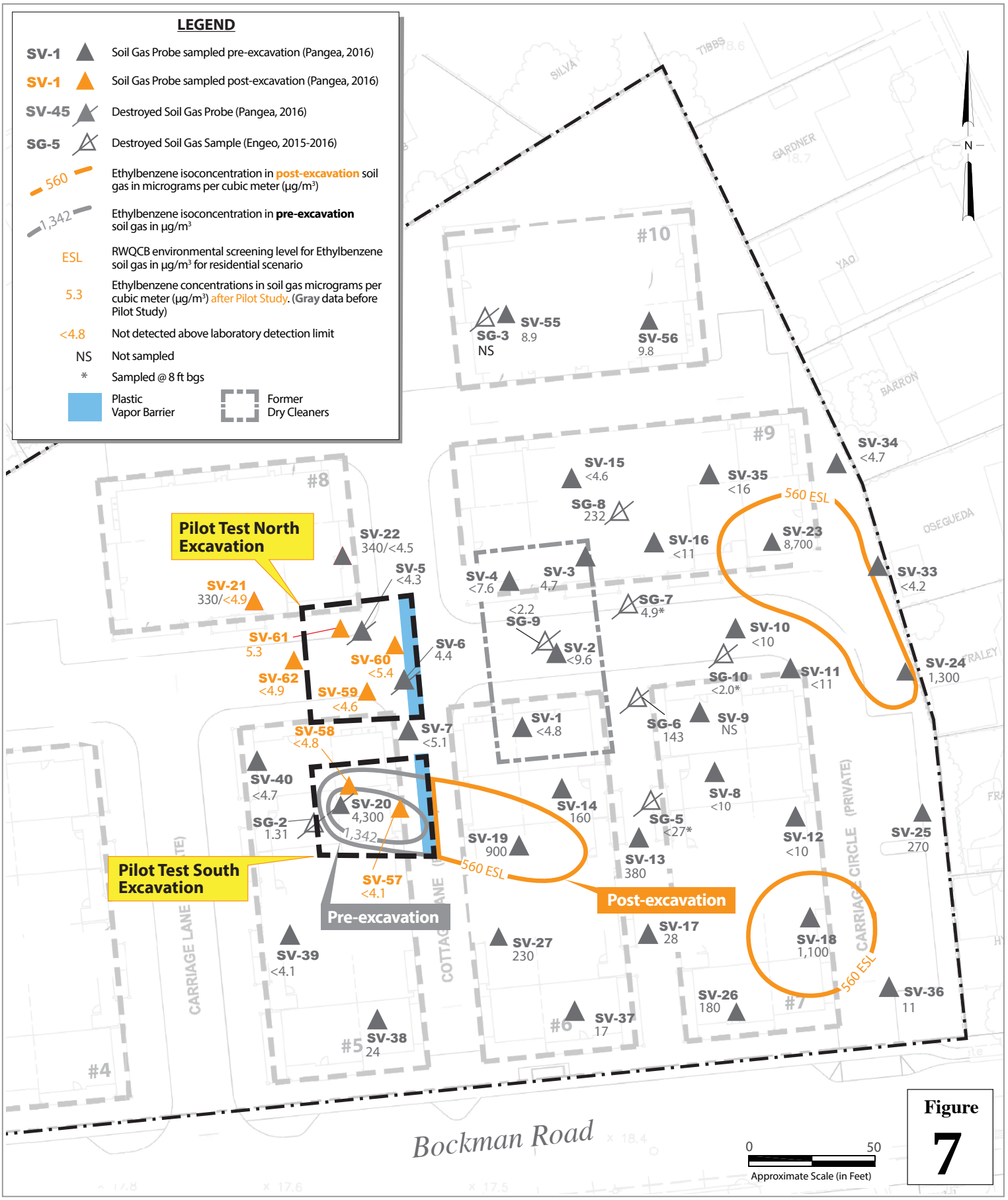


Figure 7

1233 Bockman Road
San Lorenzo, California

PANGEA

Ethylbenzene in Soil Gas
(Pre- and Post-Excavation Pilot Study)

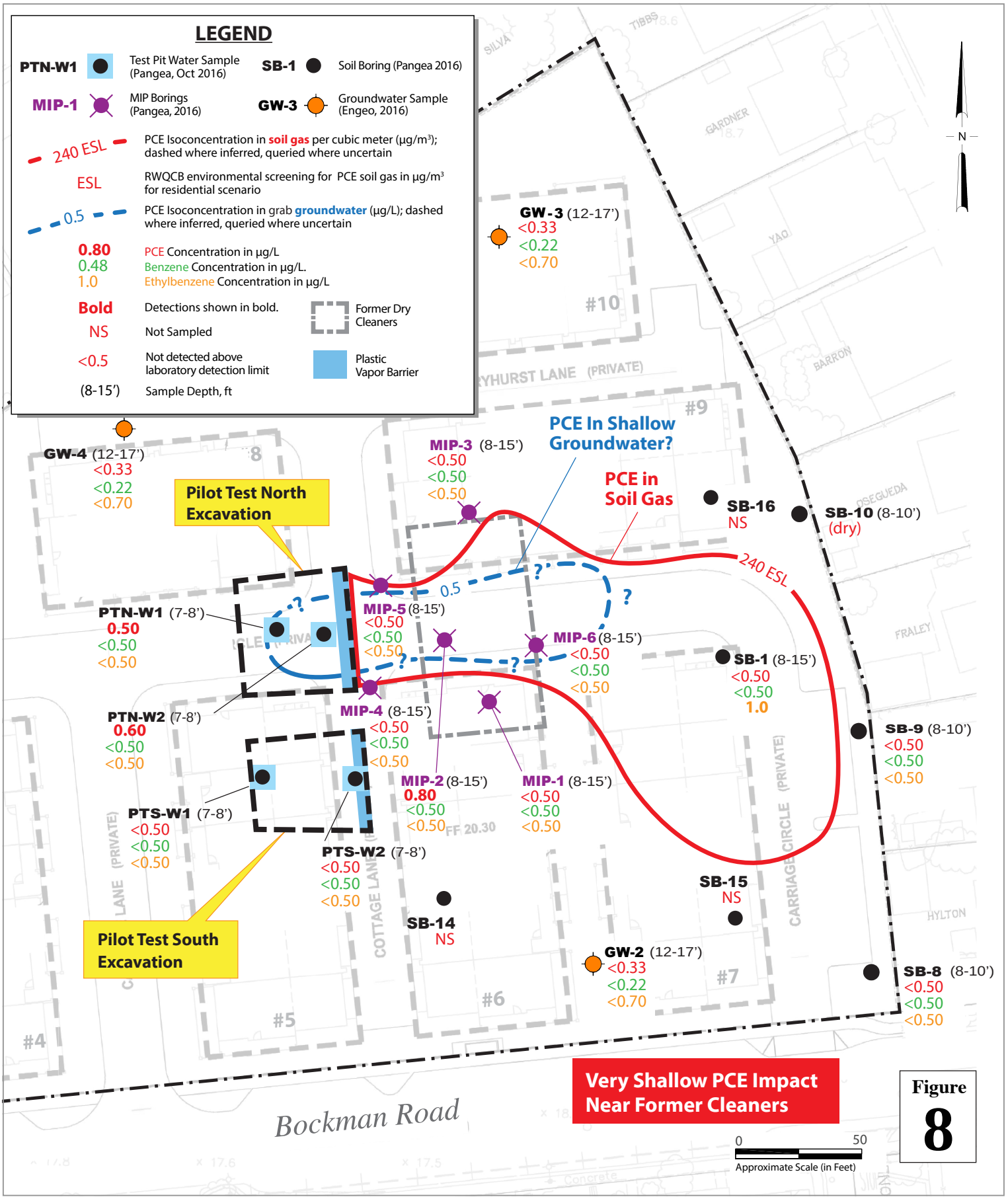
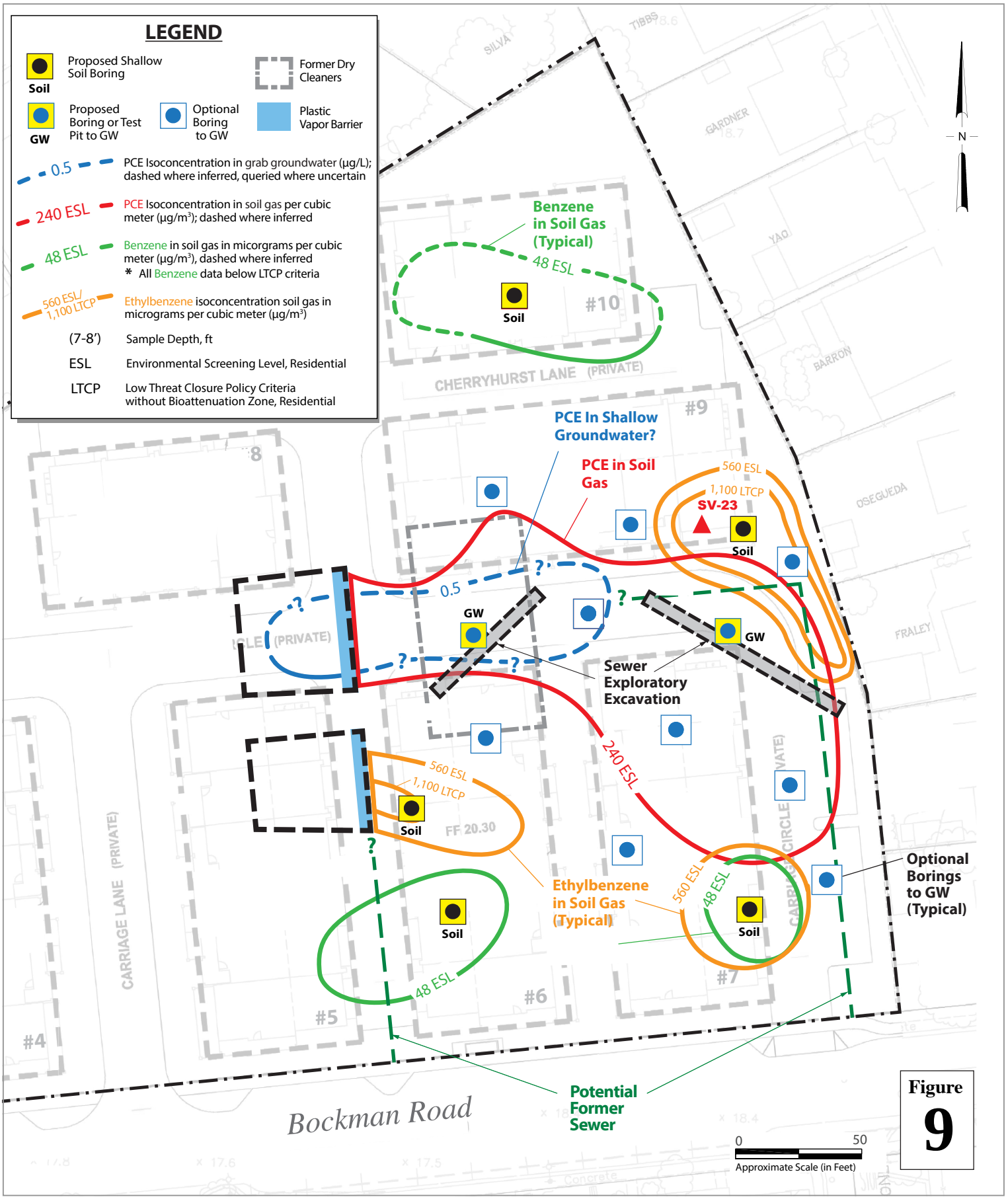


Figure 8

1233 Bockman Road
San Lorenzo, California

PANGEA

VOCs in Groundwater

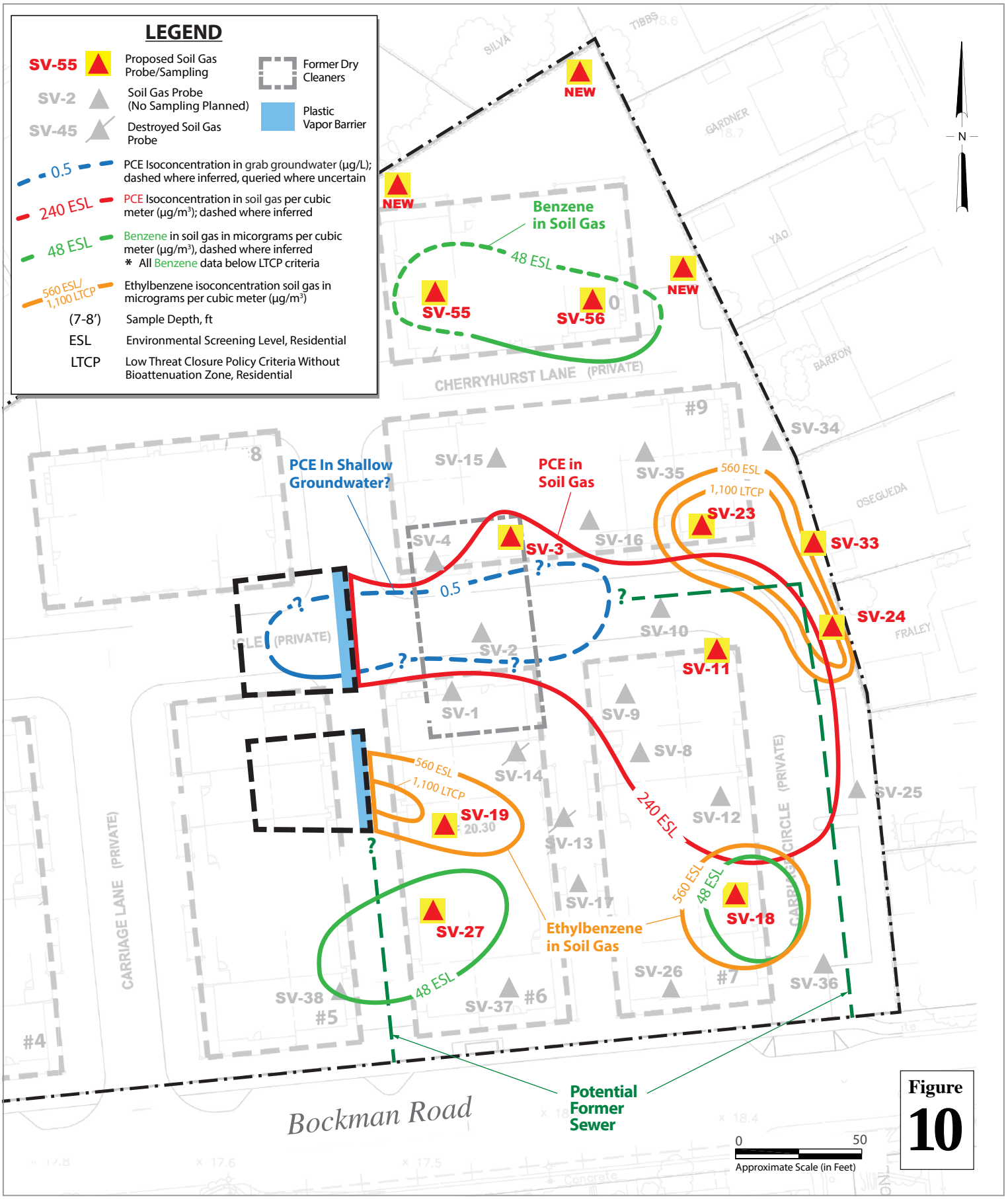


1233 Bockman Road
San Lorenzo, California

PANGEA

Proposed Sewer Exploration and Soil & Groundwater Sampling Locations

ated 06/11/15.



1233 Bockman Road
San Lorenzo, California

PANGEA

Proposed Soil Gas Sampling Locations

Pangea

Table 1. Soil Analytical Data - 1233 Bockman Road, San Lorenzo California

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	Lead	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene	1,2-DCA	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Acetone	Other VOCs	SVOCs	PCBs	Notes
Direct Exposure ESL - residential, shallow soil:			740	230	11,000	80	0.23	970	5.1	560	42	3.3	0.37	0.6	1.2	19	160	0.0082	0.30	59,000	varies	varies	varies	
			mg/Kg																					
ENGEO Site Assessment 2015																								
S-1	6/25/2015	1	<0.1	3.6	32	13	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
	6/25/2015	5	<0.1	<2.0	<10	5.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
	6/25/2015	10	<0.1	<2.0	<10	5.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
S-2	6/25/2015	1	<0.1	<2.0	<10	7.6	<0.01	<0.01	<0.01	22.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
	6/25/2015	5	<0.1	<2.0	<10	8.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
	6/25/2015	10	<0.1	<2.0	<10	4.9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	former auto repair area
S-3	6/25/2015	1	<0.1	14	230	1.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	
	6/25/2015	5	<0.1	<2.0	17	6.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	
	6/25/2015	10	<0.1	<2.0	<10	5.6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.021	---	---	
PANGEA Site Assessment 2016 - Dry Cleaner Area																								
SB-1	8/3/2016	3.5	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.02	<0.049	---	---	
		6.5	<0.96	---	---	---	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0087	<0.0043	<0.017	<0.043	---	---	
		8	---	---	---	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.02	<0.050	---	---	
SB-2	8/3/2016	1	---	---	---	3.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
		3	---	---	---	8.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
		3.5	---	---	---	---	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0091	<0.0045	<0.018	<0.045	---	---	
		6	---	---	---	6.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
		6.5	<1.1	---	---	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.02	<0.050	---	---	
		8	---	---	---	---	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0093	<0.0046	<0.019	<0.046	---	---	
SB-3	8/3/2016	3.5	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	0.027	<0.049	---	---	
		6.5	<0.99	---	---	---	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0091	<0.0045	<0.018	<0.045	---	---	
		8	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.02	<0.049	---	---	
SB-4	8/3/2016	3.5	---	---	---	---	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0097	<0.0048	<0.019	<0.048	---	---	
		5.5	<0.99	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0097	<0.0049	<0.019	<0.049	---	---	
		8	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.02	<0.049	---	---	
SB-5	8/3/2016	3.5	---	---	---	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.02	<0.050	---	---	
		5.5	<1.1	---	---	---	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0097	<0.0048	<0.019	<0.048	---	---	
		8	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.02	<0.049	---	---	
SB-6	8/3/2016	1	---	---	---	7.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
		3	---	---	---	5.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
		3.5	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0097	<0.0049	<0.019	<0.049	---	---	
		6	<0.98	---	---	4.1	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0093	<0.0047	<0.019	<0.047	---	---	
		8	---	---	---	---	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0089	<0.0044	<0.018	<0.044	---	---	
SB-7	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-8	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-9	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring

Pangea

Table 1. Soil Analytical Data - 1233 Bockman Road, San Lorenzo California

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	Lead	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene	1,2-DCA	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Acetone	Other VOC's	SVOC's	PCBs	Notes
Direct Exposure ESL - residential, shallow soil:			740	230	11,000	80	0.23	970	5.1	560	42	3.3	0.37	0.6	1.2	19	160	0.0082	0.30	59,000	varies	varies	varies	
			mg/Kg																					
SB-10	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-11	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-12	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-13	9/8/2016	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	no samples taken from boring
SB-14	10/20/2016	7	---	---	---	---	<0.0031	<0.0031	<0.0031	<0.0062	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0062	<0.0031	<0.012	<0.031	---	---	
SB-15	10/20/2016	3	---	---	---	---	<0.0034	<0.0034	<0.0034	<0.0068	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0068	<0.0034	<0.014	<0.034	---	---	
SB-16	10/20/2016	4	---	---	---	---	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0079	<0.0040	<0.016	<0.0040	---	---	
Site Assessment - Auto Repair Area																								
SV-28	8/22/2016	7.5	5.2	**1,400**	2,800	---	<0.0048	<0.0048	<0.0048	<0.0096	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095	<0.0048	<0.019	<0.048	---	---	Excavated to 8'
SS-1	9/2/2016	2.5	---	---	---	---	<0.0047	<0.0047	<0.0047	<0.0094	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0094	<0.0047	<0.019	<0.047	---	---	
SS-2	9/2/2016	2.5	<1.0	43	300	---	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0093	<0.0046	<0.019	<0.046	---	---	Excavated to 8'
SS-3	9/2/2016	2.5	---	---	---	---	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.020	<0.050	---	---	
SS-4	9/2/2016	2.5	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	0.059	<0.049	---	---	
SS-5	9/2/2016	2.5	---	---	---	---	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	0.050	<0.050	---	---	
SS-6	9/2/2016	8	---	---	---	---	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	0.0084	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.020	<0.050	---	---	Excavated to 12'
	9/2/2016	10	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0097	<0.0049	<0.019	<0.049	---	---	
SS-7	9/2/2016	8	---	---	---	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0097	<0.0049	<0.019	<0.049	---	---	
SS-8	9/2/2016	8	---	---	---	---	<0.0045	<0.0045	<0.0045	<0.0090	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0090	<0.0045	<0.018	<0.045	---	---	
SS-9	9/2/2016	8	4.0	**650**	3,100	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	0.030	<0.049	---	---	Excavated to 10'
	9/2/2016	10	<0.96	<1.0	<5.0	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0099	<0.0049	<0.020	<0.049	<0.660 a	---	
Confirmation Samples - Auto Repair Area																								
H-1	8/30/2016	8	---	110	310	---	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095	<0.0048	<0.019	<0.048	<0.660 a	<0.024	bottom of excavation sample
H-2	8/30/2016	8	---	<1.0	<5.0	---	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095	<0.0048	<0.019	<0.048	---	<0.024	bottom of excavation sample
H-3	8/30/2016	8	---	1.5	16	---	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.018	<0.048	---	<0.024	bottom of excavation sample
BS-1-12	9/7/2016	12	<1.1	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	bottom of excavation sample
BS-2-12	9/7/2016	12	<1.1	<0.99	<5.0	---	<0.0048	<0.0048	<0.0048	<0.0096	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0097	<0.0048	<0.019	<0.048	---	---	bottom of excavation sample
BS-3-12	9/7/2016	12	<1.0	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	bottom of excavation sample

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Table 1. Soil Analytical Data - 1233 Bockman Road, San Lorenzo California

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	Lead	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene	1,2-DCA	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Acetone	Other VOC's	SVOC's	PCBs	Notes
Direct Exposure ESL - residential, shallow soil:			740	230	11,000	80	0.23	970	5.1	560	42	3.3	0.37	0.6	1.2	19	160	0.0082	0.30	59,000	varies	varies	varies	
			mg/Kg																					
BS-4-8	9/7/2016	8	<1.1	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	bottom of excavation sample
BS-5-10	9/7/2016	10	<0.97	<0.99	<5.0	---	<0.0048	<0.0048	<0.0048	<0.0096	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0097	<0.0048	<0.019	<0.048	---	---	bottom of excavation sample
BS-6-10	9/7/2016	10	<0.94	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	bottom of excavation sample
BS-7-10	9/7/2016	10	<0.97	<0.99	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	bottom of excavation sample
SW-1-10	9/7/2016	10	<1.0	<1.0	<5.0	---	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0099	<0.0049	<0.020	<0.049	---	---	excavation sidewall sample
SW-2-10	9/7/2016	10	<1.0	<0.99	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	excavation sidewall sample
SW-3-10	9/8/2016	10	<0.97	1.1	<5.0	---	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0099	<0.0049	<0.020	<0.050	---	---	excavation sidewall sample
SW-4-8	9/7/2016	8	<0.97	<1.0	<5.0	---	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0099	<0.0050	<0.020	<0.050	---	---	excavation sidewall sample
SW-5-8	9/7/2016	8	<0.95	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	excavation sidewall sample
SW-6-8	9/7/2016	8	<1.0	<1.0	<5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	excavation sidewall sample
Pilot Study Excavation Samples																								
COMPA (TP1-TP4)	9/16/2016	1.0	<0.96	11	68	0.94	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.050	<0.019	TP-1 thru TP-4 composite
COMPB (TP1-TP4)	9/16/2016	3.0	<1.0	4.3	<5.0	7.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.0051	<0.019	TP-1 thru TP-4 composite
COMPC (TP1-TP4)	9/16/2016	6.0	<1.0	3.1	<5.0	5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.0050	<0.019	TP-1 thru TP-4 composite
TP-1	9/16/2016	1.0	---	---	---	---	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0090	<0.0045	<0.180	<0.045	---	---	PTS
TP-1	9/16/2016	3.0	---	---	---	---	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0089	<0.0045	<0.180	<0.045	---	---	PTS
TP-1	9/16/2016	6.0	---	---	---	---	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0081	<0.0041	<0.160	<0.041	---	---	PTS
TP-5	10/3/2016	2.0	<0.14	<1.0	<5.0	6.0	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0074	<0.0037	<0.150	<0.037	b	<0.019	PTN
TP-6	10/3/2016	4.0	<0.16	<1.0	<5.0	5.2	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0074	<0.0037	<0.150	<0.037	<0.005	<0.019	PTN
TP-7	10/3/2016	6.0	<0.14	<0.99	<5.0	5.6	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0074	<0.0034	<0.140	<0.034	<0.005	<0.019	PTN
TP-8	10/3/2016	5.0	<0.15	<1.0	<5.0	7.4	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0068	<0.0037	<0.150	<0.037	<0.005	<0.019	East property line
PTN-Comp1 (A-D)	10/19/2016	0-1	<1.0	1.4	16	3.2	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0093	<0.0047	<0.190	<0.047	---	---	soil stockpile from PTN 0-1 ft bgs
PTN-Comp2 (A-D)	10/19/2016	1-4	<0.99	<1.0	<5.0	6.2	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.0049	<0.200	<0.049	---	---	soil stockpile from PTN 1-4 ft bgs
PTN-Discrete1	10/20/2016	1-4	---	---	---	---	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0086	<0.0043	<0.170	<0.043	---	---	soil stockpile from PTN 1-4 ft bgs
PTN-Discrete2	10/20/2016	4.5	---	---	---	---	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0073	<0.0036	<0.150	<0.036	---	---	insitu PTN
PTN-Discrete3	10/25/2016	5-6.5	---	---	---	---	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.180	<0.046	---	---	soil stockpile from PTN 5-6.5 ft bgs
PTS-Discrete1	11/3/2016	0-1	---	---	---	---	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0071	<0.0035	<0.140	<0.035	---	---	soil stockpile from PTS 0-1 ft bgs
PTS-Discrete2	11/3/2016	1-4	---	---	---	---	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.160	<0.040	---	---	soil stockpile from PTS 1-5 ft bgs
PTS-Discrete3	11/3/2016	1-4	---	---	---	---	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0036	<0.0072	<0.0036	<0.140	<0.036	---	---	soil stockpile from PTS 1-5 ft bgs
PTS-Discrete4	11/3/2016	5-6.5	---	---	---	---	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0076	<0.0038	<0.150	<0.038	---	---	soil stockpile from PTS 5-6.5 ft bgs
COMP6 (1-4)	10/18/2016	stockpile	<0.93	13	200	7.9	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.050	<0.020	<0.050	<33	<0.0095	Offsite utility trenching near Building 1&2
COMP7 (1-4)	10/24/2016	stockpile	<1.1	24	300	9.5	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0099	<0.0049	<0.020	<0.049	---	---	Onsite utility trenching near Building 1&2
B1&2 - Discrete1	11/10/2016	stockpile	---	---	---	---	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.0075	<0.0037	<0.015	<0.037	---	---	Buildings 1&2 trenching stockpile
B3&4 - Discrete1	11/10/2016	stockpile	---	---	---	---	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0034	<0.0068	<0.0034	<0.014	<0.034	---	---	Buildings 3&4 trenching stockpile

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Table 1. Soil Analytical Data - 1233 Bockman Road, San Lorenzo California

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	Lead	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene	1,2-DCA	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Acetone	Other VOC's	SVOCs	PCBs	Notes
Direct Exposure ESL - residential, shallow soil:			740	230	11,000	80	0.23	970	5.1	560	42	3.3	0.37	0.6	1.2	19	160	0.0082	0.30	59,000	varies	varies	varies	
			← mg/Kg →																					

Explanation:

TPHd and TPHmo analyzed by EPA Method 8015, TPHg and VOC's analyzed by EPA Method 8260

Benzene, Toluene, Ethylbenzene and Xylenes by EPA Method 8021.

TPHd = Total Petroleum Hydrocarbons as diesel

TPHmo = Total Petroleum Hydrocarbons as motor oil

MTBE = Methyl tert-butyl ether

1,2-DCA = 1,2-Dichloroethane

PCE = Tetrachloroethene

TCE = Trichloroethene

cis-1,2-DCE = cis-1,2-Dichloroethene

VOCs = Volatile organic compounds by EPA Method 8260.

SVOCs = Semi-volatile organic compounds by EPA Method 8270.

PCB = Total polychlorinated biphenyls including Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260

mg/Kg = Milligrams per kilogram

ft bgs = Depth below ground surface (bgs) in feet.

ft bgs = Depth below ground surface (bgs) in feet.

ESL = Environmental Screening Level, from California Regional Water Quality Control Board - San Francisco Bay Region, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Revised February 2016 (Revision 3).

< n = Chemical not present at a concentration in excess of detection limit shown.

--- = Not analyzed

a = All chemicals below shown reporting limit (except benzoic acid with a reporting level of 1.7 mg/kg). See laboratory report for lower reporting limits for other chemicals.

b = Flouranthene detected at 0.0056 mg/kg, pyrene detected at 0.0089 mg/kg, both are below ESLs

ND = not detected

contaminant detections highlighted in gray

PTN = pilot test north excavation area

PTS = pilot test south excavation area

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Table 2. Groundwater Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring / Sample ID	Date Sampled	Depth to Water (ft bgs)	TPHg (µg/L)	TPHd (µg/L)	TPHmo (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Naphthalene (µg/L)	1,2-DCA (µg/L)	PCE (µg/L)	TCE (µg/L)	Chloroform (µg/L)	Other VOCs (µg/L)	Notes
Tier 1 ESL - Groundwater:			100	100	n/a	1.0	40	13	20	0.12	0.5	3.0	5.0	50	varies	
Vapor Intrusion ESL - shallow groundwater, residential:			100	100	n/a	1.1	3,600	13	1,300	20	6.1	3.0	5.6	2.3	varies	
Vapor Intrusion ESL - shallow groundwater, commercial:			5,000	5,000	n/a	9.7	30,000	110	11,000	170	53	26	49	20	varies	
ENGEO Site Assessment 2015 - 2016																
GW-1	6/25/2015	15-25[a]	51	--	--	0.48	0.42	<0.59	0.26	0.28	<0.17	<0.59	<0.59	<0.59	ND	
	7/15/2016	12-17[b]	<41	--	--	0.41	<0.20	<0.70	<0.55	<1.7	0.15	0.62	<0.70	<0.70	ND	
GW-2	6/25/2015	15-25[a]	<50	--	--	<0.50	<0.50	<0.50	<1.0	<0.16	<0.17	<0.50	<0.50	<0.50	ND	
	7/15/2016	12-17[b]	<41	--	--	<0.22	<0.20	<0.70	<0.55	<1.7	<0.15	<0.33	<0.70	<0.70	ND	
GW-3	6/25/2015	15-25[a]	<50	--	--	<0.50	<0.50	<0.50	<1.0	<0.16	<0.17	<0.50	<0.50	<0.50	ND	
	7/15/2016	12-17[b]	53.2	--	--	<0.22	<0.20	<0.70	<0.55	<1.7	<0.13	<0.33	<0.70	<0.70	ND	
GW-4	7/15/2016	12-17[b]	<41	--	--	<0.22	<0.20	<0.70	<0.55	<1.7	<0.15	<0.33	<0.70	<0.70	ND	
PANGEA Site Assessment																
MIP-1	7/25/2016	8-15	<50	--	--	<0.5	0.70	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	**2.3**	<10	
MIP-2	7/25/2016	8-15	<50	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	0.80	<0.5	**3.6**	<10	
MIP-3	7/25/2016	8-15	<50	--	--	<0.5	3.3	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	**8.1**	<10	
MIP-4	7/25/2016	8-15	<50	--	--	<0.5	1.5	<0.5	0.6	<2.0	<0.5	<0.5	<0.5	**13**	<10	
MIP-5	7/25/2016	8-15	<50	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	<0.5	<10	
MIP-6	7/25/2016	8-15	<50	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	**2.6**	<10	
SB-1	8/3/2016	8-15	<50	--	--	<0.5	<0.5	1.0	6.2	<2.0	<0.5	<0.5	<0.5	<0.5	<10	
SB-7	8/22/2016	8-10	--	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	<0.5	<10	
SB-8	9/7/2016	8-10	<50	**590**	17,000	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10	
SB-9	9/7/2016	8-10	<50	**380**	4,300	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10	
SB-10	9/8/2016	dry	--	--	--	--	--	--	--	--	--	--	--	--	--	
SB-11	9/8/2016	dry	--	--	--	--	--	--	--	--	--	--	--	--	--	Auto repair area
SB-12	9/8/2016	dry	--	--	--	--	--	--	--	--	--	--	--	--	--	Auto repair area
SB-13	9/8/2016	8-10	<50	<50	<250	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10	Auto repair area
Pit	9/7/2016	8	64	73	<250	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10[c]	Auto repair area excavation

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Table 2. Groundwater Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring / Sample ID	Date Sampled	Depth to Water (ft bgs)	TPHg	TPHd	TPHmo	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,2-DCA	PCE	TCE	Chloroform	Other VOCs	Notes
			µg/L													
Tier 1 ESL - Groundwater:			100	100	n/a	1.0	40	13	20	0.12	0.5	3.0	5.0	50	varies	
Vapor Intrusion ESL - shallow groundwater, residential:			100	100	n/a	1.1	3,600	13	1,300	20	6.1	3.0	5.6	2.3	varies	
Vapor Intrusion ESL - shallow groundwater, commercial:			5,000	5,000	n/a	9.7	30,000	110	11,000	170	53	26	49	20	varies	
PANGEA Pilot Test Assessment																
PTN-w1	10/19/2016	8	--	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	0.5	<0.5	<0.5	<10	
PTN-w2	10/19/2016	8	--	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	0.6	<0.5	<0.5	<10	
PTS-w1	11/1/2016	8	--	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	<0.5	<10	
PTS-w2	11/1/2016	8	--	--	--	<0.5	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5	<0.5	<10	

Explanation:

TPHg = Gasoline range Total Petroleum Hydrocarbons by EPA Method SW8021B/8015Bm.

TPHd = Diesel Range Total Petroleum Hydrocarbons by EPA Method SW8015B.

TPHmo = Motor Oil Range Total Petroleum Hydrocarbons by EPA Method SW8015B.

VOCs = Volatile Organic Compounds by EPA Methond 8260B.

1,2-DCA = 1,2-Dichloroethane

PCE = Tetrachloroethene

TCE = Trichloroethene

µg/L = micrograms per Liter

ft bgs = feet below grade surface.

ESL = Environmental screening level established by the SFB-RWQCB, Interim Final - November 2007 and amended in February 2016, (Rev. 3)

--- = Not analyzed or not available.

a = ENGEO report dated 07/02/2015 states samples were taken at first encountered groundwater which ranged between 15-25 ft bgs

b = ENGEO report dated 08/02/2016 states samples were taken at first encountered groundwater which ranged between 12-17 ft bgs

c = N-butylbenzene (0.64 ug/L) and 1,2,4-trimethylbenzene (1.6 ug/L)

d7 = strongly aged gasoline or diesel range compounds are significant in the TPH(g) chromatogram

e2 = diesel range compounds are significant; no recognizable pattern

e7 = oil range compounds are significant

e4/e11 = gasoline range compounds are significant; and/or stoddard solvent/mineral spirit?

Bold indicates concentration meets or exceeds Residential Vapor Intrusion ESL

< n = Chemical not present at a concentration in excess of laboratory detection limit shown.

Constituent detections highlighted in gray

PTN = pilot test north excavation area

PTS = pilot test south excavation area

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Table 3. Soil Gas Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,2-DCA	PCE	TCE	Other VOCs	Isopropyl Alcohol (Leak Check Compound)	Notes
			ug/m^3										
Residential ESL - Soil/Subslab Gas:			**48**	**160,000**	**560**	**52,000**	**41**	**54**	**240**	**240**	**Varies**	**NA**	
ENGEO Site Assessment 2015-2016													
SG-1	06/25/15	5.0	1.34	6.33	<3.2	<6.5	<7.8	<3.1	<5.1	<8.1	--	<30	West Sector
SG-2	06/25/15	5.0	2.45	18.3	1.81	14.83	<7.8	<3.1	<5.1	<8.1	--	<30	East Sector
SG-5	06/24/16	8.0	<19	<26	<27	<44	<140	<55	<24	<150	--	--	East Sector
SG-6	06/24/16	6.0	<1.6	4.1	143	260	<5.2	<2.1	**256**	<5.4	--	--	East Sector
SG-7	06/24/16	8.0	21.9	20.9	<4.9	<9.9	<12	<4.7	24.4	<12	--	--	East Sector
SG-8	06/24/16	6.0	9.18	19.1	232	1,172	<5.2	<2.1	16.7	<5.4	--	--	East Sector
SG-9	06/24/16	6.0	3.84	9.96	<2.2	4.69	<5.2	<2.1	**256**	<5.4	--	--	East Sector
SG-10	06/24/16	8.0	**61.8**	76.2	<2.0	6.97	<10	<4.1	<1.8	<11	--	--	East Sector
PANGEA Site Assessment													
SV-1	07/27/16	6.0	<3.5	<4.2	<4.8	<4.8	<23	<4.5	49	<5.9	#	<11	East Sector
SV-2	07/27/16	6.0	<7.1	<8.3	<9.6	<9.6	<46	<8.9	**1,500**	<12	#	<22	East Sector
SV-3	07/27/16	6.0	14	14	4.7	7.7	<22	<4.2	**820**	<5.6	#	140	East Sector
SV-4	07/27/16	6.0	18	7.5	<7.6	<7.6	<36	<7.0	150	<9.4	#	<17	East Sector
	09/01/16	6.0	<6.2	<7.3	<8.4	<16.8	<40	<7.8	190	<10	#	<19	East Sector
SV-5	07/27/16	6.0	3.8	<3.7	<4.3	<4.3	<21	<4.0	**710**	<5.3	#	<9.6	East Sector
SV-6	07/27/16	6.0	12	<3.8	<4.4	<4.4	<21	<4.1	**430**	<5.4	#	<9.9	East Sector
SV-7	07/27/16	6.0	18	27	<5.1	<5.1	<25	<4.7	15	<6.3	#	<12	East Sector
SV-8	07/28/16	6.0	<4.9*	<11*	<10*	<15*	--	<14*	**640**	<8.7*	#	<22*	East Sector
Shroud (SV-8)	07/28/16	--	--	--	--	--	--	--	--	--	--	130,000	East Sector
SV-9	09/01/16	6.0	<5.2	<6.1	<7.1	<14.2	<34	<6.6	<11	<8.8	#	62	East Sector
SV-10	07/28/16	6.0	<4.9*	<11*	<10*	<15*	--	<14*	**2,000**	170*	#	<22*	East Sector
SV-11	07/28/16	6.0	<4.9*	<11*	<10*	<15*	--	<14*	**2,600**	150*	#	<22*	East Sector
SV-12	07/28/16	6.0	<4.9*	<11*	<10*	110*	--	<14*	**930**	76*	#	<22*	East Sector
SV-13	07/28/16	6.0	<4.9*	<11*	380	1,470	--	<14*	100*	<8.7*	#	<22*	East Sector
SV-14	07/27/16	6.0	3.4	3.6	160	980	<20	<3.8	17	<5.1	#	64	East Sector
SV-15	07/27/16	6.0	25	9.2	<4.6	8.6	<22	<4.3	85	6.1	#	<10	East Sector

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Table 3. Soil Gas Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,2-DCA	PCE	TCE	Other VOCs	Isopropyl Alcohol (Leak Check Compound)	Notes
			ug/m^3										
Residential ESL - Soil/Subslab Gas:			**48**	**160,000**	**560**	**52,000**	**41**	**54**	**240**	**240**	**Varies**	**NA**	
SV-16	07/27/16	6.0	35	13	<11	<11	<52	<10	<17	<13	#	<24	East Sector
SV-17	07/28/16	6.0	34	13	28	191	--	<4.1	20	9.7	#	150	East Sector
SV-18	07/28/16	6.0	**54**	59	**1,100**	3,190	--	<4.1	66	<5.5	#	7.9*	East Sector
SV-19	07/28/16	6.0	15	40	**900**	2,490	--	<4.1	20	11	#	8.7*	East Sector
SV-20	08/05/16	6.0	66*	160	**4,300**	18,400	17*	<130	<8.6*	<170	#	<310	East Sector
SV-21	08/05/16	6.0	5.6*	<11	330	3,090	3.2*	<12	160	<16	#	<29	East Sector
	09/01/16	6.0	<3.2	<3.8	<4.3	9.7	<21	<4.0	220	<5.4	#	<9.8	East Sector
SV-22	08/05/16	6.0	21*	<82	340	18,100	10*	<88	24*	<120	#	<210	East Sector
	09/01/16	6.0	<3.3	<3.9	<4.5	30.7	<21	<4.1	46	<5.5	#	<10	East Sector
SV-23	08/05/16	6.0	24*	150	**8,700**	34,000	19*	<130	9.0*	<170	#	<310	East Sector
SV-24	08/05/16	6.0	42	45	**1,300**	5,500	13*	<35	<2.4*	<47	#	<86	East Sector
Shroud (SV-24)	08/05/16	--	--	--	--	--	--	--	--	--	--	180,000	East Sector, Shroud Sample
SV-25	08/05/16	6.0	39	47	270	1,440	<1.2*	<11	1.2*	<14	#	<26	East Sector
SV-26	08/05/16	6.0	23	28	180	920	2.6*	<4.4	7.6	<5.8	#	<11	East Sector
SV-27	08/05/16	6.0	**73**	48	230	1,250	3.9*	<7.9	<0.53*	<11	#	<19	East Sector
SV-28	08/23/16	6.0	<3.3	<3.9	<4.5	<9.0	<22	<4.2	200	9.6	#	1,800	West Sector, Building 1
SV-29	08/23/16	6.0	7.5	<3.9	<4.5	17.1	<21	<4.1	7.0	<5.5	#	83	West Sector, Building 1
SV-30	09/01/16	6.0	31	42	6.3	33.3	<21	<4.0	<6.7	<5.3	#	<9.7	West Sector, Building 1
SV-31	09/01/16	6.0	16	34	6.4	40	<19	<3.7	<6.2	<4.9	#	<9.0	West Sector, Building 1
SV-32	09/01/16	6.0	6.4	3.9	<4.5	<9.0	<21	<4.1	14	<5.5	#	<10	West Sector, Building 1
SV-33	09/01/16	6.0	20	27	<4.2	8.8	<20	<3.9	<6.6	<5.2	#	<9.5	East Sector
SV-34	09/01/16	6.0	17	33	4.7	24.3	<22	<4.3	<7.3	<5.7	#	<11	East Sector
SV-35	09/01/16	6.0	36	100	16	79	<20	<3.8	<6.4	<5.1	#	<9.3	East Sector
SV-36	09/01/16	6.0	33	72	11	53	<22	<4.2	<7.1	<5.6	#	<10	East Sector
SV-37	09/01/16	6.0	43	110	17	85	<21	<4.0	<6.6	<5.3	#	<9.6	East Sector
SV-38	09/01/16	6.0	**48**	120	24	120	<20	<3.9	<6.5	<5.2	#	<9.4	East Sector
SV-39	09/01/16	6.0	19	30	<4.1	12	<20	<3.8	<6.4	<5.1	#	<9.3	East Sector
SV-40	09/01/16	6.0	29	51	<4.7	22.2	<23	<4.4	26	<5.9	#	<11	East Sector
SV-41	09/19/16	6.0	**49**	31	<6.1	7.6	<30	<5.7	<9.6	<7.6	#	<14	West Sector, Building 2

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Table 3. Soil Gas Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,2-DCA	PCE	TCE	Other VOCs	Isopropyl Alcohol (Leak Check Compound)	Notes
			ug/m^3										
Residential ESL - Soil/Subslab Gas:			**48**	**160,000**	**560**	**52,000**	**41**	**54**	**240**	**240**	**Varies**	**NA**	
SV-42	09/19/16	6.0	<20	<24	<27	<54	<130	<25	<43	<34	#	<62	West Sector, Building 2
SV-43	09/19/16	6.5	7.2	23	6.9	32.2	<20	<3.9	<6.5	<5.2	#	<9.5	West Sector, Building 1
SV-44	09/19/16	6.0	--	--	--	--	--	--	--	--	--	--	West Sector, Building 1
SV-45	09/19/16	6.0	8.7	33	9.4	43.3	<23	<4.4	20	<5.8	#	<11	West Sector, Building 1
SV-46	10/20/16	5.0	16	17	6.3	30.3	<22	<4.2	9.4	<5.6	#	<10	West Sector, Building 1
SV-47	10/20/16	5.0	15	19	6.4	38	<20	<3.9	9.4	13	#	32	West Sector, Building 1
SV-48	10/20/16	5.0	10	15	7.1	67	<23	<4.4	8.0	<5.9	#	14	West Sector, Building 1
SV-49	10/20/16	5.0	22	26	<4.8	12	<23	<4.5	<7.5	<5.9	#	<11	West Sector, Building 2
SV-50	10/20/16	5.0	37	36	<4.8	13	<23	<4.5	<7.5	<5.9	#	14	West Sector, Building 2
SV-51	10/20/16	5.0	7.4	8.8	<4.5	7.0	<21	<4.1	<7.0	<5.5	#	12	West Sector, Building 3
SV-52	10/20/16	5.0	4.7	4.6	<4.4	<8.8	<21	<4.1	23	<5.5	#	13	West Sector, Building 3
SV-53	10/20/16	5.0	9.3	9.6	<4.6	8.3	<22	<4.3	19	5.7	#	15	West Sector, Building 4
SV-54	10/20/16	5.0	5.6	6.0	<4.3	4.7	<21	<4.0	41	<5.3	#	32	West Sector, Building 4
SV-55	10/20/16	5.0	**81**	98	8.9	48	<22	<4.3	<7.2	<5.7	#	<10	East Sector, Building 10
SV-56	10/20/16	5.0	**78**	85	9.8	55	<22	<4.3	<7.2	<5.7	#	<10	East Sector, Building 10
Shroud (SV-56)	08/05/16	--	--	--	--	--	--	--	--	--	--	39,000	East Sector, Shroud sample
PANGEA Pilot Test Assessment													
SV-21	08/05/16	6.0	5.6*	<11	330	3,090	3.2*	<12	160	<16	#	<29	East Sector, Northwest of PTN
	09/01/16	6.0	<3.2	<3.8	<4.3	9.7	<21	<4.0	220	<5.4	#	<9.8	East Sector, Northwest of PTN
	12/01/16	6.0	<3.6	<4.3	<4.9	<4.9	<24	<4.6	200	<6.1	--	<11	East Sector, Northwest of PTN
SV-57	12/01/16	5.0	4.8	3.7	<4.1	8.9	<20	<3.8	7.5	<5.1	#	<9.2	East Sector, PTS
	01/16/17	5.0	11	8.9	5.4	26.1	<21	<4.1	12	<5.4	#	49	East Sector, PTS
SV-58	12/01/16	4.6	4.7	15	<4.8	6.7	<23	<4.5	13	<6.0	#	<11	East Sector, PTS
	01/16/17	4.6	11	12	5.1	25.7	<21	<4.0	14	<5.3	#	<9.7	East Sector, PTS
SV-59	12/01/16	5.3	8.0	7.6	<4.6	<9.2	<22	<4.3	130	<5.7	#	<10	East Sector, PTN
	01/16/17	5.3	<9.5	<11	<13	<26	<63	<12	210	<16	#	<29	East Sector, PTN
SV-60	12/01/16	5.2	8.4	32	<5.4	6.3	<26	<5.1	160	<6.7	#	15	East Sector, PTN

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Table 3. Soil Gas Analytical Data - 1233 Bockman Road, San Lorenzo, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,2-DCA	PCE	TCE	Other VOCs	Isopropyl Alcohol (Leak Check Compound)	Notes
			ug/m^3										
Residential ESL - Soil/Subslab Gas:			**48**	**160,000**	**560**	**52,000**	**41**	**54**	**240**	**240**	**Varies**	**NA**	
	01/16/17	5.2	<9.4	<11	<13	<26	<62	<12	220	<16	#	65	East Sector, PTN
SV-61	12/01/16	5.6	5.6	19	<5.3	<10.6	<26	<4.9	170	<6.6	#	<12	East Sector, PTN
	01/16/17	5.6	<3.1	<3.7	<4.3	<8.6	<21	<4.0	200	<5.3	#	<9.7	East Sector, PTN
SV-62	12/01/16	5.0	<3.6	<4.3	<4.9	<9.8	<24	<4.6	41	<6.1	#	<11	East Sector, West of PTN
	01/16/17	5.0	<3.4	<4.0	<4.6	<9.2	<22	<4.3	21	<5.7	#	<10	East Sector, West of PTN
Shroud (SV-61)	12/01/16	--	<1,600	<1,900	<2,200	<4,400	<11,000	<2,000	<3,400	<2,700	--	140,000	East Sector, Shroud sample
Shroud (SV-62)	01/16/17	--	--	--	--	--	--	--	--	--	--	190,000	East Sector, Shroud sample

Abbreviations:

DCA = 1,2-dichloroethane

PCE = Tetrachloroethene

TCE = Trichloroethene

VOCs = volatile organic compounds

VOCs by EPA Method TO-15.

ug/m^3 = Micrograms per cubic meter.

ft bgs = Feet below ground surface

ESL = Environmental Screening Level for Shallow Soil Gas for Evaluation of Potential Vapor Intrusion (Table E-2). Established by the SFBRWQCB, Interim Final - November 2007; Feb 2016

-- = Not analyzed

Bold concentrations exceed residential ESL.

* = Represents an estimated concentration (j-flag value) below the reporting limit, or indicates that there was no detection above the method detection limit.

= other VOCs detected below screening level thresholds. See lab report for details.

contaminant detections highlighted in gray

PTN = pilot test north excavation

PTS = pilot test south excavation

APPENDIX A

Standard Operating Procedures

STANDARD FIELD PROCEDURES FOR HAND-AUGER SOIL BORINGS

This document describes Pangea Environmental Services' standard field methods for drilling and sampling soil borings using a hand-auger. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality, and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Registered Geologist (RG), Certified Engineering Geologist (CEG), or Professional Engineer. The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Hand-auger borings are typically drilled using a hand-held bucket auger to remove soil to the desired sampling depth. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the augered hole. The vertical location of each soil sample is determined using a tape measure. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Augering and sampling equipment is steam-cleaned or washed prior to drilling, between samples and between borings to prevent cross-contamination with alconox/liquinox or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied into a re-sealable plastic bag. The bag of soil is placed in the sun to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the bag headspace, extracting the vapor through a slit in the bag. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are collected from screened PVC casing installed in the hole or from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in re-sealable plastic bags, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks can be used to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank sample may also be analyzed if non-dedicated sampling equipment is used.

Grouting

The borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55-gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

This document describes Pangea Environmental Services' standard field methods for drilling and sampling soil borings. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality, and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist, scientist or engineer working under the supervision of a California Registered Engineer, California Registered Geologist (RG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or hydraulic-push technologies. At least one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples are collected near the water table and at lithologic changes. With hollow-stem drilling, samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the borehole. With hydraulic-push drilling, samples are typically collected using acetate liners. The vertical location of each soil sample is determined by measuring the distance from the middle of the soil sample tube to the end of the drive rod used to advance the split barrel sampler or the acetate tube. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes or cut acetate liners chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

Soil samples collected during drilling will be analyzed in the field for ionizable organic compounds using a photo-ionization detector (PID) with a 10.2 eV lamp. The screening procedure will involve placing an undisturbed soil sample in a sealed container (either a zip-lock bag, glass jar, or a capped soil tube). The container will be set aside, preferably in the sun or warm location. After approximately fifteen minutes, the head space within the container will be tested for total organic vapor, measured in parts per million on a volume to volume basis (ppmv) by the PID. The PID instrument will be calibrated prior to boring using hexane or isobutylene. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples collected from borings are either collected from the open borehole, from within screened PVC inserted into the borehole, or from a driven Hydropunch-type sampler. Groundwater is typically extracted using a bailer, check valve and/or a peristaltic pump. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Pangea often performs electrical conductivity (EC) logging and/or continuous coring to identify potential water-bearing zones. Hydropunch-type sampling is then performed to provide discrete-depth grab groundwater sampling within potential water-bearing zones for vertical contaminant delineation. Hydropunch-type sampling typically involves driving a cylindrical sheath of hardened steel with an expendable drive point to the desired depth within undisturbed soil. The sheath is retracted to expose a stainless steel or PVC screen that is sealed inside the sheath with Neoprene O-rings to prevent infiltration of formation fluids until the desired depth is attained. The groundwater is extracted using tubing inserted down the center of the rods into the screened sampler.

Duplicates and Blanks

Blind duplicate water samples are collected usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

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Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55 gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.