April 25, 2018

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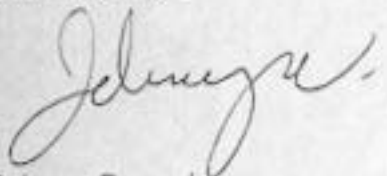
Work Plan for Soil Vapor Survey and Offsite Data Gap Investigation
Automasters
6200 Shattuck Avenue
Oakland, California
ACEH Case #RO2935

I declare, that to the best of my knowledge at the present time, the information and recommendations contained in the attached document are true and correct.

Submitted by,



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WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

WORK PLAN FOR SOIL VAPOR SURVEY AND OFFSITE DATA GAP INVESTIGATION

Automasters
Leaking Underground Tank Site
6200 Shattuck Avenue
Oakland
Case No. RO2935

Prepared For:
6200 Shattuck Partners, LLC
Oakland

Prepared By:
West & Associates Environmental Engineers, Inc.
Vacaville

March 2018

California State Contractor's License No. 734244
PHONE: 707.761-2307 • 630 EUBANKS CT, STE G • VACAVILLE, CALIFORNIA 95688

ACKNOWLEDGMENTS

This Workplan was prepared for our client, 6200 Shattuck Partners LLC and is intended for their exclusive use.

In the preparation of this Workplan, reliance was made of work product of Pangea, Inc.

The Automasters project has been assigned GeoTracker Global ID No. T0619748201. The technical specifications presented in this Workplan for conducting a soil vapor survey were based on guidelines as presented in "Advisory – Active Soil Gas Investigations" California Environmental Protection Agency, Department of Toxic Substances Control, dated July 2016.

This Workplan was prepared by West & Associates Environmental Engineers, Inc. West & Associates is located at 630 Eubanks Ct., Unit G, Vacaville, CA 95688; 707-761-2307. Principal author is Mr. Brian W. West, PE. (Registered California Civil Engineer No. 32319 - expires 12/31/18.)

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APPENDICES

1.0 INTRODUCTION

West & Associates Environmental Engineers, Inc. (W&A) has prepared this Work Plan for Soil Vapor Survey and Offsite Data Gap Investigation for Automasters and 6200 Shattuck Partners, LLC, in order to provide additional information regarding Alameda County Environmental Health UST Case #RO0002935. The Automasters site (the Site) is located at 6200 Shattuck Avenue in Oakland, California and is currently used as an independent automotive repair facility. A Site location map is presented as *Figure 1* in *Appendix A*.

The objective of this Work Plan for Soil Vapor Survey and Offsite Data Gap Investigation is to further evaluate current Site conditions in relation to the Low Threat Closure Policy (LTCP) and determine what additional activities may be required in order to prepare the Site for closure.

2.0 SITE BACKGROUND

The Automasters facility is located at the northeast corner of Shattuck Avenue and 62nd Street in an area of mixed residential and commercial land use. The elevation of the Site is 131 feet above mean sea level, with local topography sloping gently to the southwest (US Geological Survey [USGS], Oakland West Quadrangle, California). Surrounding properties are primarily single-family and multi-family residences with a few commercial buildings located along Shattuck Avenue to the south and northwest of the Site. The Assessor's Parcel Number for this Site is 15-1377-22.

Shortly after purchasing the Site in 1986, Mr. Glenn Logan contracted with Ray Walker Hydraulics of Pleasanton, CA to remove two small underground gasoline storage tanks (USTs) from the southern portion of the Site. W&A contacted Mr. Walker in December 2014 to gather more information on these USTs and determine whether any contaminated soil was encountered during their removal. Mr. Walker searched his archived files but did not have any written information on this Site as the work was performed almost 30 years ago. To the best of his recollection both USTs were used for gasoline and either 500 or 1,000 gallons in size.

Mr. Logan distinctly remembers that contaminated soil between the USTs was removed and transported offsite for disposal. Attempts to contact the Oakland Fire Department regarding this Site have been unsuccessful, so there is no written documentation of the quantity of soil removed or where it was taken.

The initial site assessment activities at this Site were performed by Pangea in 2006. Three soil borings were advanced across the Site at the locations shown on *Figure 2*. Borings SB-1 and SB-3 were clean, i.e. there were no detectable concentrations of TPH-g, , BTEX compounds, fuel oxygenates, lead scavengers, TPH-d or TPH-motor oil detected in any of the soil samples collected from these borings. The sample collected from boring SB-2 at 11 feet below ground surface (bgs) was reported to contain TPH-g at 3,000 mg/kg, TPH-d at 850 mg/kg, naphthalene at 10 mg/kg, and negligible concentrations of BTEX compounds and fuel additives. The 8-foot and 16-foot deep samples from SB-2 had insignificant concentrations of TPH-g and TPH-d, indicating that the zone of contamination was very limited in vertical extent. Total lead concentrations in all samples were typical of background levels in the vicinity.

No groundwater was encountered during the drilling of this 48-foot deep borehole. The SB-2 borehole was left open overnight with a 10-foot screen placed near the bottom and a groundwater "grab" sample was collected from SB-2 the following day. The depth to groundwater in this borehole was 8 feet bgs. TPH-g at 1,700 µg/L, TPH-d at 1,000 µg/, TPH-motor oil at 1,100 µg/L, and naphthalene at 440 µg/L were reported in this sample along with modest concentrations of BTEX compounds and fuel additives. This groundwater was in direct contact with the sand and gravel layer at 11-12 feet bgs, so it is unclear whether these results are indicative of actual groundwater concentrations.

During the 4th quarter of 2015 an extensive remedial investigation was performed at the Site. Seven boreholes were advanced to 20 feet bgs and shallow soil samples were collected from seven additional locations adjacent to the repair shop building. Three of the deep boreholes were completed as monitoring wells.

The soil sample analytical results obtained from 7 boreholes sampled to 20 feet bgs are consistent with the results reported during the limited site investigation program conducted by Pangea. Both sampling activities reported significant concentrations of TPH-g and TPH-d in the vicinity of the former fuel dispenser island, predominantly in the permeable silty sand strata between 7 and 12 feet BGS.

Two of the groundwater monitoring wells installed in 2015 had significant concentrations of TPH-g, TPH-d, BTEX compounds and naphthalene when first sampled on December 31st. MW-101, the well located west of the former USTs and dispenser island, was reported to contain TPH-g at 18,000 µg/L, TPH-d at 5,100 µg/L, benzene at 1,000 µg/L, and naphthalene at 170 µg/L. MW-103, south of the former USTs, was reported to contain TPH-g at 4,700 µg/L, TPH-d at 1,400 µg/L, benzene at 110 µg/L, and naphthalene at 78 µg/L The groundwater sample from upgradient well MW-102 was clean.

Additional soil and groundwater samples were collected during a follow-up remedial investigation conducted in March 2017. Sub-surface conditions encountered during the 2017 remedial investigation were consistent with those found during the initial site assessment by Pangea in 2006 and the 2015 remedial investigation. The relatively permeable silty sand strata (USCS 'GM') found between 7-12 feet BGS is overlain and underlain by much less permeable clayey silt strata (USCS 'ML'). The potentiometric groundwater surface is 3-7 feet BGS, indicating that shallow groundwater is semi-confined. The direction of groundwater flow is west to southwest, generally toward San Francisco Bay.

Soil and groundwater sample analytical results generated during this investigation are also consistent with the results reported during the two previous site investigation events. Both sampling activities reported significant concentrations of TPH-g and TPH-d in the vicinity of the former fuel dispenser island. Soil contamination is predominantly found in the permeable silty sand strata between 7 to 12 feet BGS.

All shallow soil samples (<5 feet BGS) collected from locations adjacent to the facility's current and past waste oil storage containers during these investigations were reported to be uncontaminated with 8270 compounds and LUFT 5 metals, indicating that waste oil contamination is not a concern at the Automasters Site.

The full magnitude and extent of offsite groundwater contamination remains undefined, based on the fact that groundwater concentrations of TPH-g and benzene exceed water quality objectives at B-20, located in Shattuck Avenue directly west of MW-101. In addition, a soil vapor survey with oxygen data will be required in order to evaluate the potential for direct contact / outdoor air exposure and vapor intrusion as defined in the LTCP.

3.0 SITE CONCEPTUAL MODEL

The Site Conceptual Model (SCM) has been updated to aid in understanding of Site conditions and to identify any data gaps that need to be addressed. Data gaps identified in the SCM are summarized along with the proposed investigation activities to close these gaps in a separate Data Gap Summary Table. These documents are included in *Appendix B*.

The SCM will be amended to incorporate pertinent information gathered during subsequent remedial investigations and included in the NFAR for this Site. This SCM will be revised once additional soil, groundwater and soil vapor data become available as remedial investigation activities are completed.

Figure 3 presents a geological cross-section of Site conditions based on the boring logs from previous remedial investigation programs.

4.0 SENSITIVE RECEPTORS

A limited sensitive receptor evaluation has been performed based on Sensitive Receptor Surveys performed at nearby sites.

No onsite water supply wells or other sensitive receptors exist at the Site. Based on the data collected during previous investigations in 2006 and 2015, potential onsite receptors include construction workers exposed to gasoline vapors while excavating into contaminated soil during Site development activities. Even this exposure is unlikely since the identified contamination is 10 to 12 feet bgs and the proposed development does not include an underground parking garage.

The homes and small commercial establishments south and west of the Site are located downgradient and are considered the only potential offsite receptors. The probability of this release having an impact on these receptors is unknown based on the fact that significant concentrations of benzene were found in confined groundwater that rises to a depth of 3 to 5 feet bgs in the wells during the winter months.

A well survey of the area performed by Woodward Clyde Consultants (WCC) in 1986 found five wells within a one mile radius of the Site. Two of these wells are (or were) used for industrial purposes, two for irrigation, and one for domestic purposes. No municipal wells were identified anywhere near the Site. The closest well is the irrigation well at 3215 Adeline Street in Berkeley, approximately 1,340 feet west-northwest of the Site. The only other well within a 2000-foot radius of the Site is the domestic well, which is located 1,800 feet south-southeast (cross-gradient) from the Site. Mr. James Yoo of the Alameda Public Works Department confirmed that no new wells have been installed with a one-mile radius of the Site since the WCC well survey.

There are no surface water bodies within a 2,000-foot radius of the Site. The nearest surface water body is Claremont Creek, located approximately 0.8 miles northwest of the Site. San Francisco Bay is located 2 miles west of the Site.

Other potential receptors within 2,000 feet of the Site include the Sankofa Academy Elementary School, whose property begins 400 feet south of the Site, and Colby Park, located 1,800 feet east of the Site. Based on the known direction of groundwater flow in the area, these receptors are cross-gradient and upgradient of the Site, so it is highly unlikely that they would be impacted by this release.

The locations of the wells and other potential receptors listed above are shown on *Figure 4*.

5.0 DATA GAPS

Based on the site assessment activities performed to date it is clear that there are data gaps in our understanding of the lateral extent of this contamination plume and shallow soil conditions that may pose a human health risk. These data gaps are identified in the SCM and the activities that will be performed to close these data gaps are presented in the *Data Gap Summary Table*.

There are two activities designed to address known data gaps described in this work plan:

1) A soil vapor survey with oxygen data in the area of known soil contamination, to evaluate the potential for direct contact / outdoor air exposure and vapor intrusion as specified in the LTCP; and

2) An offsite remedial investigation to determine whether the plume has migrated across Shattuck Avenue, in order to complete plume definition and establish the length of the groundwater plume.

If the plume has migrated offsite, it may be necessary to perform a soil vapor assessment of the adjacent residential and commercial buildings to determine the potential risk of soil vapor intrusion. Offsite migration will also necessitate an expanded utility survey to determine whether there are utility corridors acting as preferential pathways and an updated Sensitive Receptor Survey.

6.0 DATA GAP INVESTIGATION WORK PLAN

There are a few data gaps that must be addressed in order to evaluate the lateral extent of contamination and determine whether the Site meets LTCP criteria for case closure. These data gaps are to some degree dictated by the planned development activities for the Site, which include residential apartments and retail commercial businesses that may include food service.

The field activities to be performed in an effort to address remaining known data gaps are as follows:

- Collect soil vapor samples from five shallow soil borings, located as shown on *Figure 5,* and analyze these samples for TPH-g and VOCs (including BTEX compounds; MtBE and naphthalene) by EPA Method 8260.

- Advance three offsite GeoProbe borings along the west side of Shattuck Avenue.

- Collect soil and groundwater “grab” samples from the three new GeoProbe borings and analyze these samples for the standard COCs as described below.

- Analyze all soil and groundwater samples for TPH-g, TPH-d, TPH-mo, and VOCs (including BTEX compounds, MtBE and naphthalene) by EPA Method 8260B.

Proposed methods, equipment, materials and techniques to successfully complete this work are as follows.

6.1 Pre-Field Activities

The site specific Health & Safety Plan (H&SP) has already been prepared for this Site. A properly licensed (C-57) drilling subcontractor with expertise in environmental investigations will be retained. An application will be submitted to the Alameda County Public Works Agency for soil boring permits. The site will be marked for Underground Service Alert and a USA ticket opened no later than 48 hours prior to starting subsurface work. ACEH will be notified in advance of any field work. All field work will be directly supervised by a registered professional civil engineer or geologist.

6.2 Semi-Permanent Soil Vapor Probe Installation

Soil vapor probe installation includes probe siting, design and testing. Each sub-task is described below.

6.2.1 Semi-Permanent Soil Vapor Probe Siting

Five soil vapor probes are proposed at the locations shown on *Figure 5.* These locations are sited between the known area of contamination and the potential receptors, i.e. the Automasters building and the residences along 62nd Street and Shattuck Avenue. Soil vapor probes installed and sampled at the proposed locations will provide data required to evaluate the potential for direct contact / outdoor air exposure or soil vapor intrusion.

6.2.2 Soil Vapor Probe Design

All proposed soil vapor sample probes will have the same design. Each will consist of a collection probe attached to a sample extraction line extending to the ground surface. The probe will be bedded in a permeable, inert, sand pack. An effective seal will be employed to prevent short-circuiting to the atmosphere.

Design details include:

Probe and extraction tube: The probe design and specifications are illustrated in *Figure 7*. A corrosion-resistant, positive closing vapor-tight valve will be fitted to the top of the sample extraction tubing at each sample point.

Probe depth: Based on the guidelines presented in the DTSC Advisory for Active Soil Gas Investigations, it is proposed to install all five soil vapor probes at a depth of 6 feet below grade.

Bore construction: A six foot deep, 2.5 inch diameter, bore hole will be made using a hand auger. Based on our knowledge of shallow soil characteristics at the Site, it is anticipated that the holes will remain open and not collapse. Groundwater is not expected be a consideration at the proposed probe depth.

All downhole equipment will be properly decontaminated between placement of sample probes at each location. Soil cuttings will be stored in 55-gallon drums pending arrangements for proper disposal.

Bedding: The collection probe tip will be bedded in Monterey No. 3 sand. The sand pack will extend from bottom of hole to 6 inches above the probe tip, i.e. there will be approximately 12 inches of sand pack.

Seal: One vertical foot of dry bentonite powder will be placed in the hole on top of the sand pack.

Surface seal: Hydrated bentonite will be placed in the boring from the top of the dry bentonite layer up to six inches BGS.

Traffic box: Since all five proposed probe locations are in areas subject to pedestrian traffic, a rated Christy box will be installed for wellhead protection. The upper 9 inches of boring will be reamed to accept the box skirt. Concrete will be used to cement the box into place.

A schematic cross section of the proposed soil probe design is illustrated in *Figure 7.*

6.2.3 Soil Vapor Probe Testing

Each soil vapor probe will be individually tested to verify that ambient air is not leaking into the probe tip. The test procedure will consist of placing isopropanol (rubbing alcohol) soaked rags in the Christy box. A vapor sample will then be collected utilizing the standard procedure (see Section 6.4). If laboratory analysis of the vapor sample detects isopropanol, it will be concluded that there is a vapor pathway from ambient air to the probe tip. The minimum detection limit for isopropanol analysis for purposes of soil vapor probe testing will be 0.5 ppmv.

Any soil vapor probe that is found to be leaking will be either repaired or replaced.

6.3 Collection of Representative Soil Samples

This Section describes the procedures and scheduling parameters for collection of the soil vapor samples.

6.3.1 Sample Collection Scheduling

The samples will be collected a minimum of 48 hours and a maximum of 144 hours after soil vapor probe installation. No soil vapor samples will be collected within 72 hours after rainfall totaling 0.5 inches or greater, as measured at the Downtown Oakland Weather Monitoring Station (No. KCAOAKLA38) 2 miles southeast of the Automasters Site.

6.3.2 Weather Monitoring

Local weather information, as collected at the Downtown Oakland Weather Station, will be acquired from the Accuweather.com internet site. Recorded information including precipitation, outdoor temperature and barometric pressure for 72 hours preceding the soil vapor sampling event will be included in each soil vapor survey report.

6.4 Soil Vapor Survey

A description the Automasters soil vapor survey procedures is presented in this Section.

6.4.1 Purging

Representative soil vapor from the surrounding undisturbed formation will be drawn into the probe tip by purging dead air from the tubing, probe and filter pack. Assuming a vapor extraction rate of 200 ml/min and a dead air volume of 600 ml, one dead air volume would be purged in 3 minutes. Further assuming that three purge volumes are adequate to assure the sampling of fresh soil vapor from the formation, a total purge time of 9 minutes is specified.

Purging will be accomplished utilizing an electric vacuum pump. As described above, the pump will be operated at 200 ml/min. A Dwyer flowrate regulator will be used to adjust the vapor flowrate at each sample probe.

Utilizing a Dwyer regulating flow meter and a stop watch, the actual purge volume at each sample point will be accurately measured and recorded. Standard procedure for all sampling events will be to purge no more than 1,800 ml prior to sample collection.

6.4.2 Sampling

Sample collection will only be performed after the purging process is completed. Soil vapor samples will be collected in new laboratory supplied and evacuated Summa canisters. Each Summa canister will be equipped with a stainless steel flow-limiting valve. The flow-limiting valve will be laboratory calibrated so that each canister is properly filled in two minutes.

All soil vapor samples collected will be entered on a chain-of-custody form.

6. 4.3 Quality Assurance/Quality Control (QA/QC)

Standard QA/QC procedures will include trip blanks, method blanks and duplicate samples. Trip blanks will consist of laboratory supplied and evacuated Summa canisters that are opened and filled with ambient air in the office and accompany the sample set to the site and then on to the laboratory. One trip blank per sampling activity will be included in the sample set.

Method blanks will consist of laboratory supplied and evacuated Summa canisters which are filled with ambient air at the site. One method blank per sampling activity will be included in the sample set.

Duplicate samples will be laboratory supplied and evacuated Summa canisters that are immediately filled with soil vapor from the same soil vapor probe previously sampled. One duplicate sample will be included in the sample set.

QA\QC samples will be disguised on the chain of custody form to appear as routine field samples.

Additional QA/QC procedures will include:

- Assigning experienced, qualified, personnel for sample collection
- Maintaining chain of custody documentation
- Rapid delivery of the sample set to the testing laboratory
- Utilizing approved equipment and techniques
- Flushing the Summa flow-limiting valve with compressed air between sample collection points

6.4.4 Sample Handling and Laboratory Procedures

Soil vapor samples will be analyzed in a laboratory certified by the State of California, Department of Health Services. Only EPA approved analytical techniques will be used. Specifically, for gasoline related compounds such as those known to be present at the Site, GC/MS methods as specified in method 8260B will be employed. In addition, all soil vapor samples will be analyzed for oxygen and carbon dioxide with minimum detection limits of 0.5% and 0.1%, respectively.

The soil vapor sample set will be delivered to the analytical laboratory rapidly to ensure allowable holding times are not exceeded. Minimum laboratory detection limits for soil vapor analysis will be in conformance with prevailing Risk Screening Levels (RSLs). The prevailing RSLs for COCs known to be present at the Site are presented in *Appendix C*.

6.5 Offsite Soil and Groundwater Investigation

It is proposed to advance three soil borings using a GeoProbe rig and collect soil samples from each boring for laboratory testing at five-foot intervals, with specific depths to be determined based on photoionization detector (PID) readings and visual observations of the auger cuttings. The proposed locations of these soil borings are shown on *Figure 6.*

All soil borings will be logged by a California licensed civil engineer or geologist. It is anticipated that total boring depth will be 20 feet bgs. Site work will be completed in conformance with West & Associates "Standard Field Procedures", included in this work plan as *Appendix D*.

In addition, it is proposed to collect groundwater “grab” samples from all three boreholes. These samples will be collected as described below. After all soil and groundwater samples have been collected, the boreholes will be backfilled with grout as specified in the drilling permit for this work.

6.5.1 Soil Sampling

Undisturbed soil samples will be collected from each soil boring using Geoprobe sleeves. The lead 6-inch section from each sleeve will be field screened with a PID for the presence of contamination. Soil from the following sleeve will be sealed, labeled and preserved for chemical analysis in a State certified testing laboratory. All soil samples will be analyzed for TPH-g, TPH-d, TPH-mo, and VOCs (including BTEX compounds, MtBE and naphthalene) by EPA Method 8260B.

The borings will be advanced to at least a total depth of 20 feet bgs. Based on field conditions encountered, a boring may be advanced beyond 20 feet bgs to follow contamination vertically to its termination.

Drill cuttings will be containerized on site in 55-gallon drums so they are isolated from the environment or human contact. Residue management is discussed in Section 6.6.

6.5.2 Groundwater Sample Collection

Representative groundwater samples will be collected from each of the GeoProbe boreholes for chemical analysis in a subcontracted testing laboratory. These groundwater samples will be collected the day after the boreholes are originally advanced, to allow time for groundwater to accumulate in the boreholes. The following groundwater sampling procedure will be employed at each borehole.

Approximately three casing volumes of groundwater will be purged from each borehole prior to sampling. A new bailer will then be lowered into the well to retrieve the water sample. The sample will be transferred into appropriate laboratory supplied containers, labeled and then chilled prior to laboratory delivery.

6.5.3 Laboratory Analysis of Soil and Groundwater Samples

Soil and groundwater samples will be submitted to a State-certified testing laboratory for chemical analysis. All samples submitted for testing will be listed on a standardized Chain of Custody record which will accompany the sample set at all times. These samples will be analyzed for TPH-g, TPH-d, TPH-motor oil, BTEX compounds, naphthalene, MtBE, and other VOCs detected on an 8260B scan.

All laboratory methods and procedures, including minimum detection limits, will comply with EPA guidelines. A copy of the original laboratory report, including lab QA/QC data, will be included in the Report of Findings.

6.6 Solid and Liquid Residue Management

Both solid and liquid residues will be generated during this environmental assessment project. Solid residues will be generated during the soil boring process. Liquid residues will be generated from equipment decontamination and groundwater purging. All residues will be considered contaminated until proven otherwise. Soil cuttings will be placed in labeled 55-gallon drums for effective protection from the environment and human contact. Liquid residues will also be stored in labeled 55-gallon drums.

Representative samples will be collected from the soil and the water residues for waste profiling. It is anticipated that soil cuttings will be transported to the Class 2 Hay Road Landfill in Solano County. It is anticipated that liquid residues will be transported to InStrat (Rio Vista) for recycling. Disposal documentation for all residues will be included in the Report of Findings.

6.7 Quality Assurance/Quality Control

QA/QC measures to be employed on the Automasters remedial investigation project will conform with West & Associates' Standard Field Procedures, attached to this Workplan. To summarize, proposed QA/QC measures include:

- Assigning experienced and capable staff
- Following approved field procedures and techniques
- Utilizing appropriate equipment and supplies
- Relying on new, disposable, sampling supplies to the maximum extent possible
- Thorough and frequent decontamination of field equipment
- Maintaining detailed field notes
- Utilizing laboratory supplied sample containers
- Timely delivery of samples to the testing laboratory
- Keeping an unbroken Chain of Custody Record
- Adhering to EPA-approved analytical procedures

Any deviations from standard QA/QC protocol will be described in the Report of Findings.

7.0 REPORT OF FINDINGS

At the conclusion of this proposed data gap investigation project a written Report of Findings will be prepared and submitted to ACEH. This Report will be submitted within 30 days of receiving final analytical results.

The Report will include:

- An Executive Summary
- Selected background material
- A summary of any deviations from this Workplan
- A description of all field work performed
- Scaled site diagram accurately depicting all soil vapor probe and GeoProbe boring locations
- Boring logs
- Analytical data in tabular format
- Original laboratory reports with Chain of Custody record
- A description of QA/QC results and any deviations from stated QA/QC procedures
- Technical discussion of investigative results
- Recommendations for further action, as appropriate
- Waste residue disposal documentation
- GeoTracker upload certification

8.0 GEOTRACKER UPLOAD

This Data Gap Investigation Work Plan and updated SCM has been uploaded to the ACEH web site per instructions included with the ACEH letter requesting these documents. Once approved by ACEH, it will be uploaded to the Automasters GeoTracker Domain, Global ID T0619748201. The upload certificate is presented in *Appendix E*. Selected future work products will be uploaded to the GeoTracker database in conformance with State requirements. Future work products that will be uploaded include:

- Boring logs
- Analytical data
- Report of Findings

The GeoTracker upload certificate will be included in the Report of Findings.

APPENDIX A

Figures

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS

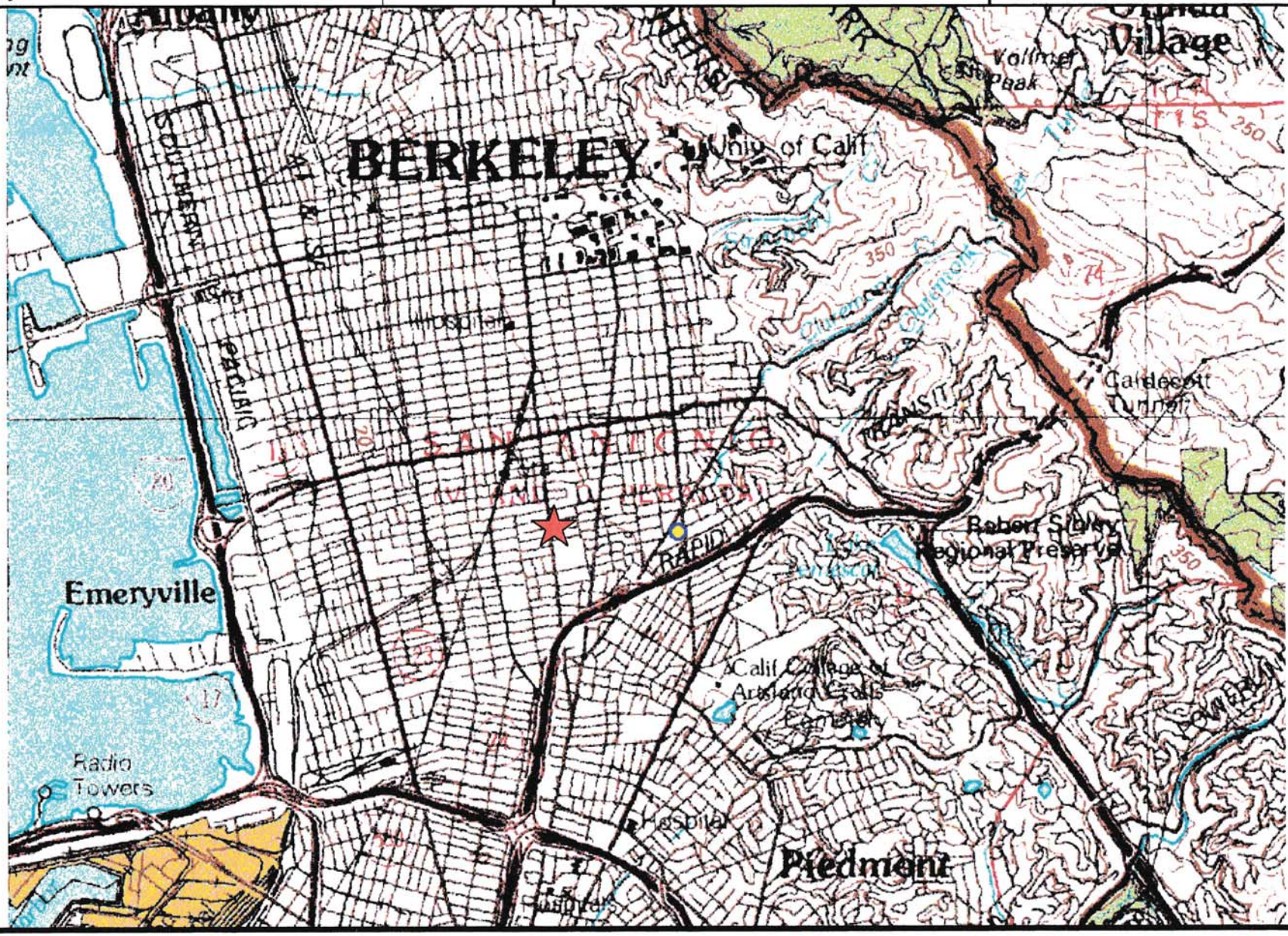
PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** February 2016
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** No Scale

Legend

★ Site Location

FIGURE 1
Regional Site Location



WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS

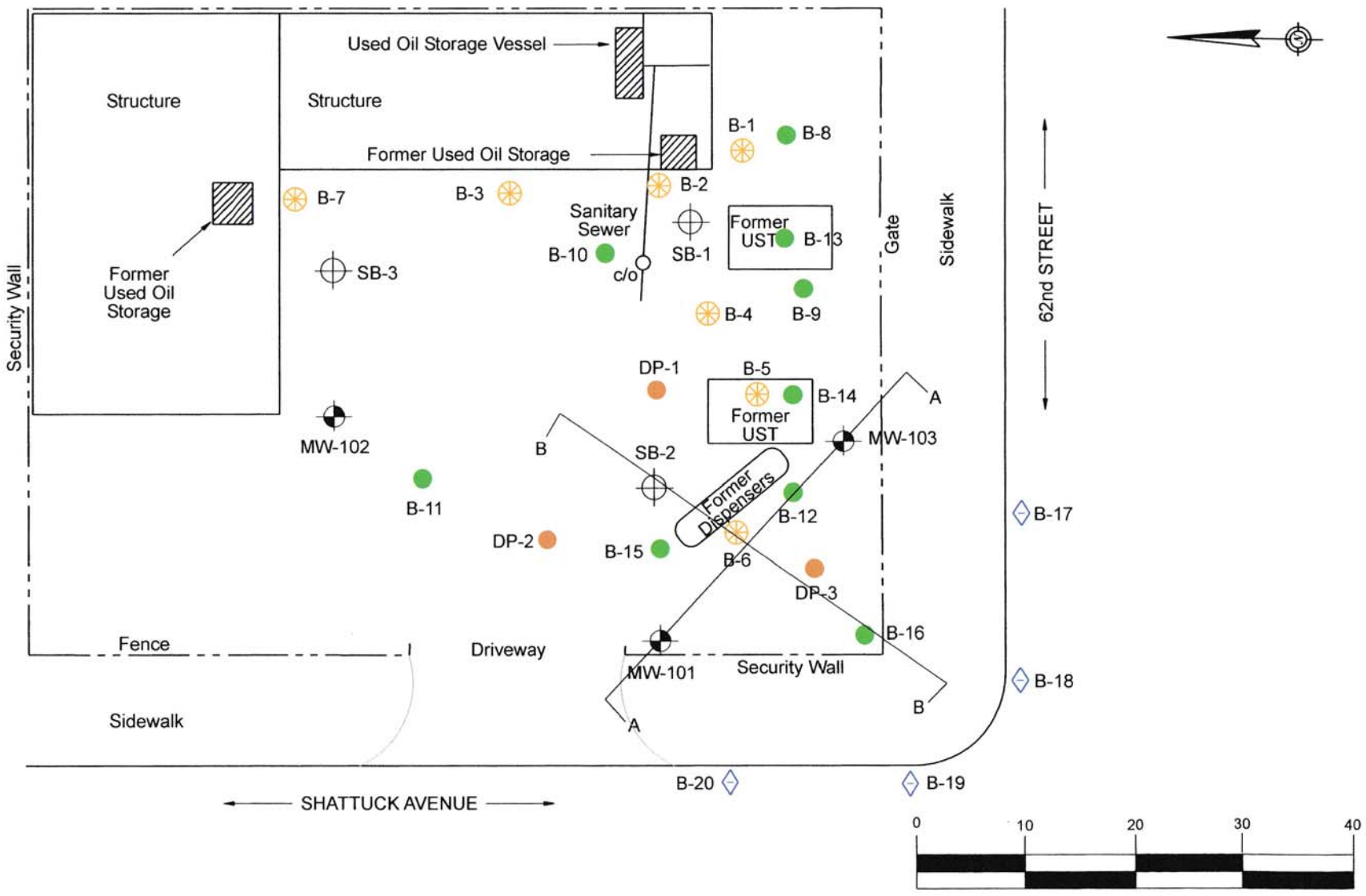
PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** Apr 2017
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** 1" = 14 ft

Legend

- Existing Groundwater Monitoring Well
- Previous Deep Soil Boring - Dec 2015
- Previous Shallow Soil Sample - Dec 2015
- Proposed Soil Boring and Groundwater Sample Collection Location - March 2017
- Pangea Boring (2006)
- Groundwater Sample Collection Location March 2017
- Past and Present Above Ground Used Oil Storage Vessels

FIGURE 2
Site Diagram



WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS

PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** Feb 2016
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** See Below

Legend

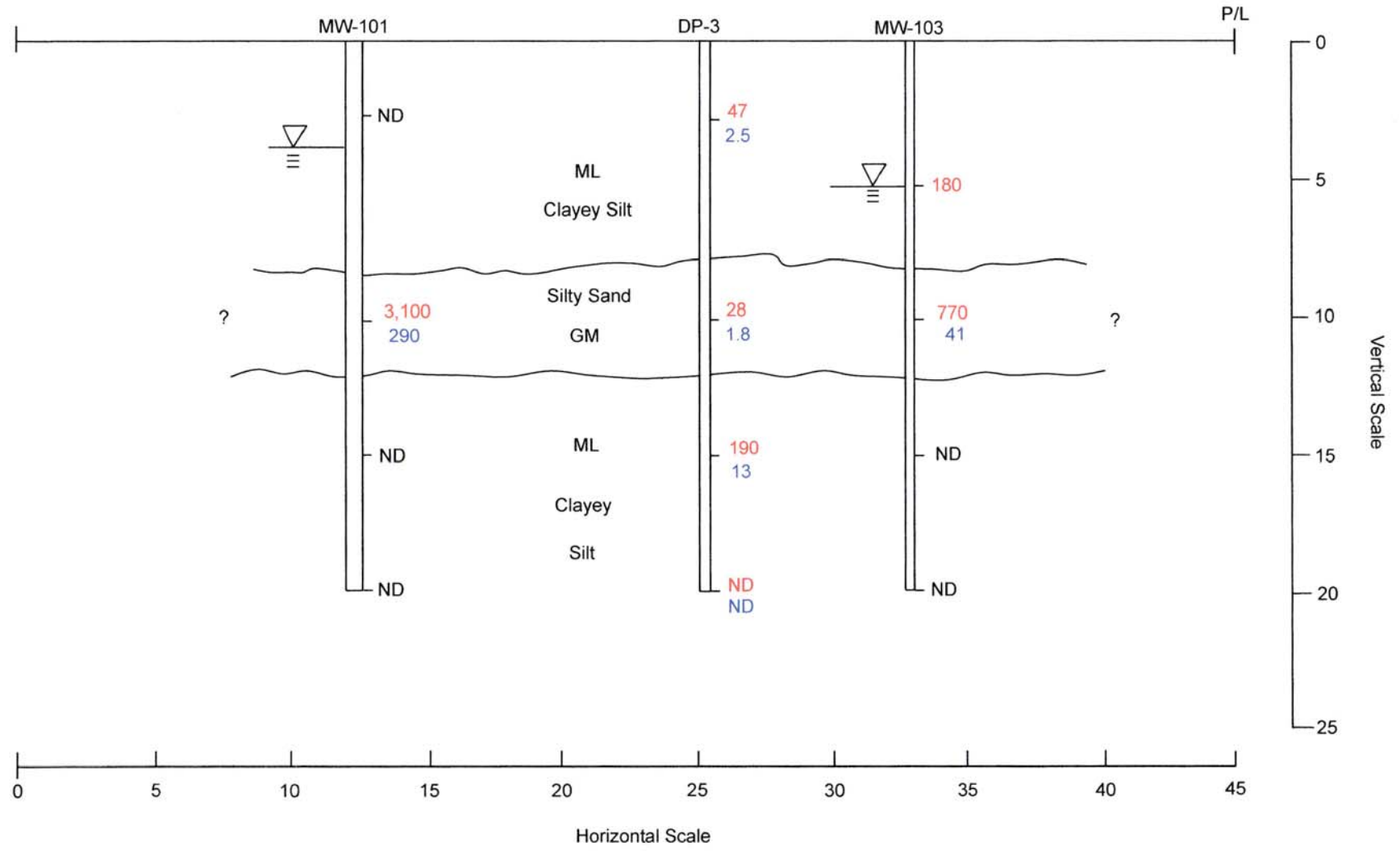
Soil Sample Analysis

3,100 TPH-gas

290 TPH-diesel

▽ Static GWE 12/31/15

FIGURE 3
Cross Section A-A



WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS

PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** August 2016
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** NA

Legend

1 - Domestic Well
2 - Irrigation Well
3 - Sankofa Academy
4 - Colby Park
5 - Residential Basements

FIGURE 4
Nearby Sensitive Receptors

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS

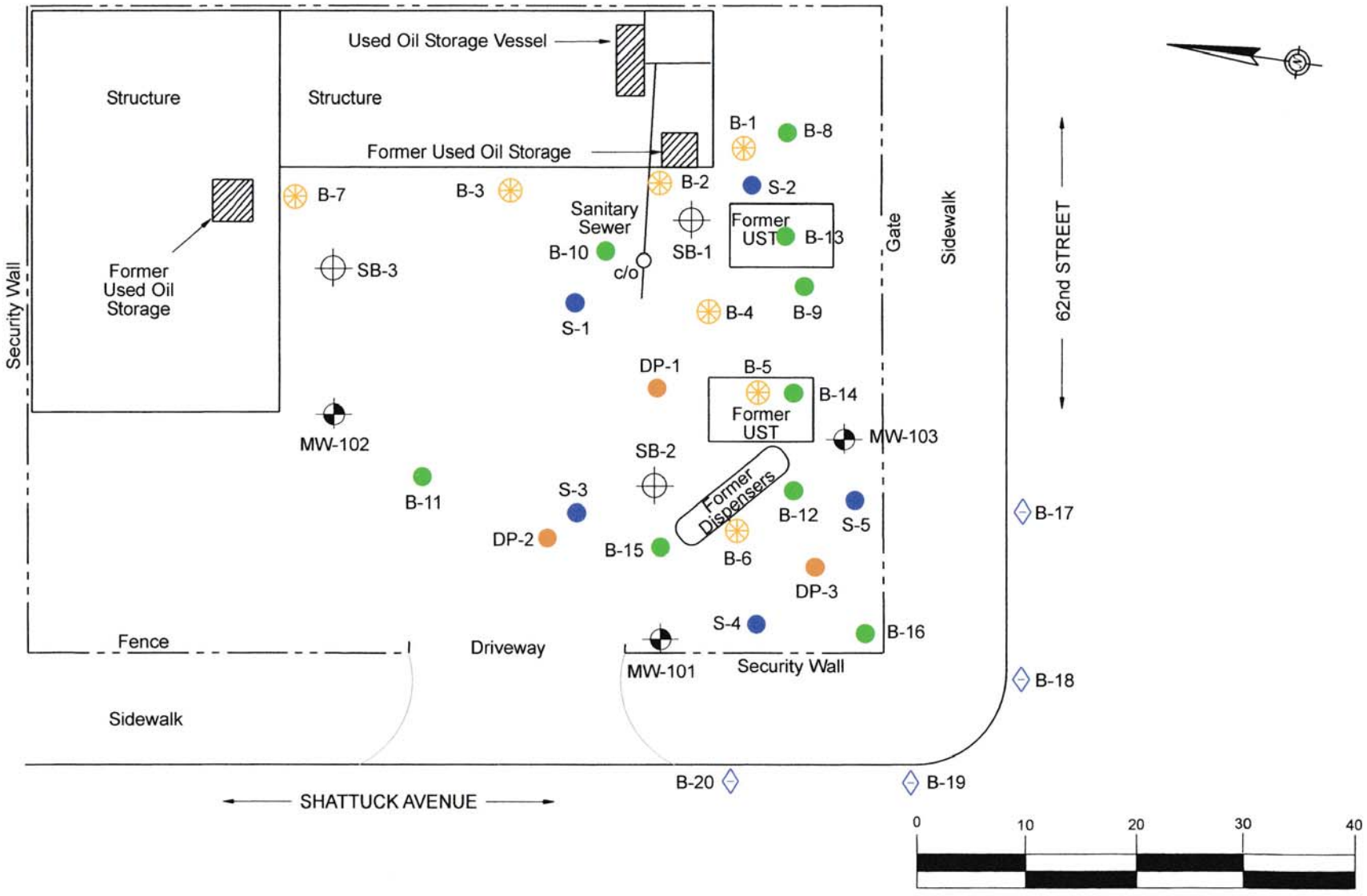
PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** Apr 2017
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** 1" = 14 ft

Legend

- Existing Groundwater Monitoring Well
- Previous Deep Soil Boring - Dec 2015
- Previous Shallow Soil Sample - Dec 2015
- Soil Boring and Groundwater Sample Collection Location - March 2017
- Pangea Boring (2006)
- Groundwater Sample Collection Location March 2017
- Past and Present Above Ground Used Oil Storage Vessels
- Proposed Soil Vapor Probe Locations: S-1 thru S-5

FIGURE 5
Proposed Soil Vapor Locations



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PO Box 5891, Vacaville, CA 95696

Project Name: Automasters	**Date:** Apr 2017
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	**Scale:** 1" = 14 ft

Legend

G-X Proposed Geoprobe Boring

→ Groundwater Gradient

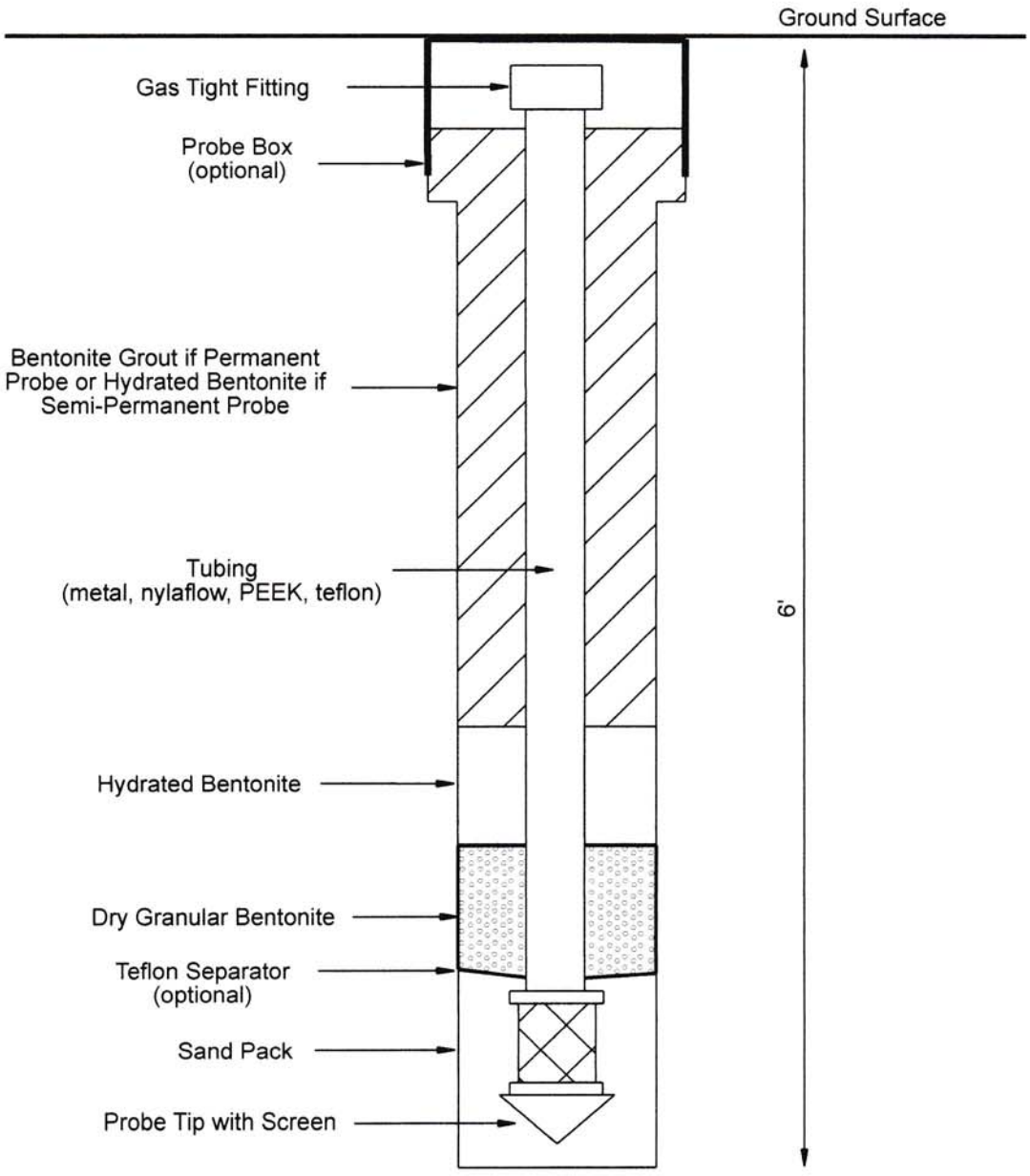
◌ Source Area

FIGURE 6
Proposed Geoprobe Boring Locations

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS
630 Eubanks Ct, Ste G, Vacaville, CA 95688

Project Name: Automasters	Date: May 2018
Location: 6200 Shattuck Avenue, Oakland, CA	
Drawing By: DLG	Scale: Not to Scale

FIGURE 7
Vapor Probe
Typical Diagram



APPENDIX B

Site Conceptual Model and Data Gap Summary Table

SITE CONCEPTUAL MODEL – REVISED MARCH 2018
Automasters
6200 Shattuck Ave, Oakland

SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Geology and Hydrogeology	Regional	The Site is located within the San Francisco Bay structural depression of the Coast Ranges Physiographic Province, within the Oakland Sub-Area of the East Bay Plain. The Site is situated in a relatively flat area between the San Francisco Bay and the Oakland Hills. Bedrock in the area consists of sedimentary, metasedimentary, volcanic, and intrusive rocks from the Jurassic through Paleozene geologic periods. Quaternary-age marine and alluvial sediments ranging in thickness from 300 to 700 feet cover the bedrock. Near the surface this Site is underlain by Holocene alluvium and marsh deposits comprised of silts and clay. The Site lies within the Berkeley Alluvial Plain sub-area of the East Bay Plain groundwater basin. The primary water-bearing unit in this area is comprised of unconsolidated alluvial deposits from the Late Quaternary period. There is also a secondary, older, semi-consolidated deposit from the Neogene-Quaternary period. Groundwater within these deposits is primarily confined although some of the aquifers are unconfined. Throughout most of the Alameda County portion of the East Bay Plain the general direction of groundwater flow follows the surface topography and runs from east to west, i.e. from the Hayward Fault to the San Francisco Bay. Flow direction and velocity are occasionally influenced by buried stream channels that typically are oriented in an east to west direction.	None	N/A
	Site	Soil types encountered during the 2006 site investigation activities consisted predominantly of silty clay to clayey silt with some sands and gravels to 36 feet below ground surface (bgs) and stiff clay from 36 feet to 48 feet bgs. The two borings advanced by Pangea closest to the former USTs and dispenser islands had a distinct sand and gravel lens at 10 to 12 feet bgs. The 2015 and 2017 remedial investigations confirmed that shallow soils are predominately silty clay to clayey silt with a sand and gravel lens at 7 to 12 feet bgs. The depth to first groundwater ranges from approximately 3 to 6 feet bgs.	None	N/A
Surface Water Bodies		The nearest surface water body is Claremont Creek, located approximately 0.8 miles northwest of the Site. Claremont Creek flows generally east to west near the Site vicinity. The San Francisco Bay is located approximately 2 miles west of the Site.	None	N/A

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Nearby Wells		A well survey of the area performed by Woodward Clyde Consultants (WCC) in 1986 found five wells within a one mile radius of the Site. Two of these wells are (or were) used for industrial purposes, two for irrigation, and one for domestic purposes. No municipal wells were identified anywhere near the Site. The closest well is the irrigation well at 3215 Adeline Street in Berkeley, approximately 1,340 feet west-northwest of the Site. The only other well within a 2000-foot radius of the Site is the domestic well, which is located 1,800 feet south-southeast (cross-gradient) from the Site. A well survey was also performed by evaluating the Alameda County Public Works Agency (ACPWA) database in 2016. The only wells identified by ACPWA within the 2,000-foot search radius were groundwater monitoring wells and cathodic protection wells.	None	N/A

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Release Source and Volume		The two USTs removed in 1986 comprise the only known release mechanism impacting soil and groundwater underlying this Site. There is no UST removal report or other definitive documentation that no other USTs or underground piping remain at the Site. The surrounding area is primarily residential and there are no current or former UST cases within 1,000 feet of the Site listed on GeoTracker. It is not known whether the UST release was from the piping, dispensers, and/or USTs themselves. There is no known history of leaks or spills from the aboveground waste oil storage vessels (former or current) or other aspects of the automotive repair operation. Seven shallow soil samples collected near the current and former waste oil storage areas in 2015 were all clean, indicating that there has been no environmental impact from waste oil handling operations at the site. Additional soil samples were collected from four locations adjacent to the waste oil storage areas in March 2017 and analyzed for for poly-nuclear aromatics (PNAs) by EPA Method 8270 and CAM 5 metals. All of these results provided additional confirmation that there are no impacts resulting from waste oil storage and handling at this site. The volume of this release is very difficult to ascertain. Based on the lack of definitive documentation regarding removal of the USTs, a geophysical survey was performed to determine whether any USTs or underground piping remain at the Site. The survey used horizontal magnetic gradient (HMG), ground penetrating radar (GPR) and metal detection (MD) methods to evaluate a 2000-square foot area in which the USTs, piping and dispensers were known to have been located. No evidence of any USTs or fuel distribution piping was detected by any of these geophysical methods, so it is concluded that the primary source (all USTs and associated piping) has been removed.	None	N/A

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
LNAPL		Light non-aqueous phase liquids (LNAPL) have not been encountered in any of the three groundwater monitoring wells installed in December 2015, either during the well development or subsequent sampling activities. There was no evidence of LNAPL in the groundwater "grab" samples collected from borings B-8 through B-20 on March 22, 2017. Although elevated soil and groundwater concentrations of TPH-g on the south side and southwest corner of the Site indicate the possible presence of LNAPL, there has been no evidence of LNAPL to date. Therefore, it is concluded that LNAPL is not present at this site.	None	N/A
Source Removal Activities		It is reported that contaminated soil between the USTs was excavated and transported off-site for disposal. No records are available regarding the quantity or final destination of this soil.	None	N/A
Contaminants of Concern		Based on the information available from the Site owner and the 2006 and 2015 remedial investigation reports, contaminants of concern (COCs) are TPH-g, TPH-d, TPH-mo, and VOCs by EPA Method 8260B (including naphthalene). MtBE and other fuel oxygenates/additives were all reported as N.D. at the standard method detection limits in the 2006 and 2015 laboratory reports, so they are not COCs at this Site. Waste oil has been stored above grade at the Site and there is no evidence or documentation of spills from these containers. Shallow soil samples collected from several areas adjacent to where waste oil has been stored in aboveground containers over the years were analyzed for all the COCs listed above as well as semi-volatile organic compounds (PNAs) and LUFT 5 metals. All results confirm that there is no subsurface contamination related to waste oil storage at the Automasters facility.	None	N/A

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Petroleum Hydrocarbons in Soil		Significant concentrations of COCs were reported in five of the seven 20-foot deep borings installed in December 2015 (three of which were completed as monitoring wells). The highest concentrations were reported in the soil sample from MW-101 at 10 feet bgs, which had 3,100 mg/kg TPH-g, 2.5 mg/kg benzene, and 33 mg/kg naphthalene. Additional site investigation was performed in March 2017 to further characterize the lateral extent of soil contamination, both on-site and off-site. The scope of work for this site investigation is presented in Section 6 of the *Data Gap Investigation Work Plan* and associated *Addendum*. A brief description of the work performed is as follows: The geophysical survey did not reveal the presence of additional USTs or underground piping, so nine additional soil borings were advanced to 20 feet bgs in the vicinity of the former USTs, piping and dispensers to determine whether a secondary source remains at the Site. The locations of these borings are shown on *Figure N*. These borings were sampled at 5-foot intervals and wherever there was physical evidence of contamination. Significant concentrations of TPH-g (1,800 to 2,000 mg/kg) and TPH-d (220 to 450 mg/kg) were reported at 10 feet bgs in borings B-12 and B-14, both located directly south of the former UST and dispenser island area. In order to further define the lateral extent of soil contamination, samples were collected from the off-site groundwater grab sample boreholes B-17 to B-20 (also shown on *Figure N*). No significant concentrations of any COCs were reported in these soil samples, so it is concluded that off-site soil contamination is not a concern at this facility. All soil sample results for COCs from the 2006, 2015 and 2017 remedial investigation events are included on *Table 3A* found in *Appendix Q*.	None	N/A

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Petroleum Hydrocarbons in Groundwater		Three groundwater monitoring wells were installed in December 2015. The initial samples from MW-101 and MW-103 had significant concentrations of COCs, while upgradient well MW-102 was clean. TPH-g and benzene concentrations in MW-101 were 18,000 µg/L and 1,000 µg/L, respectively. Additional groundwater samples were collected in March 2017 from Geoprobe borings B-8 to B-20. All 13 of these borings were left open overnight to allow collection of a groundwater "grab" sample. The highest concentrations of COCs were found in samples from B-12 (11,000 µg/L TPH-g, 900 µg/L benzene, and 2,700 µg/L TPH-d), B-15 (11,000 µg/L TPH-g, 1,100 µg/L benzene, and 2,400 µg/L TPH-d) and B-9 (3,700 µg/L TPH-g and 4,000 µg/L TPH-d). Borings B-12 and B-15 are located between the former dispenser island and MW-101, so these results are consistent with the predominant groundwater gradient being to the south (MW-101 is directly south of the source area). Of the four off-site borings, COC concentrations for these groundwater "grab" samples were only significant in B-20, located 20 feet west of MW-101. This sample had 1,100 µg/L TPH-g, 14 µg/L benzene, and 610 µg/L TPH-d, indicating that off-site migration is an issue that requires further investigation. The TPH-g and benzene concentrations in groundwater from the March 2017 remedial investigation and quarterly monitoring event are shown on *Figure* and *Figure* , respectively. A utility survey performed in February 2016 determined that there are several utility corridors running along 62nd Street directly south of the Site and along Shattuck Avenue directly west of the Site. Based on the data gathered during the 2017 remedial investigation, these utilities do not appear to be acting as preferential pathways for contaminant migration.	1. Lateral extent of off-site groundwater migration	Install three GeoProbe borings on the west side of Shattuck Avenue and collect groundwater samples to determine whether the contamination has migrated that far

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Risk Evaluation		The Site is currently used as an independent automotive repair facility. 6200 Shattuck Partners, LLC would like to proceed with development of the Site, involving mixed-use commercial and residential facilities. The Site and surrounding properties are zoned RM-4, Mixed Housing Residential Zone 4 as defined in Section 17.17.010 of the Municipal Code. The objective of this zoning classification is to maintain an enhanced residential area "characterized by a mix of single family homes, townhouses, small multi-unit buildings... and neighborhood businesses where appropriate". Identified potential human receptors include residents at the Site and nearby homes and apartments, workers and patrons of nearby commercial establishments, and construction workers involved with Site development. The homes and small commercial establishments located downgradient from the Site are considered the only likely off-site receptors. Homes across Shattuck Avenue (west and southwest of the Site) have basements, so it is possible that contaminant migration may have caused vapor intrusion into these residences. A soil vapor survey has not been performed at the Site. Based on the soil data from 2015 and 2017 along with the potential for residential land use, the exposure scenarios listed in the LTCP have been evaluated using residential standards for shallow soils (< 5 feet bgs). The concentrations of benzene, ethylbenzene and naphthalene in shallow soil samples from all 30 locations were mostly non-detect and in all cases significantly below the thresholds listed in the residential column on *Table 1* in the Direct Contact and Outdoor Air Exposure section of the LTCP. However, shallow soil samples have not been analyzed for PAHs by EPA Method 8270 or CAM 5 metals, which could have been released during spills from the aboveground waste oil storage vessels. In order to evaluate the potential for vapor intrusion to indoor air, the concentrations of TPH-g and TPH-d in soils <10 feet bgs and the benzene concentration in groundwater must be compared with the scenarios depicted in the appendices of the LTCP. The sum of TPH-g & TPH-d concentrations in shallow soil samples from MW-101, MW-103 and DP-2 exceed 100 ppm and the benzene concentration in MW-101 is 1,000 µg/L. Consequently, the potential for vapor intrusion to indoor air cannot be dismissed without performing a soil vapor survey.	2. Potential for direct contact / outdoor air exposure or soil vapor intrusion to indoor air 3. Potential for soil vapor intrusion to indoor air, particularly in residential basements on the west side of Shattuck Avenue	Perform a soil vapor survey to determine whether either of these pathways could result in exposure levels exceeding the thresholds established in the LTCP Perform a soil vapor survey to determine whether any of the residences to the west or southwest of the Site (across Shattuck Avenue) have been impacted by this release

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SCM Element	SCM Sub-Element	Description	Data Gap Item #	Resolution
Risk Evaluation		A limited sensitive receptor evaluation has been performed based on Sensitive Receptor Surveys performed at nearby sites. Other potential receptors within 2,000 feet of the Site include the Sankofa Academy Elementary School, whose property begins 400 feet south of the Site, and Colby Park, located 1,800 feet east of the Site. A limited sensitive receptor evaluation has been performed based on Sensitive Receptor Surveys performed at nearby sites. The other potential receptor within 2,000 feet of the Site is the Sankofa Academy Elementary School, whose property begins 400 feet south of the Site. Colby Park, located 2,300 feet east of the Site is just outside the 2,000 foot radius. Based on the known direction of groundwater flow in the area these receptors are cross-gradient and upgradient of the Site, so it is highly unlikely that they would be impacted by this release. Identified potential human receptors include residents at the Site and nearby homes and apartments, workers and patrons of nearby commercial establishments, and construction workers involved with Site development. Once the soil vapor survey has been completed it will be possible to perform a thorough evaluation of whether Site conditions might impact any of the off-site receptors. If there are complete pathways that require mitigation, a Remedial Action Plan will be prepared and submitted to ACDEH for approval.		

DATA GAP SUMMARY AND PROPOSED INVESTIGATION – REVISED MARCH 2018
Automasters
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Item #	Data Gap	Proposed Investigation	Rationale	Analyses
1	Lateral extent of groundwater contamination	Install a groundwater monitoring well on the west side of Shattuck Avenue and collect groundwater samples to determine whether the contamination has migrated that far	The high concentrations of TPH-g in well MW-101 and B-20 on the west side of the property indicate that the lateral extent of the groundwater plume is not fully defined	TPH-g, TPH-d, TPH-mo, and VOCs by EPA Method 8260B
2	Potential for direct contact / outdoor air exposure or vapor intrusion into buildings on-site	Perform a soil vapor survey to determine whether either of these pathways could result in exposure levels exceeding the thresholds established in the LTCP	The LTCP requires soil vapor data when COC concentrations in shallow soil samples exceed the thresholds listed in Table 1 and Appendices 1-4 of the LTCP, which is the case at this Site	TPH-g, VOCs by EPA Method 8260B
3	Potential for VOC intrusion into basements downgradient from the Site	Perform a soil vapor survey to determine whether any of the residences west of the Site (across Shattuck Avenue) with basements have been impacted by this release	The basements in the houses structures have the potential to bring contamination into contact with their residents	TPH-g, VOCs by EPA Method 8260B

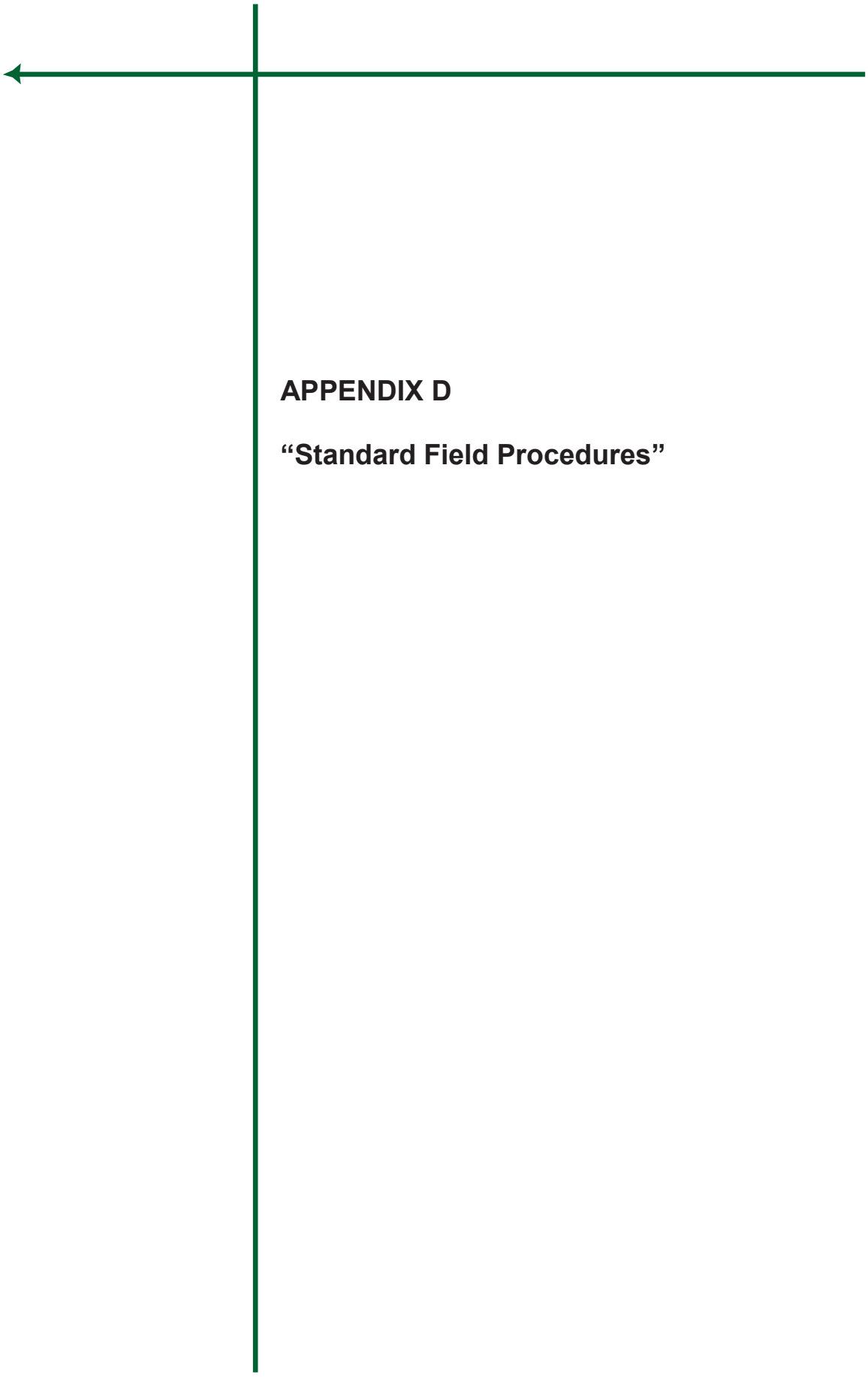
APPENDIX C

Risk Screening Levels

Table 3. Page 1. Alternate air screening levels currently recommended in lieu of the Spring 2013 RSLs.

				DTSC Recommended Values			
		More Protective of CalEPA and Nov 2012 U.S. EPA RSL Table Criteria		DTSC-Modified Residential Air Screening Level Calculated using RSL Calculator		DTSC-Modified Industrial Air Screening Level Calculated using RSL Calculator	
CAS No.	Volatile Organic Compound	IUR (per µg/m^3)	RfC or REL (mg/m^3)	Cancer (µg/m^3)	Noncancer (µg/m^3)	Cancer (µg/m^3)	Noncancer (µg/m^3)
75-07-0	**Acetaldehyde**	2.7E-06 (C)	0.009 (S)	**0.9**	Use RSL	**4.5**	Use RSL
107-13-1	**Acrylonitrile**	2.9E-04 (C)	0.002 (S)	**0.0084**	Use RSL	**0.042**	Use RSL
71-43-2	**Benzene**	2.9E-05 (C)	0.03 (S)	**0.084**	Use RSL	**0.42**	Use RSL
111-44-4	**Bis(2-chloroethyl)ether**	7.1E-04 (C)	-	**0.0034**	-	**0.017**	-
75-27-4	**Bromodichloromethane**	3.70E-05 (C)	0.07 (R)	Use RSL	**73**	Use RSL	**310**
75-25-2	**Bromoform**	1.10E-06	0.07 (R)	Use RSL	**73**	Use RSL	**310**
106-99-0	**1,3-Butadiene**	1.7E-04 (C)	0.002 (C*)	**0.014**	Use RSL	**0.072**	Use RSL
104-51-8	**n-Butylbenzene**	-	0.175 (R)	-	**180**	-	**770**
135-98-8	**sec-Butylbenzene**	-	0.4 (SUR)	-	**420**	-	**1800**
98-06-6	**tert-Butylbenzene**	-	0.4 (SUR)	-	**420**	-	**1800**
56-23-5	**Carbon tetrachloride**	4.2E-05 (C)	0.04 (C)	**0.058**	**42**	**0.29**	**180**
109-69-3	**1-Chlorobutane**	-	0.14 (R)	-	**150**	-	**610**
124-48-1	**Dibromochloromethane**	2.7E-05 (C)	0.07 (R)	Use RSL	**73**	Use RSL	**310**
75-34-3	**1,1-Dichloroethane**	1.6E-06 (C)	0.7 (R)	Use RSL	**730**	Use RSL	**3100**
75-35-4	**1,1-Dichloroethylene (1,1-DCE)**	-	0.07 (C)	-	**73**	-	**310**
156-59-2	**cis-1,2-Dichloroethylene (cis-1,2-DCE)**	-	0.007 (R)	-	**7.3**	-	**31**
542-75-6	**1,3-Dichloropropene**	1.6E-05 (C)	0.02	**0.15**	Use RSL	**0.77**	Use RSL
118-74-1	**Hexachlorobenzene**	5.1E-04 (C)	0.0028 (R)	**0.0048**	**2.9**	**0.024**	**12**
87-68-3	**Hexachlorobutadiene**	2.20E-05	0.0035 (R)	Use RSL	**3.7**	Use RSL	**15**
75-09-2	**Methylene Chloride**	1E-06 (C)	0.4 (C)	**0.96**	**420**	**12**	**1800**
91-57-6	**2-Methylnaphthalene**	-	0.014 (R)	-	**15**	-	**61**
88-72-2	**o-Nitrotoluene**	6.3E-5 (R)	0.00315 (R)	0.039	**3.3**	0.195	**14**
100-42-5	**Styrene**	-	0.9 (C)	-	**940**	-	**3900**
630-20-6	**1,1,1,2-Tetrachloroethane**	7.40E-06	0.11 (R)	Use RSL	**120**	Use RSL	**480**
79-34-5	**1,1,2,2-Tetrachloroethane**	5.8E-05 (C)	0.07 (R)	Use RSL	**73**	Use RSL	**310**
127-18-4	**Tetrachloroethylene (PCE)**	5.9E-06 (C)	0.035 (C)	**0.41**	**37**	**2.08**	**150**
108-88-3	**Toluene**	-	0.3 (C)	-	**310**	-	**1300**
71-55-6	**1,1,1-Trichloroethane**	-	1 (C)	-	**1040**	-	**4400**
96-18-4	**1,2,3-Trichloropropane**	8.6E-03 (R)	0.0003	**0.0001**	Use RSL	**0.0014**	Use RSL
108-67-8	**1,3,5-Trimethylbenzene**	-	0.035 (R)	-	**37**	-	**150**
75-01-4	**Vinyl chloride**	7.8E-05 (C)	0.1	**0.031***	Use RSL	**0.16**	Use RSL

From Reference #3



APPENDIX D

“Standard Field Procedures”

STANDARD FIELD PROCEDURES

The methods and procedures used by West & Associates Environmental Engineers, Inc. for groundwater sampling are described below. These procedures for groundwater sampling are designed to provide consistent and reproducible results and ensure that the overall objectives of the monitoring program are achieved.

The following documents have been used as guidelines for the development of these procedures:

- *Leaking Underground Fuel Tank Field Manual,* State of California Leaking Underground Fuel Tank Task Force (revised 1989, as updated by memoranda)
- *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities* (EPA-530/SW-611, August 1997)
- *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (OSWER 9950.1, September 1986)
- *Standard Guide for Sampling Groundwater Monitoring Wells* (ASTM, D 4448-85a)
- *Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites* (ASTM, D 5088-90)
- *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)* (ASTM, D 4750-87)
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, Base Manual [3rd edition, November 1986], through Update III [June 1997])

HYDROLOGIC MONITORING

Before disturbing the water column, the static water level is measured in selected monitoring wells and piezometers.

The water level in wells and piezometers is measured with an electric depth to water gauge (DTWG) with cable markings at 0.01-foot increments. The water level is measured by lowering the sensor in to the monitoring well.

The DTWG is equipped with both visual and audible alarms. A sensitivity control compensates for very saline or conductive water. The electric sounder is decontaminated by washing with a detergent solution then rinsed with deionized water after each use. Depth to water is recorded to the nearest 0.01 foot on a field data form. The groundwater elevation at the monitoring well is calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. A witness mark on the casing is used as a fixed reference for make the depth to groundwater measurement.

FREE PHASE PRODUCT MEASUREMENT

The level and thickness of free phase floating hydrocarbon product in a well is measured using an interface meter and/or a clear bailer. The interface meter works on a principal similar to the electric DTWG, measuring both conductive and non-conductive liquid within the well. Floating product can also be measured using a clear, bottom-filling bailer. The bailer is lowered slowly in to the well until the bailer is approximately half submerged. The bailer is then retrieved from the well and the thickness of floating product in the bailer is measured. The thickness of floating product is recorded to the nearest 0.01 foot on the field data record form.

TOTAL WELL DEPTH

Total well depth is measured in monitoring wells Scheduled for sampling by lowering a probe to the bottom of the well and recording the depth. Total well depth, used to calculate purge volumes and to determine whether the well screen is partially obstructed by silt, is recorded to the nearest 0.1 foot on the Field Data Record form.

GROUNDWATER SAMPLE COLLECTION

Groundwater sample collection procedures include equipment cleaning, well purging, and sampling.

Equipment Cleaning

Before sampling event all downhole equipment, or items which come in contact with groundwater, are dissembled and cleaned thoroughly with detergent solution and then rinsed with deionized water. Any parts that may absorb contaminants, such as plastic pump valves, bladders, etc., are cleaned or replaced.

For electric submersible pumps used for well purging, all external pump surfaces and the discharge tube are cleaned prior to lowering the pump in to the water column. An aqueous solution of Liquinox (phosphate-free detergent), followed by deionized water, is run through the pump and discharge tubing to clean internal surfaces. Water is prevented from draining back through the pump by an inline check valve located immediately above the pump.

Monitoring Well Purging

Before sampling, standing water in the casing and sand pack is purged from the monitoring well using either a positive displacement polyvinyl chloride (PVC) hand pump, a portable or dedicated electric submersible pump, a PVC or polyethylene bailer, a centrifugal pump, a dedicated pneumatic bladder pump, or a peristaltic pump. Field measurements of pH, specific conductance, turbidity, and temperature are made at casing volume intervals during purging and recorded on field data sheets. The field measurements are used as indicator parameters to determine when a representative sample can be collected. Purging is generally performed until stabilization (± 10 percent variation) of the indicator parameters takes place. The amount of water purged before sampling is greater than or equal to three casing volumes, unless the well is dewatered. If a well dewaters during purging, it will be allowed to recharge for up to 24 hours; samples will be collected as soon as sufficient volume is available. If a well does not recharge sufficiently within 24 hours, the well will be considered dry for that sampling event.

Monitoring Well Sampling

Groundwater samples are collected using a Teflon bailer, an individually sealed disposable polyethylene bailer, a dedicated electric submersible or pneumatic bladder pump, or inline through a peristaltic pump with clean tubing. Wells are sampled in progression from "clean wells" to wells yielding poorer-quality water. The purpose of this procedure is to reduce the potential for cross contamination of wells by purging or sampling equipment.

Laboratory supplied clean glass bottles of at least 40 milliliters volume fitted with Teflon-lined septa are used to collect samples for volatile organic analyses. These bottles are completely filled to prevent air from remaining in the container. A positive meniscus forms when the bottle is completely full. A convex Teflon®-lined septum is placed over the positive meniscus to eliminate air. After capping, the bottles are inverted and tapped to verify that they do not contain air bubbles. The sample containers for other parameters are filled, filtered as required, and capped.

To determine dissolved concentrations of metals, appropriate field filtration techniques are used. When using a bailer for sampling, a transfer vessel is filled with sample and fitted with a disposable 0.45-micron acrylic copolymer filter. Air pressure is applied to the transfer vessel forcing the sample through the filter; the filtrate is then directed in to the appropriate containers. If a pump is used for sampling, the filter is placed inline at the end of the discharge tubing and the filtrate directed into the appropriate containers. Each filter is used once and discarded.

SAMPLE PRESERVATION AND HANDLING

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers and preservatives vary with each type of analytical parameter. Container types and materials are selected to be non-reactive with the particular analytical parameter tested. Sample preservatives used are consistent with regulatory guidelines and specified analytical methods.

Sample Handling

All sample containers are labeled immediately following collection. Samples are kept chilled with blue ice until received by the laboratory. At the time of sampling, each sample is logged on a chain-of-custody record which accompanies the samples to the laboratory. Water samples are transported from the site by the sampler.

Upon receipt of the samples by laboratory personnel, the chain-of-custody record is signed and released, and a unique sample identification number is assigned to each sample container. This number is recorded on the chain-of-custody record and is used to identify the sample in all subsequent internal chain-of-custody and analytical records. The manger of the subcontracted laboratory ensures that the holding times for requested analyses are not exceeded.

SAMPLE DOCUMENTATION

The following procedures are used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation includes the use of the following:

- Standardized field data record forms to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-Custody record sheets for documenting possession and transfer of samples

Water Sample Field Data Record Forms

In the field, the ampler records the following information on a standardized water sample field data record form:

- Location
- Project Number
- Client Name
- Sample ID

- Name of Sampler
- Regulatory Agency
- Date and Time
- Pertinent Well Data (e.g., casing diameter, depth to water, well depth)
- Calculated and Actual Purge Volumes
- Purging Equipment Used
- Sampling Equipment Used
- Appearance of Sample (e.g., color, turbidity, sediment)
- Results of Field Analyses (e.g., temperature, pH, specific conductance)
- Purge Water Containment
- General Remarks, Including Well Accessibility and Integrity

The sampler signs the field data sheets.

Labels

Sample labels contain the following information:

- Project Number
- Sample ID (e.g. well designation)
- Sampler's Initials
- Date and Time of Collection
- Type of Preservative Used

Sampling and Analysis Chain-of-Custody Record

The sampling and analysis chain-of-custody record, initiated at the time of sampling contains, but is not limited to, the well number, sample type, analytical request, date of sampling, and the name of the sampler. The record sheet is signed and dated by the sampler when transferring the samples. Custody transfers are recorded for each individual sample. The number of custodians in the chain of possession is dept to a minimum. A copy of the sampling and analysis chain-of-custody record is returned to West & Associates Inc. for inclusion with analytical results.

FIELD QUALITY ASSURANCE PROCEDURES

Field quality assurance procedures are specified for each sampling event. Field quality assurance typically includes documenting field instrument calibration, and collecting and analyzing trip blanks, field blanks, equipment blanks, and duplicate samples.

The analysis of trip, field, and equipment blanks, prepared with organic-free water, are used to detect contamination introduces through sampling procedures, external field conditions, sample transportation, container preparation, sample storage, and the analytical process.

Trip blanks are prepared at the same time and location as the sample containers for a particular sampling event. Trip blanks accompany the containers to and from that event, but at no time are they opened or exposed to the atmosphere. Typically, one trip blank for volatile organic parameters will be included per sampling event.

Field blanks are prepared in the field so they are exposed to the ambient atmosphere at a specified monitoring point during sample collection to determine the influence of the external field conditions on sample integrity. Equipment blanks are prepared in the field to ensure that sampling equipment does not cross-contaminate water samples. Organic-free water is run through the properly cleaned or unused (if disposable) sampling equipment, collected and analyzed. One field blank or equipment blank for volatile organic parameters will typically be included per sampling event.

Duplicate samples are collected to assess sampling and analytical precision. For each sampling event including more than six wells, duplicate monitoring well samples will typically be collected at a frequency of 10 percent. Where possible, field duplicates are collected at sampling points known or suspected to contain chemical constituents of interest. Duplicates are packed and shipped blind to the laboratory for analysis with the samples from that particular event.

SOIL SAMPLE COLLECTION AND PRESERVATION

Soil Borings

Undisturbed soil samples will be collected from open borings utilizing a hammer driven spilt spoon sampler fitted with new stainless steel or brass sleeves.

The spilt spoon sampler will be decontaminated between samples by a triple rinse procedure: 1.) Alconox solution, 2.) Water rinse, and 3.) Distilled water rinse.

Soil samples selected for analysis will be immediately capped and labeled. The capped sample sleeve will then be placed in a closed zip lock plastic bag.

Bagged samples will be immediately placed in an ice chest containing water ice or dry ice. Soil samples will be kept in a chilled state until transfer to the testing laboratory.

All soil samples for chemical analysis will be entered on a chain of custody form in the field which will accompany the complete sample set.

Shallow Soil Samples

The tool used to collect shallow soil samples will be decontaminated with a triple rinse procedure between samples.

Soil samples will be tightly packed into a glass, Teflon lidded, jar. Alternatively, the soil sample may be tightly packed into a brass or stainless steel sample sleeve.

Samples will be immediately sealed, labeled and placed into a closed zip lock plastic bag.

Bagged samples will be immediately placed in an ice chest containing water or dry ice. Soil samples will be kept in a chilled state until transfer to the testing laboratory.

All soil samples for chemical analysis will be entered on a chain of custody form in the field which will accompany the complete sample set.

LABORATORY PROCEDURES

West & Associates Environmental Engineers, Inc. specifies analytical methods and procedures to ensure that proper analytical methods are applied; analytical results are accurate, precise and complete; and the overall objectives of the monitoring program are achieved.

Samples are analyzed in accordance with accepted analytical procedures by laboratories certified by the California Department of Health Services. The following publications are the primary references for analytical procedures:

- *Leaking Underground Fuel Tank Field Manual,* Stat of California Leaking Underground Fuel Tank Task Force (revised 1989, as updated by memoranda)
- *Methods for Chemical Analysis of Water and Wastes* (EPA 600/4-79-020, Revised March 1983)
- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater* (EPA 821-B-96-005)
- *Standard Methods for the Examination of Water and Wastewater,* APHA, AWWA, WPCF, 20th edition.
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, Base Manual [3rd edition, November 1986], through Update III [June 1997])

LABORATORY QUALITY ASSURANCE PROCEDURES

Laboratory quality assurance (QA) procedures include those required under the DTSC hazardous waste testing program. Laboratory-specific procedures are included in the laboratory's QA manual, including the use of method blanks, surrogate spikes, matrix spikes and matrix spike duplicates.

Method blanks are analyzed daily to assess the effect of the laboratory environment on the analytical results. Method blanks are performed for each parameter analyzed.

Each sample analyzed for organic parameters contain surrogate spike compounds. The surrogate recovery is used to determine if the analytical instruments are operating within limits. Surrogate recoveries are compared to control limits established and updated by the laboratory based on its historical operation.

Matrix spikes are analyzed at a frequency of approximately 10 percent. Matrix spike results are evaluated to determine whether the sample matrix is interfering with the laboratory analysis and provide a measure of the accuracy of the analytical data. Matrix spike recoveries are compared to control limits established and updated by the laboratory based on its historical operation.

Laboratory quality control (QC) data are included with the analytical results. This QC data includes method blanks, surrogate spike recoveries (for organic parameters only), matrix spike recoveries, and matrix spike duplicates.

APPENDIX E

Electronic Data Submittal Confirmations