THE SALVATION ARMY
USA Western Territory
Adult Rehabilitation Centers Command
180 East Ocean Boulevard, 3rd Floor
Long Beach, CA 90802-4709

FOUNDED IN 1865

WILLIAM BOOTH
Founder

ANDRE COX
General

JAMES KNAGGS
Territorial Commander

DOUGLAS TOLLERUD
ARC Commander

RECEIVED
By Alameda County Environmental Health 11:00 am, Oct 04, 2017

September 25, 2017

Re: Workplan for Site Assessment Fall 2017
The Salvation Army Oakland ARC
601 Webster Street
Oakland, California
Fuel Leak Case No. RO3084
Geotracker Global ID T10000003428

"I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document or report to be submitted on my behalf to ACDEH's FTP server and the SWRCB's GeoTracker website."

Submitted by:

Henry Graciani, Major
ARC Command General Secretary

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

1117 Lone Palm Avenue, Suite 201B
Modesto, CA 95351
Telephone 209-579-2221
Fax 209-579-2225
www.atcgroupservices.com

September 22, 2017

Mr. Keith Nowell, PG, CHG
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Environmental Health Services, Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Subject: **Workplan for Site Assessment Fall 2017**
The Salvation Army Oakland ARC
601 Webster Street
Oakland, California
Fuel Leak Case No. RO3084
Geotracker Global ID T10000003428

Dear Mr. Nowell,

ATC Group Services LLC (ATC) has prepared this Workplan for the delineation of the dissolved phase PHC Plume on behalf of The Salvation Army for their Oakland Adult Rehabilitation Center (ARC) facility located at 601 Webster Street in Oakland, California.

If you have questions or comments regarding this workplan, please contact us at your convenience. If you have any questions or require further information, please email or call us at (209) 579-2221.

Sincerely,

Michael D. Sonke
Project Manager
Phone +1 209 579 2221
Email: mike.sonke@atcassociates.com

Gabe Stivala, P.G.
Senior Geologist
Phone +1 916 386 3870
Email: gabe.stivala@atcassociates.com

PROFESSIONAL GEOLOGIST
GABRIEL V. STIVALA
No. 7780
STATE OF CALIFORNIA

ACEH FTP website	https://www.acgov.org/aceh/lop/lop.htm	
Geotracker website	http://geotracker.waterboards.ca.gov	
Email distribution list		
Name	Title	email
Major Henry Graciani	General Secretary	henry.graciani@usw.salvationarmy.org
Ms. Kaye Patterson	Property Project Manager	kaye.patterson@usw.salvationarmy.org
Ms. Jeanie Brown	Property Project Facilitator	jeanie.brown@usw.salvationarmy.org
Captain Tim Rockey	Administrator – Oakland	timothy.rockey@usw.salvationarmy.org

Workplan for
Site Assessment Fall 2017

The Salvation Army Oakland ARC Building
601 Webster Street,
Oakland, California,
ACEH Fuel Leak Case No. R00003084
Geotracker Global ID T10000003428

Submitted to:

Mr. Keith Nowell, PG, CHG
Hazardous Materials Specialist
Alameda County
Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

On behalf of:

Salvation Army ARC Command
180 E. Ocean Blvd, 3rd Floor
Long Beach CA 90802

Submitted by:

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

ATC Group Services, LLC
1117 Lone Palm Avenue
Suite 201B
Modesto, California 95351
ATC Project No. Z054000006-0011

September 22, 2017

TABLE OF CONTENTS

FIGURES

APPENDICES

Appendix	A	ACEH Directive Letter dated June 15, 2017
Appendix	B	Bibliography including Historical Work ATC Work products
Appendix	C	Beacon paper *Groundwater Plume, Source and Risk Identification Using Passive Soil Gas*
Appendix	D	Beacon's SOP: Passive Soil Gas Testing Standard for Site Characterization
Appendix	E	ATC's Standard Field Guidelines Groundwater Monitoring and Sampling

1.0 INTRODUCTION

ATC Group Services LLC (ATC) has prepared this workplan for additional site investigation on behalf of The Salvation Army for their Oakland Adult Rehabilitation Center (ARC) facility located at 601 Webster Street in Oakland, California. The workplan was prepared in response to ACEH's letter dated June 15, 2017. A copy of this letter is included in **Appendix A.**

The workplan scope is intended to further delineate petroleum hydrocarbon impacts in soil and groundwater on-site and off-site by performing a passive soil gas (PSG) survey. The PSG survey will be followed by soil and groundwater sampling and analysis, as needed, to verify the survey results. Soil and groundwater sampling will be facilitated through the installation of soil borings and/or groundwater monitoring wells.

2.0 SITE DESCRIPTION

The site is The Salvation Army's (TSA) Adult Rehabilitation Center (ARC) (site) located at 601 Webster Street in Oakland, California, as shown on **Figure 1**. The site occupies the entire city block between Webster and Franklin Streets; and between Sixth and Seventh Streets. The northeast portion of the site includes the truck enclosure area. This area is where the former underground storage tank (UST) system was located. Fencing or walls enclose the truck enclosure area, which is used for loading/unloading trucks and for overnight truck parking/security. **Figure 2**, Site Plan illustrates the pertinent site features and the surrounding area.

2.1. SITE HISTORY / CHRONOLOGY

According to TSA, the site was purchased by TSA in April of 1920.

TSA had an onsite fueling system for their fleet of commercial trucks that was decommissioned and removed in in 2010. The fueling system was removed between November 22, and 23, 2010, and included a 10,000-gallon UST containing diesel, an 8,000-gallon UST containing gasoline, and associated fuel dispensers and piping.. The USTs appeared to be in good condition, with no visible holes or signs of leakage. Laboratory analysis of soil samples collected from the base of the UST pit indicated that petroleum hydrocarbons (PHCs) related to gasoline were present. PHCs in the diesel range were not detected in any of the soil samples. This work was described in a report produced by the contractor, Terry Hamilton (Hamilton, 10/4/2010).[1]

In early 2011, TSA retained ATC Associates to investigate and assist in fulfilling obligations that resulting from the PHC release. Based on a discussion with the Oakland City Fire Department (OFD), ATC developed limited-scope workplan to assess the release to assist OFD in determining if the case could be closed or should be forwarded to the Local Oversight Program (LOP) Agency,

[1] Bibliography (including Historical Work ATC work products) is included as **Appendix B**.

Alameda County Health Care Services Agency (ACEH). The proposed investigation consisted of drilling five borings to collect and analyze soil and groundwater samples (ATC, 8/8/2011).

Prior to implementing the workplan, the environmental case oversight authority was transferred from OFD to the ACEH. In correspondence dated May 2012 and November 2012, ACEH requested changes to the March 18, 2011 workplan originally submitted to the OFD. Cardno ATC submitted a revise workplan that proposed two additional borings and the development a site conceptual model (Cardno ATC, 2/28/2013). The workplan was approved by ACEH in a letter dated May 31, 2013.

On July 29 and July 30, 2013, Cardno ATC implemented the workplan advancing seven direct-push soil borings at the site. Borings SB1 through SB7 were advanced to groundwater. Sixteen soil samples and six groundwater samples were collected and analyzed at an environmental laboratory. The results of laboratory analyses indicated PHC contamination within the truck enclosure area surrounding the former UST location (Cardno, 1/13//2014) (Cardno, 1/13//2014).

On July 2, 2014, a meeting was held between ACEH, TSA, and ATC. Based on the meeting, a follow up email on July 2, 2014 from the ACEH directed the development of a workplan to address laboratory analysis continuity, lateral and vertical delineation of soil and groundwater contamination, gas intrusion to indoor air, and a sensitive receptor survey. Additionally, ACEH requested a Feasibility Study/ Corrective Action Plan (FS/CAP) to be submitted by the end of the year, if warranted by the field investigation. In response, Cardno ATC produced and submitted a workplan that proposed 1.) Advancing twelve to sixteen membrane interface probe (MIP) borings to screen the soil and water for the presence of contamination, followed by 2.) The advancement of eight to ten Hollow Stem Auger (HSA) borings to retrieve quantitative samples, and finally 3.) The installation of four monitoring wells to further assess PHCs dissolved in groundwater (Cardno ATC, 8/14/2014).

ACEH evaluated the existing data and the results projected to be derived from implementation of the workplan and recounted this process in correspondence dated December 24, 2014. ACEH determined that the site did not meet several of the criteria for the State of California Water Resources Control Board's (Water Board) Low Threat Closure Policy (LTCP) including the Conceptual Site Model (CSM) portion of the General Criteria section.

ACEH indicated that LTCP data gaps could not be addressed with MIP data. ACEH directed the advancement of additional HSA borings to address the LTCP data gaps particularly targeting the 0- to 5-foot and 5- to 10-foot zones. ACEH's opinion was that it was premature to collect sub-slab soil vapor samples as described in the workplan unless depth to water data indicated the piezometric surface is less than 2 feet below the base of the foundations. ACEH requested the preliminary data collected from the soil and groundwater portion of the investigation be submitted for consideration prior to conducting the soil vapor assessment portion of the investigation. ACEH stated that if a diesel release had occurred, it was not likely to be significant and therefore total petroleum hydrocarbons as diesel (TPHd) could be eliminated from the analytical scope. ACEH directed the placement of three onsite monitoring wells, but believed it was premature to identify locations of offsite well. In February 2015, Cardno ATC responded by reissuing a new workplan (Cardno ATC, 2/27/2015).

ACEH responded to ATC's February 2015 workplan in a letter dated June 1, 2015. ACEH directed the inclusion of two additional HSA borings within the footprint of the former UST location, sampling at additional depths within HSA borings J2, J5, M2, and M5, as well as collection of an additional soil sample collected between ten feet bgs and first encountered groundwater for all borings showing evidence of contamination. ACEH agreed with the installation of three monitoring wells within the truck enclosure area but wanted Cardno ATC to provide the MIP and HSA data, and to confer with ACEH prior to installing additional wells. ACEH also believed it was premature to collect soil vapor samples until the depth to groundwater (DTW) had been established through the installation and gauging of monitoring wells.

Between September 28, and October 2, 2015, ATC advanced fourteen (14) MIP borings, first with a conventional direct-push rig, but later with a CPT rig when refusal was encountered prior to the target depth. Results of the MIP investigation indicated PHC was present both in the truck enclosure and across Franklin Street in the Salvation Army Used Car lot. To confirm and supplement the MIP data, nine (9) hollow stem auger (HSA) borings were advanced for the collection of discrete soil samples, for field screening and laboratory analysis. The four monitoring well locations were selected based on MIP and HSA boring data. ATC communicated this information to ACEH in an email. ATC installed three groundwater monitoring wells in the truck enclosure area and one additional well in the used car lot across Franklin Street. Groundwater samples collected from all the monitoring wells contained dissolved phase PHC, with the highest concentrations seen in monitoring wells MW-1 and MW-3 (ATC, (4/26/2016).

Since the end of 2015, ATC has performed quarterly monitoring of the monitoring well network at the site. Dissolved phase PHC is present onsite and offsite to the west. The highest concentrations have been reported in MW-3 and MW-1 with benzene concentrations currently exceeding the Environmental Screening Levels (ESL). Groundwater elevation averaged around 11.68 feet above mean sea level (amsl) with the groundwater flow direction varying between the west-southwest to the southwest at an average slope of 0.012 feet/foot (ft/ft).

During the quarterly groundwater sampling activities on August 16, 2016, ATC detected 2.04 inches/0.17 feet of light non-aqueous phase liquid (LNAPL) in MW-3 which resulted in ATC installing a passive skimmer in this well on September 8, 2016. On May 16, 2017, ATC detected 3.24 inches (0.27 feet) of LNAPL in MW-1 during the quarterly monitoring event, which resulted in ATC installing a passive skimmer in this well on July 19, 2017.

In the fall of 2015, ATC performed a Sensitive Receptor Survey (SRS). ATC requested a list of prospective candidate wells shown to be located within the search area encompassing a 2,000-foot radius around the site from the California Department Water Resources (DWR) and the Alameda County Public Works Agency, Water Resources (ACPWAWR). These requests resulted in a subset of 742 candidate wells that ATC further screened by location and well type. This screening eventually identified four qualified production and two cathodic protection wells within the 2,000-foot radius search area. During field reconnaissance, ATC determined that all six wells were located upgradient or cross gradient of the TSA site and thereby unlikely sensitive receptors. Additionally, during field reconnaissance, ATC identified the nearby 8 Orchids Condos multi-story Building as possibly having sumps to dewater their subsurface structures, but these sumps were not included in the list of permitted wells obtained from the DWR or ACPWAWR sources. ATC also observed determined the proximity of BART's subsurface infrastructure might include dewatering components that could potentially be a receptor and could be influencing the hydrology local to the TSA Site. The results of the SRS documented in ATC's Sensitive Receptor Survey Update Report - December 2016 which was submitted to the ACEH (ATC, 1/25/2017).

In a letter dated August 3, 2016, ACEH directed the installation and sampling of subslab soil gas sampling points as permanent sampling points, and to sample, analyze and report on these points quarterly, simultaneous with the quarterly groundwater sampling, analyses, and reporting. In December of 2016, ATC installed three sub-slab vapor points in the basement of the TSA ARC Building to sample sub-slab vapor adjacent beneath the ARC Building. Subslab vapor samples were collected, analyzed and the laboratory results compared to San Francisco Bay Regional Water Quality Control Environmental Screening Levels (ESLs), Table 1 for Subslab/Soil Gas in a commercial/industrial setting. None of the reported analytical results were in excess of the RWQCB Tier I ESLs. Sub-slab vapor sampling has occurred quarterly since the first sampling. None of the subsequent result have exceeded the applicable ESLs, therefore there is no indication of a vapor intrusion risk related to the petroleum hydrocarbon release at this site. ACEH directed continued quarterly sampling for the purpose of confirmation and assessment of potential seasonal variation in subslab vapor concentrations (ATC, 1/10/2017).

3.0 GEOLOGY AND HYDROGEOLOGY

The City of Oakland is located within the San Francisco Bay Area Physiographic Province and is bounded by the San Francisco Bay to the northwest, west, and southwest and by the Oakland Hills to the east. The landmass on which Oakland is located was formed as a result of an uplift of the Oakland Hills along the Hayward Fault out of the San Francisco Bay basin, which lies to the north and west. The area where Oakland is located is covered with alluvium from the Sierra Nevada mountain range deposited by the San Joaquin and Sacramento River systems, and by local creeks and streams flowing from the Oakland Hills. Sedimentary deposits consisting of non-marine sandstone, conglomerate, and mudstone underlie the alluvium.

Specific to the geology of the site, soil from borings SB1, SB2, and SB7 advanced at the site in July 2013 consisted of fill material placed in the former tank excavation to a depth of approximately 13 to 15 feet bgs. Silty sand and fine sand were encountered from 15 feet to 25 feet in SB1, and from 13 feet to 20 feet in SB2 and SB7, the maximum depths to which these borings were characterized. Soil from the borings SB3, SB4, and SB5 consisted of sandy clay or clayey sand to a depth of approximately 5 to 7 feet bgs. Silty sand and fine sand were encountered from depths between 5 to 7 feet and 20 feet, the maximum depths to which the borings were characterized, with the exception of SB3 that had sandy clay from 16 to 18 feet bgs. Soil from the boring SB6 consisted of silty sand to a depth of approximately 5 feet bgs. Fine sand was encountered from 5 feet to 15 feet bgs, and silty sand was encountered between 15 feet and 20 feet, the maximum depth to which the boring was characterized (Cardno ATC, 1/13/2014).

The site lies within the East Bay Plain Sub-basin 2-9.04. In general, groundwater in this basin has been designated beneficial for municipal and domestic water supply, industrial process and service water supply, and agricultural water supply. Despite this designation, the East Bay Municipal Utility District (EBMUD) indicates that all potable drinking water for the City of Oakland is imported from the Mokelumne River watershed. Lake Merritt lies approximately 3,250 feet to the east-northeast upgradient of the site. The nearest surface water body to the site is Oakland

Inner Harbor/Oakland Estuary, located approximately 2,000 feet downgradient to the south (ATC, 12/23/2016).

The surface topography in the vicinity surrounding the site slopes moderately from the northeast to the southwest, which is consistent with the path of Franklin Street. However, available data obtained from other nearby leaking underground storage tank (LUST) sites reveals the direction of regional groundwater flow to be variable, with variability sometimes attributed to dewatering activities related to subterranean BART infrastructure (ATC, 12/23/2016).

The groundwater flow direction is variable ranging from southeast to southwest. ATC suspects groundwater flow in the area may be affected by dewatering associated with the subterranean BART tunnel located offsite to the southwest.

4.0 CHARACTERIZATION STATUS

ATC has conducted three investigations including the advancing fourteen (14) MIP borings, fifteen (15) soil borings, and installation of four (4) monitoring wells.

Boring P2 in the northwest corner of the truck enclosure area laterally defines PHCs in both soil and groundwater. The vertical extent of PHC is defined by soil sample results collected at borings for monitoring wells MW-1 and MW-3. Soil samples collected at these locations indicate PHCs are limited to the upper 20 feet. It should be noted that these borings were performed in the suspected source area of the site. Dissolved-phase PHC has been reported in groundwater samples collected from all four groundwater monitoring wells at the site with non-aqueous phase liquid (NAPL) occasionally detected in monitoring wells MW-1 and MW-3. Therefore, the extent of dissolved-phase remains undefined (ATC, 4/26/2016).

Vapor phase PHC was reported to be present in sub-slab vapor samples collected during the quarterly sub-slab vapor monitoring. None of the results were found to be in excess of the RWQCB Tier I ESLs. Quarterly monitoring of sub-slab vapor is ongoing.

During quarterly groundwater sampling activities on August 16, 2016, ATC detected 2.04 inches/0.17 feet of light non-aqueous phase liquid (LNAPL) in MW-3. On September 8, 2016, ATC installed a passive skimmer in MW-3. On May 16, 2017, ATC detected 3.24 inches (0.27 feet) of LNAPL in MW-1 during the quarterly monitoring event and on July 19, 2017, ATC installed a passive skimmer in MW-1.

Regional groundwater flow direction is suspected to be to the west, toward the San Francisco Bay. Measured groundwater flow at the site varies from west to northwest and may be influenced various groundwater dewatering systems in the area including those used to dewater BART tunnels and those used to dewater subsurface structures of nearby buildings.

5.0 SCOPE OF WORK

The general goals of the project are as follows:

1. Further to evaluate the lateral distribution of the dissolved phase PHC contamination beneath the ARC Building and across the adjacent property to the north across Franklin Street (TSA parking lot).
2. Further evaluate the extent of PHC contaminant mass in the source area.

ATC intends to achieve these goals by the deployment of a Passive Soil Gas (PSG) survey in a grid pattern within 1) the source area (truck enclosure area); 2) the adjacent property to the TSA parking lot; and 3) in the basement of the ARC building. Based on the results of the PSG survey, ATC will advance hollow stem auger (HSA) borings and/or installing groundwater monitoring wells to collect soil and groundwater samples in order to verify the PSG survey results. Proposed PSG sampler locations are depicted in **Figures 3** through **6**.

PSG sampling technology has been widely used for environmental monitoring throughout the world since its inception over three decades ago. The application of PSG screening technology to identify contaminant movement via vapor intrusion and groundwater pathways is a relatively new application of this existing technology. Naval Air Station (NAS) North Island demonstrated the use of PSG survey to identify possible discharges of volatile organic compounds (VOCs) into San Diego Bay. In addition, Lawrence Livermore National Laboratory has used this technique for the rapid screening of soil and groundwater contamination at its two Superfund sites. PSG sampling is further described in detail in Section 4.2 below.

Beacon has published a paper *Groundwater Plume, Source and Risk Identification Using Passive Soil Gas*, by Joseph E. Odencrantz and Harry O`Neill before the Proceedings of the Sixth International Battelle Conference: Remediation of Chlorinated and Recalcitrant Compounds Monterey, California, May 19-22, 2008. This paper concluded that passive soil gas (PSG) sampling was an effective tool for soil and groundwater source identification and assessment of spatial variability for site investigation and remediation. This paper is included as **Appendix C**.

ATC intends this workplan to be deployed as a dynamic workplan as endorsed by the USEPA, and the 2012 LUFT manual. A dynamic workplan relies, in part, on an adaptive sampling and analysis strategy. In this workplan, the qualitative data from the PSG survey will be used to screen large areas of the site and identify data gaps in the current conceptual model. Data from the PSG survey will verified through correlation with existing data and/or follow-up borings and monitoring wells.

5.1. PROJECT PLANNING & PERMITTING

ATC will obtain the necessary drilling permits from ACPWAWR as necessary.

ATC will attempt to locate potential subsurface underground utilities at site locations where intrusive soil borings will be undertaken. This work will include notifying Underground Services Alert (USA North) as required by law and employing a private subsurface utility locating service to locate both public and private underground utilities that may be present in the work areas identified above. This information will be added to the information gathered previously, to update the subsurface utilities map. ATC will notify the ACEH 48 hours in advance of drilling.

5.2. PASSIVE SOIL GAS SAMPLING

For this investigation, ATC will utilize Beacon Environmental Services, Inc. (Beacon) of Forest Hill, Maryland to provide and analyze PSG samplers. ATC will follow Beacon's standard for site characterization using PSG testing, which are performed in general accordance with ASTM standards 05314 & 07758. A copy of Beacon's SOP is included as **Appendix D.** The samplers will be installed in a grid [pattern across each study are as shown on **Figures 3** through **6.**

At each sample location, surface asphalt or concrete will be removed to expose the soil. ATC will then advance shallow boring 0.5-inch diameter 36-inches deep using hand tools so as not to risk potential damage to subsurface utilities, if present. An individual PSG sampler will be selected from the kit, marked with an identification number; the impermeable shipping cap will be removed and replaced with a permeable cap to allow exposure. The sampler will be emplaced face down in the boring and suspended by a wire holder approximately four inches below the surface, and seal the boring from access by surface vapors.

The extended borehole beneath the samples provides a pathway for this PHC vapor to reach a PSG sampler installed near the top of this boring. The PSG sampler contains sorbent materials that have an affinity for a broad range of VOC and semi volatile organic compounds (SVOCs).

The sampler will then be left in place for a residence time of approximately two weeks. As the VOCs present in the soil and groundwater volatilize, the resulting gases migrate through the vadose zone with soil gases being sorbed onto the PSG sampler's absorbent material.

Following the prescribed residence time, ATC will retrieve the PSG adsorbent samplers, prepare the samplers for shipment, and ship the sampling kit under chain of custody documentation to Beacon for analysis.

Beacon will analyze the samples for benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tertiary-butyl ether (MTBE), tertiary butyl alcohol (TBA), di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), 1,2-dichloroethane (1,2-DCA), ethyl dibromide (EDB), naphthalene and the chlorinated compounds detected previously at the site (i.e. tetrachloroethene, trichloroethene, chloromethane, methylene chloride) using U.S. EPA Method 8260C. After sample analysis, Beacon will present the resulting data in a report that includes a narrative, tabular results, and color isopleth maps showing the distribution of compounds identified.

5.3. Data Evaluation and Soil Boring/Monitoring Well Placement

ATC will evaluate PSG survey data through comparison with existing quantitative data for the site. Based on the evaluation, ATC will propose soil borings and/or monitoring wells to confirm lateral extent of PHCs reported in the PSG survey report. ATC anticipates that at least two monitoring wells will be required to define the down gradient extent of dissolved phase PHC. However, the number and location of wells to be installed will be discussed with the ACEH prior to installation.

5.4. Hollow Stem Auger Borings - Placement and Construction

IHSA boring will be advanced by a State-licensed (C57) drilling company using pre-cleaned 8-inch hollow stem augers. During the auger advancement, an ATC field geologist will screen soil cuttings with a Photo Ionization Detector (PID) and characterize the soil in general accordance with the Unified Soil Classification System (USCS). Vadose zone soil samples will be considered for lab analysis based on PID readings, visual observation of impacts, or significant changes in lithology. A single grab groundwater sample will be collected from the terminus of each HSA boring, unless the boring is to be used to construct a groundwater monitoring well. Field observations will be recorded on the field boring logs.

Grab groundwater samples will be obtained by deploying a hydropunch-style sampling tool or inserting a temporary PVC slotted well screen after saturated soil is encountered; groundwater is anticipated to exist between 25 to 30 feet bgs. The hydropunch-style sampling tool will be lowered through the augers to the interface with the undisturbed formation. The sampling tool will then be driven to the desired depth and retracted, exposing the screened section of the sampling device. Groundwater will pass through the screen and enter the void made by the tool. In the case of sampling using temporary well screen, the screened section will be across the entire length of the boring. Groundwater samples will then be collected from within the sampling tool or temporary well screen with a small-diameter bailer.

Collected soil and groundwater samples will be placed in a cooler with ice and shipped under chain of custody documentation to a state-certified environmental analytical laboratory for analysis

Used equipment will be decontaminated prior to subsequent drilling and sampling. Augers and other large pieces of equipment will be decontaminated using high-pressure hot water spray. Samplers, groundwater pumps, liners, and other equipment will be decontaminated in an Alconox scrub solution and double rinsed with clean tap water. Rinseate will be containerized for later disposal.

Upon completion of sampling, the boreholes will be grouted to the surface. In areas where boreholes have penetrated existing asphalt or concrete, the borehole will be capped with an equivalent thickness of asphalt or concrete patch to match the finished grade.

5.5. Groundwater Monitoring Wells - Placement and Construction

Groundwater monitoring wells will be constructed at predetermined strategic locations in the areas prescreened during the PSG sampling phase of the investigation. The monitoring well will start with the advancement of a typical HSA boring as described in Section 4.4. The State-licensed

(C57) drilling company will then begin construction by assembling a 2-inch inside diameter Schedule 40 polyvinyl chloride (PVC) casing with approximately 15 feet of 0.010-inch slotted screen. The top of the screened interval will be placed approximately five feet above the depth of encountered groundwater depth. The annulus of the screened portion of the groundwater monitoring well will be backfilled with a #3 Monterey sand (or equivalent) filter pack from the bottom of the borehole to approximately two to three feet above the top of the screen. An approximately two-foot layer of medium bentonite chips will be placed on top of the filter pack and hydrated to form an annular seal. The remaining annular space will be filled with a neat cement grout. To protect the integrity of the wells, locking, watertight well plugs will be installed on each well and a watertight wellhead labeled "monitoring well" will be installed in concrete over well.

5.5.1. Well Surveying

Once the proposed groundwater monitoring wells have been installed, the locations and elevations of the wells will be surveyed to Geotracker standards. The new wells will be surveyed to NAD83 horizontal datum and NAVD88 vertical datum by a California Licensed Professional Land Surveyor.

5.5.2. Well Development

The groundwater monitoring well development will occur a minimum of 72-hours after installation. A surge and bail technique will be used to develop the wells. During well development, the temperature, pH, and electrical conductivity during each successive purge volume (casing and sand pack), will be recorded. Development will continue until the discharge water is relatively clear and free of sediment, and the temperature, electrical conductivity, and pH have stabilized.

5.5.3. Management of Investigation Derived Waste

Investigative derived wastes (IDW) including soil cuttings, wash water, decontamination rinseate water, and purge water will be contained in Department of Transportation (DOT) approved 55-gallon drums. The drums will be labeled as non-hazardous waste and will be temporarily staged onsite pending laboratory results. Disposition of the IDW will be conducted by an appropriate waste disposal subcontractor and will be managed in accordance with State and local guidelines.

5.5.4. Groundwater Sampling

A minimum of 48-hours following monitoring well development, ATC field personnel will collect groundwater samples from the newly established well in accordance with ATC's Standard Field Procedures for Groundwater Monitoring, Sampling, and Laboratory Analysis, a copy of which is included in **Appendix E**.

6.0 REPORT PREPARATION

ATC will prepare a report for submission to the ACEH.

This report will include:

- Descriptions of the field activities;
- Boring/well logs;
- Laboratory derived analytical data presented in tabular form, isoconcentration maps that depict the estimated horizontal extent of PHC impacted soil and groundwater;
- A risk analyses of the impacts of the released hydrocarbons including a description of the risk analyses process;
- Updated Site Conceptual Model Table;
- Updated Low Threat Closure Policy Table;
- Identification of remaining data gaps;
- Recommendations for further courses of action, if warranted.

7.0 PROJECTED TIMETABLE

Once approval of this workplan has been received from the ACEH, ATC will confirm a schedule for field activities. ATC will notify the ACEH at least 48 hours prior to beginning any field activities. The summary report will be submitted to the ACEH approximately 45 days or less following competition of field activities.

8.0 LIMITATIONS

This document was prepared and the work proposed for application solely to the corresponding site. This document was prepared and the work proposed have been undertaken in good faith, with due diligence and with the expertise, experience, capability, and specialized knowledge necessary to perform the work in a good and workperson like manner. This document was prepared and the work proposed within all generally accepted professional engineering and environmental consulting practices existing at the time of completion pertaining to providers of environmental services in California at the time of investigation and within the scope of work outlined in ATC's contract. All work at the site and documents submitted are completed under the advisement and review of a California-licensed Professional Geologist (PG) or Professional Engineer (PE).

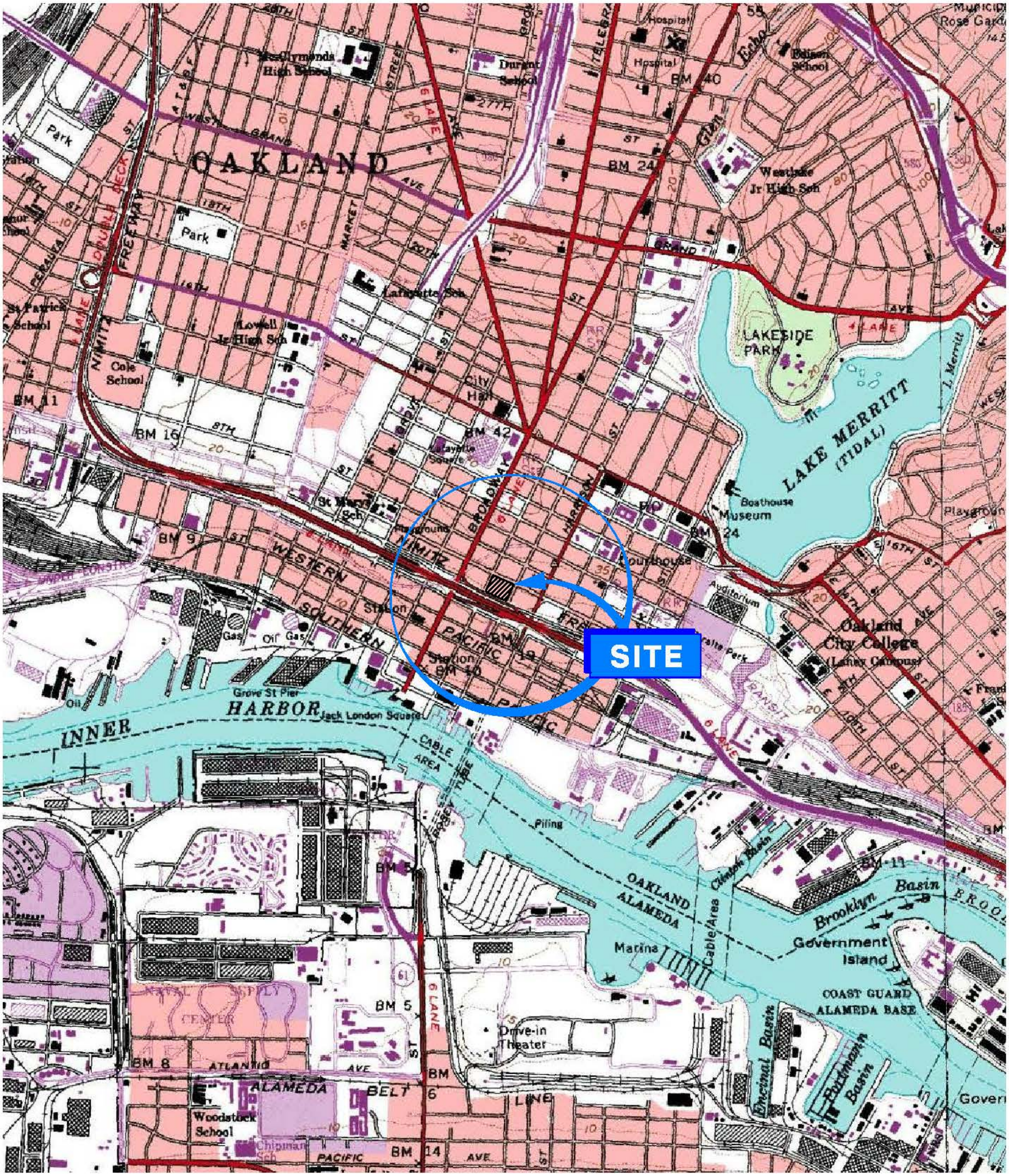
The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points. No soil engineering or geotechnical references are implied or should be inferred.

To the extent that this workplan/report is based on information provided to ATC by third parties, the information is used "as is" and is assumed to be accurate. ATC may have made efforts to verify this third party information, but ATC cannot guarantee the completeness or accuracy of this third party information.

ATC does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents. The data collected and opinions expressed are based on the conditions of the site existing at the time of the field investigation.

No other warranties, expressed or implied are made by ATC.

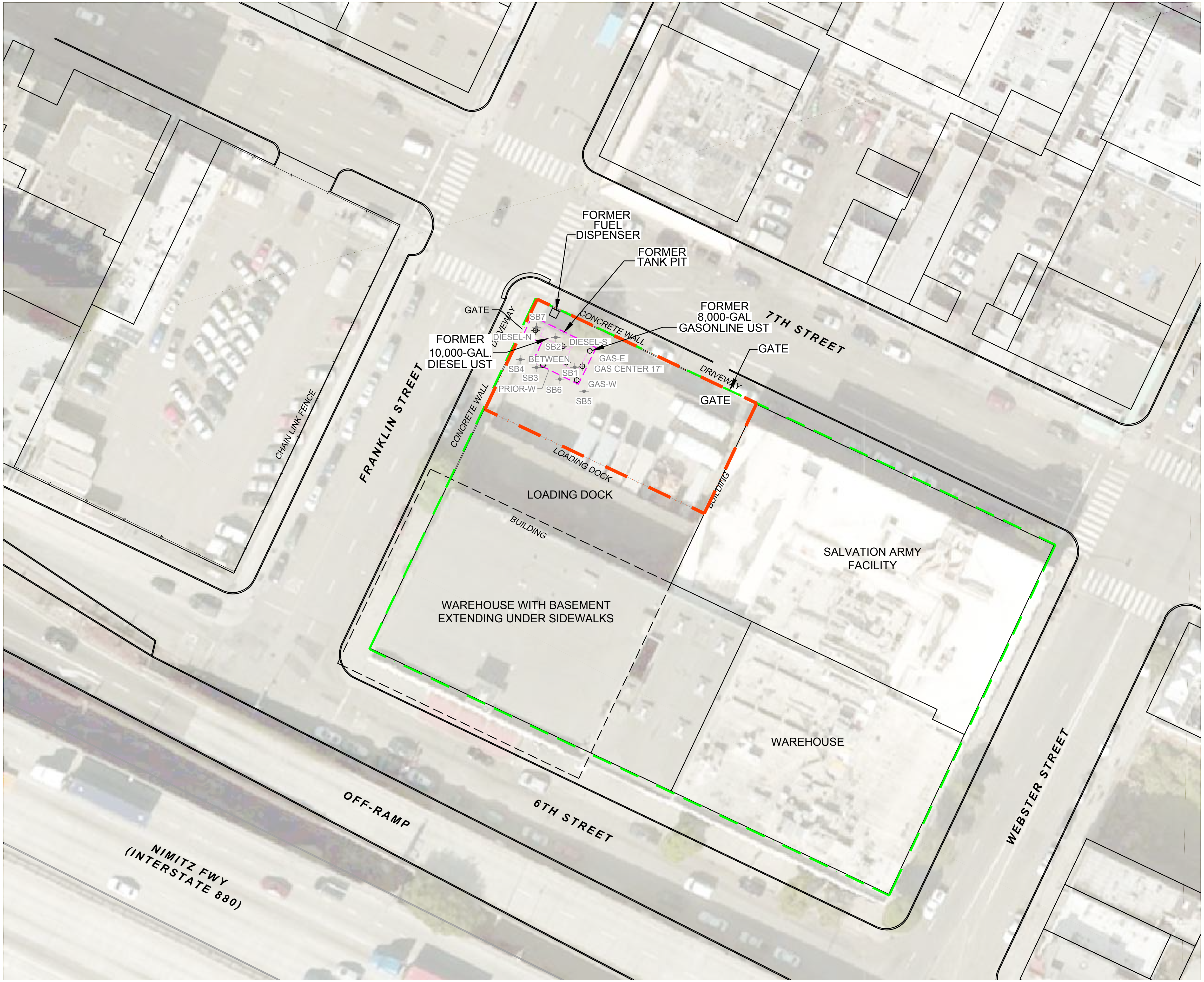
FIGURES



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP
OAKLAND WEST QUADRANGLE, CALIFORNIA, DATE 1959, PHOTO-UPDATED 1980

FIGURE 1 **SITE LOCATION MAP** THE SALVATION ARMY 601 WEBSTER STREET OAKLAND, CALIFORNIA	ATC ENVIRONMENTAL • GEOTECHNICAL BUILDING SCIENCES • MATERIALS TESTING	1117 LONE PALM AVE., SUITE 201 MODESTO, CA 95351 Ph: (209) 579-2221	
	PROJECT NUMBER: Z054000006		
	DESIGNED BY: MDS	APPROVED BY: JH	DATE: 1-22-15
	REVIEWED BY: MDS	DRAWN BY: DAW	SCALE: 1:24,000

FILE: M:\Enviromental\25026 - The Salvation Army\TSA-O-UST 601 Webster Oakland\Drawing & Figures\DWGs\04 Denise's CAD Folder\2015 4Q GW Contour 2.dwg



LEGEND

- APPROXIMATE FACILITY BOUNDARY
- FORMER UST
- FORMER EXCAVATION
- TRUCK ENCLOSURE AREA
- FORMER DIRECT PUSH BORING
- SOIL BORING

0 50' 100'

SCALE, FT

N

NOTE: SCALE AND LOCATIONS ARE APPROXIMATE

FIGURE 2

DATE: 12-8-15

DRAWN BY: DAW

PROJECT NUMBER: Z05400000066

APPROVED BY: M. SONKE

ATC ENVIRONMENTAL • GEOTECHNICAL BUILDING SCIENCES • MATERIALS TESTING

1117 Lone Palm Avenue, Ste. 201
Modesto, California 95351
Ph: (209) 579-2221 *** Fax: (209) 579-2225

SITE PLAN

THE SALVATION ARMY
601 WEBSTER STREET
OAKLAND, CA

FILE: M: \Enviromental\25026 – The Salvation Army\TSA–O–UST 601 Webster Oakland\Drawing & Figures\DWGs\04 Denise's CAD Folder\2015 4Q GW Contour 2.dwg Apr 26, 2016 – 2:43pm Denise.Walp

FIGURE 3

DATE: 8-23-17

DRAWN BY: DAW

PROJECT NUMBER: Z054000066

APPROVED BY: M. SONKE

ATC
ENVIRONMENTAL • GEOTECHNICAL BUILDING SCIENCES • MATERIALS TESTING

1117 Lone Palm Avenue, Ste. 201
Modesto, California 95351
Ph: (209) 579-2221 *** Fax: (209) 579-2225

TSA PSG SCREENING AREAS

THE SALVATION ARMY
601 WEBSTER STREET
OAKLAND, CA

FILE: W:\Modesto Office\Z054000006_Salvation Army\PGS Survey Area Maps\2017 TSAO PSG Survey Areas.dwg Sep 08, 2017 — 2:49pm denise.walp

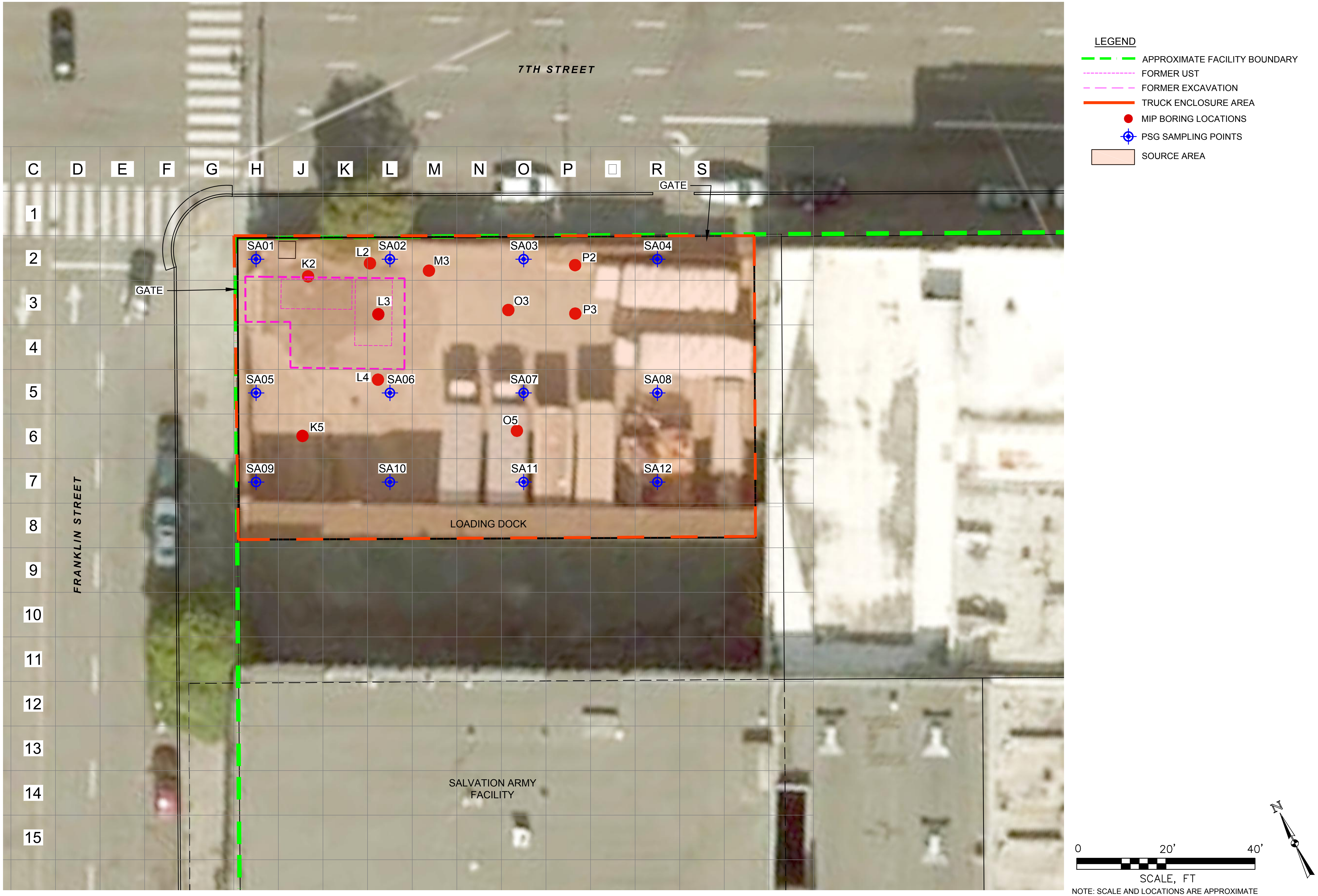


FIGURE 4

DATE: 8-23-17

DRAWN BY: DAW

PROJECT NUMBER: Z054000066

APPROVED BY: M. SONKE

ATC

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

1117 Lone Palm Avenue, Ste. 201
Modesto, California 95351
Ph: (209) 579-2221 *** Fax: (209) 579-2225

TSA PSG SCREENING AREA - SOURCE AREA

THE SALVATION ARMY
601 WEBSTER STREET
OAKLAND, CA

FILE: W:\Modesto Office\Z054000006_Salvation Army\PGS Survey Area Maps\2017 TSAO PSG Survey Areas.dwg Sep 08, 2017 – 1:23pm denise.walp

FIGURE 5

DATE: 8-23-17

DRAWN BY: DAW

PROJECT NUMBER: Z054000066

APPROVED BY: M. SONKE

ATC
ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

1117 Lone Palm Avenue, Ste. 201
Modesto, California 95351
Ph: (209) 579-2221 *** Fax: (209) 579-2225

TSA PSG SCREENING AREA - TSA USED CAR LOT

THE SALVATION ARMY
601 WEBSTER STREET
OAKLAND, CA

FILE: W:\Modesto Office\Z054000006_Salvation Army\PGS Survey Area Maps\2017 TSAO PSG Survey Areas.dwg Sep 08, 2017 — 1:23pm denise.walp

NOTE: SCALE AND LOCATIONS ARE APPROXIMATE

TSA PSG SCREENING AREA - ARC BUILDING BASEMENT

THE SALVATION ARMY
601 WEBSTER STREET
OAKLAND, CA

FIGURE 6

PROJECT NUMBER: Z05400000066
DATE: 8-23-17
APPROVED BY: M. SONKE
DRAWN BY: DAW

ATC
ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING
1117 Lone Palm Avenue, Ste. 201
Modesto, California 95351
Ph: (209) 579-2221 *** Fax: (209) 579-2225

FILE: W:\Modesto Office\Z054000006_Salvation Army\PGS Survey Area Maps\2017 TSAO PSG Survey Areas.dwg Sep 08, 2017 – 2:49pm denise.walp

APPENDICES

Appendix A

Alameda County
Environmental Health
Directive Letter

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
REBECCA GEBHART, Interim Director

DEPARTMENT OF ENVIRONMENTAL HEALTH
LOCAL OVERSIGHT PROGRAM FOR
HAZARDOUS MATERIALS RELEASES
1131 HARBOR BAY PARKWAY
ALAMEDA, CA 94502
(510) 567-6700
FAX (510) 337-9335

June 15, 2017

The Salvation Army
601 Webster Street
Oakland CA 94607
Attn.: Major Jack Phillips
(*Sent* via *electronic mail to* Jack.phillips@usw.salvationarmy.org)

Subject: Report Review for Fuel Leak Case No. RO0003084 and Geotracker Global ID T10000003428, The Salvation Army, 601 Webster St., Oakland, CA 94607

Dear Major Phillips:

Alameda County Department of Environmental Health (ACDEH) staff has reviewed the case file including the recently submitted documents entitled *Sensitive Receptor Survey Update Report* (SRS)*, dated January 25, 2017* and the *Quarterly Groundwater Monitoring and Vapor Monitoring and Site Status Report- First Quarter, 2017* (GWM), dated March 24, 2017, and associated electronic submittals to the State Water Resources Control Board's (SWRCBs) GeoTracker website. The submittals were prepared by ATC Group Services LLC (ATC) for the subject site.

The SRS documented one irrigation well, three potential supply wells, and two cathodic protection wells within 2,000 feet of the site. ACDEH had requested inclusion of the cathodic protection wells in the survey as they may provide a vertical conduit should they be located within the contaminant plume.

The GWM included the presentation of the groundwater analysis results for sampling conducted on February 13, 2017 for the groundwater monitoring well network. The well network, consisting of three on-site and one off-site wells, are currently sampled quarterly. The GWM documents the activities, findings, and recommendations for the monitoring event, which includes groundwater from on-site well MW-1 reported having concentrations of 29,000 micrograms per liter (μg/L) total petroleum hydrocarbons as gasoline (TPHg), 6,700 μg/L benzene (B), and 760 μg/L ethyl benzene (E), and concentrations of 4,700 μg/L TPHg, 1,000 μg/L B, and 37 μg/L E in downgradient well MW-4.

Additionally, the GWM documents the second round of soil vapor collection from three sub-slab soil vapor points located within the basement of the Salvation Army building. ATC stated the soil vapor samples collected from beneath the basement floor of the building contain both leaking underground fuel tank (LUFT)-related and chlorinated volatile organic compounds (CVOCs); however, all detected concentrations are below their respective Environmental Screening Levels (ESLs). The source of the CVOCs not known.

Based on its findings, ATC recommends the following:

- Continue to sample and analyze groundwater samples from the monitoring well network on the existing quarterly groundwater sampling schedule
- Continue to attempt to collect separate-phase petroleum hydrocarbon (PHC) recovery in MW-3 using the installed passive skimmer;
- Discontinue the analysis of collected groundwater samples for organic lead;
- Continue to develop the Conceptual Site Model for the site by expanding the downgradient groundwater investigation of the extent of benzene existing in concentrations in excess of their respective ESLs, and

- Work plan preparation for the continued definition and quantification of the petroleum hydrocarbon adsorbed mass in the source area; delineation of the dissolved phase PHC downgradient of the site, and continued evaluation of the risks represented by the PHC mass in the source area and dissolved phase PHC downgradient of the site

Based on the review of the case file, ACDEH requests that you address the following technical comments and send us the documents requested below.

TECHNICAL COMMENTS

1. **ESI Submittal** — The GWM was resubmitted to GeoTracker with a revised Table X-Table 6. However, the revised report was not submitted to the ACDEH FTP site. ACDEH requests the submittal of the revised report to our FTP site by the date specified below. Additionally, we request that future submittal of revised reports include a revision date and include the rationale for the revision in the opening paragraph.

2. **Sampling Frequency** — ACDEH concurs that groundwater and soil vapor monitoring continue on a quarterly basis for the foreseeable future as the significant rainfall this past season and the elevated groundwater levels may affect concentrations of potential chemicals of concern.

3. **Free Product Recovery** — ACDEH concurs with continued efforts be made to recover separate phase PHC. The elevated the groundwater levels reported for the February event may have inhibited the influx of separate phase PHC, as evidenced by a sheen appearing in two of the wells during the purge process.

4. **Scope of Analysis** — ACDEH is in general agreement that organic lead may be eliminated from the scope of analysis. Additionally, as concentrations of the fuel oxygenates diisopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), and tertiary butyl alcohol (TBA) have not been documented above the laboratory reporting limit in soil and water samples collected to date, these compounds may also be eliminated from the scope of analysis. Concentrations of the lead scavenger 1,2-dichloroethane (1,2-DCA) have been reported; therefore, ACDEH requests that 1,2-dibromoethane (EDB) be retained on the list of analytes, thought it has yet to be identified at the site.

   Please add TPHg to the scope of analysis for the soil vapor samples.

5. **Groundwater Plume Delineation** — Based on the reported concentrations in groundwater at the MW-4 location, it appears the contaminant plume is not defined. Therefore, ACDEH in in general agreement with ATC's recommendation for work plan preparation as outlined in the GWM. Please submit the investigation work plan by the date specified below.

SUBMITTAL ACKNOWLEDGEMENT STATEMENT

Please note that ACDEH has updated its Attachment 1 with regard to report submittals to ACDEH. ACDEH will now be requiring a Submittal Acknowledgement Statement, replacing the Perjury Statement, as a cover letter signed by the Responsible Party (RP). The language for the Submittal Acknowledgement Statement is as follows:

"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 SWRCB's GeoTracker website."

Please make this change to your submittals to ACDEH.

TECHNICAL REPORT REQUEST

Please upload technical reports to the ACDEH FTP site (Attention: Keith Nowell), and to the State Water Resources Control Board's GeoTracker website, in accordance with Attachment 1 and the following specified file naming convention and schedule:

- **June 29, 2017:** Submittal of revised Quarterly Groundwater Monitoring and Vapor Monitoring and Site Status Report- First Quarter, 2017 to the ACDEH FTP site (Attention: Keith Nowell)
- **July 28, 2017:** Second Quarter 2017 Groundwater and Soil Vapor Monitoring Report. File to be named: RO0003084_GWM_ R_yyyy-mm-dd
- **August 15, 2017:** Work Plan for Site Characterization and Plume Delineation. File to be named: RO0003084_WP_ R_yyyy-mm-dd
- **October 28, 2017:** Third Quarter 2017 Groundwater and Soil Vapor Monitoring Report. File to be named: RO0003084_GWM_ R_yyyy-mm-dd

Thank you for your cooperation. ACDEH looks forward to working with you and your consultants to advance the case toward closure. Should you have any questions regarding this correspondence or your case, please call me at (510) 567-6764 or send an electronic mail message at keith.nowell@acgov.org

Sincerely,

Keith Nowell

Digitally signed by Keith Nowell
DN: cn=Keith Nowell, o=Alameda County, ou=Department of Environmental Health, email=keith.nowell@acgov.org, c=US
Date: 2017.06.15 10:22:45 -07'00'

Keith Nowell, PG, CHG
Hazardous Materials Specialist

Enclosures: Attachment 1 - Responsible Party(ies) Legal Requirements/Obligations & ACDEH Electronic Report Upload (FTP) Instructions

cc: Kaye Patterson, The Salvation Army USA Western Territory Offices, 180 East Ocean Blvd., 3rd Floor St, Long Beach, CA 94607 (*Sent via electronic mail to kaye.patterson@usw.salvationarmy.org*)

Timothy Rockey, The Salvation Army, 94607 (*Sent via electronic mail to timothy.rockey@usw.salvationarmy.org*)

Mike Sonke, ATC Group Services LLC, 1117 Lone Palm Ave, Ste B, Modesto, CA 95351 (*Sent via electronic mail to: (mike.sonke@atcassociates.com)*
Gabe Stivala, ATC Group Services LLC, 915 Highland Pointe Drive, Suite 250, Roseville, CA 95678 (*Sent via electronic mail to: gabe.stivala@atcassociates.com)*

Dilan Roe, ACDEH (*Sent via electronic mail to: dilan.roe@acgov.org*)
Paresh Khatri, ACDEH (*Sent via electronic mail to: paresh.khatri@acgov.org*)
Keith Nowell, ACDEH (*Sent via electronic mail to keith.nowell@acgov.org)*
GeoTracker / File

Attachment 1

Responsible Party(ies) Legal Requirements / Obligations

REPORT REQUESTS

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

Alameda County Department of Environmental Health's (ACDEH) Environmental Cleanup Oversight Programs, Local Oversight Program (LOP) and Site Cleanup Program (SCP) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program File Transfer Protocol (FTP) site are provided on the attached "Electronic Report Upload Instructions." Submission of reports to the Alameda County FTP site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) GeoTracker website. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitoring wells, and other data to the GeoTracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to SCP sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in GeoTracker (in PDF format). Please visit the SWRCB website (http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/) for more information on these requirements.

ACKNOWLEDGEMENT STATEMENT

All work plans, technical reports, or technical documents submitted to ACDEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "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 SWRCB's GeoTracker website." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6731, 6735, and 7835) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately licensed or certified professional. For your submittal to be considered a valid technical report, you are to present site-specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this case meet this requirement. Additional information is available on the Board of Professional Engineers, Land Surveyors, and Geologists website at: http://www.bpelsg.ca.gov/laws/index.shtml.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, late reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

Alameda County Environmental Cleanup Oversight Programs (LOP and SCP)	**REVISION DATE:** December 1, 2016
	ISSUE DATE: July 5, 2005
	PREVIOUS REVISIONS: October 31, 2005; December 16, 2005; March 27, 2009; July 8, 2010, July 25, 2010; May 15, 2014, November 29, 2016
SECTION: Miscellaneous Administrative Topics & Procedures	**SUBJECT:** Electronic Report Upload (ftp) Instructions

The Alameda County Environmental Cleanup Oversight Programs (LOP and SCP) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities.

REQUIREMENTS

- **Please do not submit reports as attachments to electronic mail.**
- Entire report including cover letter must be submitted to the ftp site as **a single portable document format (PDF) with no password protection**.
- It is **preferable** that reports be converted to PDF format from their original format, (e.g., Microsoft Word) rather than scanned.
- **Signature pages and acknowledgement and perjury statements must be included and have either original or electronic signature.**
- **Do not password protect the document**. Once indexed and inserted into the correct electronic case file, the document will be secured in compliance with the County's current security standards and a password. **Documents with password protection will not be accepted**.
- Each page in the PDF document should be rotated in the direction that will make it easiest to read on a computer monitor.
- Reports must be named and saved using the following naming convention:

  RO#_Report Name_Year-Month-Date (e.g., RO#5555_WorkPlan_2005-06-14)

Submission Instructions

1) Obtain User Name and Password
   a) Contact the Alameda County Environmental Health Department to obtain a User Name and Password to upload files to the ftp site.
      i) Send an e-mail to deh.loptoxic@acgov.org.
   b) In the subject line of your request, be sure to include **"ftp PASSWORD REQUEST"** and in the body of your request, include the **Contact Information, Site Addresses**, and the **Case Numbers (RO# available in Geotracker) you will be posting for**.

2) Upload Files to the ftp Site
   a) Open File Explorer using the Windows key + E keyboard shortcut.
      i) Note: Netscape, Safari, and Firefox browsers will not open the FTP site as they are NOT being supported at this time.
   b) On the address bar, type in ftp://alcoftp1.acgov.org.
   c) Enter your User Name and Password. (Note: Both are Case Sensitive)
   d) Click Log On.
   e) Open "My Computer" on your computer and navigate to the file(s) you wish to upload to the ftp site.
   f) With both "My Computer" and the ftp site open in separate windows, drag and drop the file(s) from "My Computer" to the ftp window.

3) Send E-mail Notifications to the Environmental Cleanup Oversight Programs
   a) Send email to deh.loptoxic@acgov.org notify us that you have placed a report on our ftp site.
   b) Copy your Caseworker on the e-mail. Your Caseworker's e-mail address is the entire first name then a period and entire last name @acgov.org. (e.g., firstname.lastname@acgov.org)
   c) The subject line of the e-mail must start with the RO# followed by **Report Upload**. (e.g., Subject: RO1234 Report Upload) If site is a new case without an RO#, use the street address instead.
   d) If your document meets the above requirements and you follow the submission instructions, you will receive a notification by email indicating that your document was successfully uploaded to the ftp site.

Appendix B

Bibliography including Historical ATC Work Products

Bibliography

Hamilton, Terry, (10/4/2010), *Underground Storage Tank, Removal Report, Jobsite Address: The Salvation Army, 601 Webster Street, Oakland, CA,* http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC Associates, (8/18/2011), *Subsurface Investigation Workplan, Salvation Army, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC Associates, (3/1/2013), *Subsurface Investigation Workplan Revised*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Cardno ATC, (2/28/2013) *Revised Subsurface Investigation Workplan, The Salvation Army, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Cardno ATC, (1/13/2014), *Site Conceptual Model with Data Gap Identification, and Preliminary Subsurface Investigation Report, The Salvation Army, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Cardno ATC, (8/14/2014), *Workplan for Continued Subsurface Investigation, The Salvation Army, Adult Rehabilitation Center, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Cardno ATC, (2/24/2015), *Workplan for Continued Subsurface Investigation, The Salvation Army, Adult Rehabilitation Center, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Stivala, Gabe, (10/12/2015), email communication to K. Nowell.

ATC, (4/26/2016), *Soil and Groundwater Investigation Report, The Salvation Army, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (8/30/2016), *Quarterly Groundwater Monitoring and Site Status Report, First and Second Quarter 2016, The Salvation Army Oakland ARC, 601 Webster Street, Oakland, CA*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (10/17/2016), Quarterly Groundwater Monitoring and Site Status Report, Third Quarter 2016, The Salvation Army Oakland ARC, 601 Webster Street, Oakland, California, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (12/23/2016), *Quarterly Groundwater Monitoring and Site Status Report, Fourth Quarter 2016, The Salvation Army Oakland ARC, 601 Webster Street, Oakland, California,* http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (1/10/2017), *Vapor Intrusion Assessment Report, The Salvation Army Oakland ARC Building, 601 Webster Street, Oakland, California*, http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (1/25/2017), *Sensitive Receptor Survey Update Report - December 2016, The Salvation Army Oakland ARC Building, 601 Webster Street, Oakland, California*, , http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (3/24/2017), *Quarterly Groundwater Monitoring and Site Status Report, First Quarter 2017, The Salvation Army Oakland ARC, 601 Webster Street, Oakland, California,* http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

ATC, (7/31/2017), *Quarterly Groundwater Monitoring and Site Status Report, Second Quarter 2017, The Salvation Army Oakland ARC, 601 Webster Street, Oakland, California,* http://geotracker.waterboards.ca.gov, http://gis.acgov.org/DEH/InspectionResults/?SITE=LOP

Appendix C

Beacon Envrionmental
Groundwater Plume, Source and Risk
Identification Using Passive Soil Gas

Groundwater Plume, Source and Risk Identification Using Passive Soil Gas

Joseph E. Odencrantz (joe.odencrantz@beacon-usa.com) and Harry O`Neill
(Beacon Environmental Services, Bel Air, Maryland, USA)

ABSTRACT: The results from sixty passive soil gas (PSG) samplers placed at a grain silo and mixed-use industrial facility with a known chlorinated solvent release aided with the rapid investigation time-schedule. The samplers were used to determine potential sources, plume extent and vapor risks in areas beyond the previous discrete soil sampling and permanent groundwater monitoring well network. Passive soil gas testing involves the installation of sorbents in a one-inch diameter hole, three-foot deep and the samplers are then placed at a depth of approximately six inches. The samplers were installed in grid pattern at a spacing of 25 to 50 feet at the site and across the street. The depth to groundwater was approximately ten to twelve feet below grade.

The installation of numerous monitoring wells in areas where Trichloroethene (TCE) and Tetrachloroethene (PCE) were discovered using the PSG samplers revealed that there were indeed two separate sources and groundwater plumes at the site, which became co-mingled downgradient. In this previously uninvestigated portion of the site, TCE was found at 600 ng in a PSG sampler and a permanent groundwater monitoring well was subsequently installed in that vicinity. The groundwater concentration of TCE in that well was 400 ug/L. The PSG sampling network was wide enough to identify the approximate size of this new plume. In a region approximately 75 feet downgradient from the previously discussed location, 294 ng of TCE was discovered in a PSG sampler. The groundwater monitoring well installed at this location revealed 110 ug/L of TCE. Further yet, a cross-gradient PSG sampler revealed 107 ng of TCE and the groundwater monitoring well placed at the location revealed 74 ug/L of TCE. The PSG investigation was completed from start to finish in a two-week period of time. The paper will focus on the importance of PSG sampling for source identification, groundwater investigation and complying with regulatory directives for the assessment of the vapor intrusion pathway for risk assessment purposes.

INTRODUCTION

The use of passive soil gas (PSG) sampling for soil and groundwater source identification and assessment of spatial variability is an effective tool for site investigation and remediation. PSG sampling and analytical methods are used to target a broad range of volatile and semi-volatile organic compounds (VOCs and SVOCs), even when present at low concentrations. It is necessary to use state-of-the-art sampling and analytical procedures to provide the foundations for this highly sensitive technology to identify trace levels of compounds present in the vapor phase. The purpose of the work described in this paper was to determine potential sources, plume extent and vapor risks in areas beyond the previous discrete soil sampling and permanent groundwater monitoring well network at a site in the Western United States of America.

Small, easy-to-carry field kits containing detailed instructions and the requested number of field samples are provided so a project manager can have the samplers installed by local personnel at a convenient schedule. To install a PSG Sampler, a 3/4" diameter hole is made to a depth of four inches using a hammer and a metal stake provided in the kit. When applicable, a hammer drill, slide hammer, or other comparable equipment can be used to create a 1/2" or larger diameter hole to a three-foot depth. In either case, the PSG sampler (which contains two sets of hydrophobic adsorbent cartridges) need only be installed in the upper portion of the hole. For locations covered by asphalt or concrete surfacing, a 1 1/4" to 1 1/2" diameter hole is drilled through the surfacing to the underlying soils, and the hole is sleeved with a sanitized pipe provided in the kit. After the Sampler is installed inside the pipe, the hole is patched with an aluminum foil plug and a thin concrete patch to protect the sampler. The samplers are exposed to subsurface gas for approximately three to 14 days, depending on the objectives of the investigation and the compound concentrations that are expected to be present at the site. Following the exposure period, the Samplers are retrieved and shipped to BEACON's laboratory for analysis. A trip blank, which remains with the other PSG samples during preparation, shipment, and storage, is included with each batch of up to 40 field samples.

The adsorbent cartridges used by Beacon Environmental are hydrophobic, which allows the samplers to be effective even in water-saturated conditions. Extensive empirical evidence, which is supported by a government study, has proven that hydrophobic adsorbents work perfectly well in high moisture conditions and should not be encased by a hydrophobic membrane (The Marines Project, 2002). The use of surrogates and internal standards by the laboratory during the analysis of samples verifies that moisture is not a problem during the analysis of the samples. Therefore, water does not adversely impact adsorption of compounds in the field or the analysis of the samplers at the laboratory.

Soil gas samples are analyzed by the laboratory using gas chromatography/mass spectrometry (GC/MS) instrumentation, following modified EPA Method 8260B procedures. Samples for this project were analyzed for a broad range of organic compounds from vinyl chloride to naphthalene. Analytical results were based on a five-point initial calibration, and internal standards and surrogates were included with each sample analysis. In addition, a BFB tune was performed daily and a method blank was run following the daily calibration. The laboratory's reported quantitation level (RQL) for each of the targeted compounds is 25 nanograms (ng), however, the actual detection limits are even lower. The sampler design includes two sets of adsorbent cartridges, which allows for confirmatory or duplicate analysis from any selected location.

FIELD SAMPLING PROGRAM

It has been established in numerous guidance documents that passive soil gas sampling is a valuable tool for site assessment (New Jersey Vapor Intrusion Guidance (2005) and Interstate Technology and Regulatory Council. (2007)). An environmental consulting company (confidential) contracted Beacon Environmental Services, Inc. to install sixty PSG samplers across a site in the western United States in June 2005 placed at a depth of six inches and the holes were all drilled to a depth of three feet (one-inch diameter from surface to one-foot depth and one-half inch diameter from one to three feet in depth). The samplers were installed in a grid pattern at a spacing of 25 to 50 feet at the site. The samplers were left in the subsurface for eleven days and were retrieved in late June 2005. Twenty-six of the locations were drilled through native materials (sand/gravel) and thirty-six were through asphalt.

After the samplers were retrieved, the results were reported to the client three days after the samplers arrived at the laboratory. The final report on the project was prepared and returned to the client two weeks after the data was reported. The primary compound of interest at the site is trichloroethylene (TCE) and this paper will be limited to examining the spatial distribution of TCE.

RESULTS/DISCUSSION

An important goal in the PSG sampling program was to delineate the spatial distribution of soil gas to determine the areal extent of the groundwater in the area marked as Area B on Figure 1. The results of the PSG survey for TCE are shown in Figure 1 and there appears to be two distinct source areas: one within Area B and the other at SG-23 east of Area B. The extent of TCE impacts in the soil gas is well-defined and the groundwater flow direction is southwest. The depth to groundwater was approximately ten to twelve feet below grade. In this previously uninvestigated portion of the site (Area B), TCE was found at 600 ng in a PSG sampler and a permanent groundwater monitoring well was subsequently installed in that vicinity.

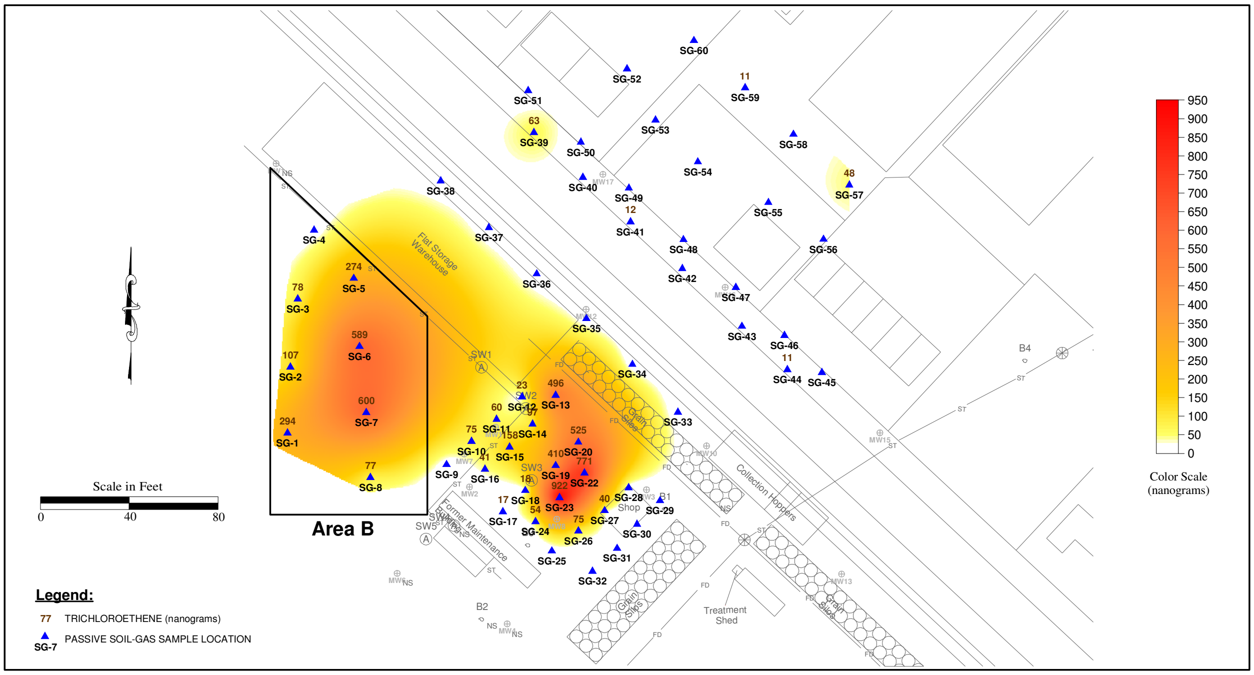


FIGURE 1. Passive Soil Gas Results for TCE and Depiction of Area B.

A total of three groundwater monitoring wells were installed in close proximity to three PSG locales within Area B (shown in Figure 1). As previously stated, one of the primary purposes of the PSG survey was to guide the placement of permanent groundwater monitoring wells in that previously uninvestigated area of the site. The monitoring wells were installed several months after the passive soil gas survey was performed. Beacon Environmental performed an analysis of the PSG masses to the measured groundwater concentrations from the permanent groundwater monitoring wells. The results of this analysis are shown in Figure 2 along with an exponential line of best fit, equation and correlation coefficient. The correlation coefficient means that 97.51 percent of the variability is accounted for by the equation that describes the line of best fit.

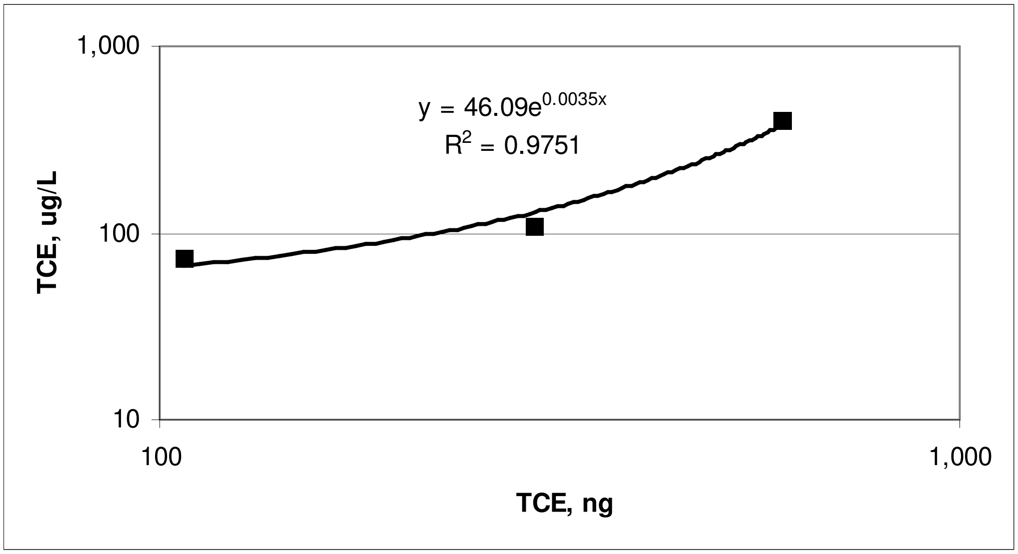


FIGURE 2. Correlation of PSG results from SG-1, 2 and 7 with nearby groundwater monitoring wells.

The correlation between the PSG masses and the groundwater concentrations for TCE are excellent for the three sample pairs. The equation can be used to estimate the groundwater concentration at other points in the PSG grid. An illustration of using the exponential line-of-best fit is shown in Table 1 for the maximum PSG location (SG-23)

Table 1. Example application of correlation of TCE results for passive soil gas mass and groundwater concentrations for the maximum soil gas encountered at the site. The Delta column provides the differences between the actual and estimated groundwater concentrations by applying the site-specific correlation equation.

Locale	PSG, ng	Estimated GW, ug/L	Actual GW, ug/L	Delta
SG-7	600	376	400	-23.6
SG-1	294	129	110	19.0
SG-2	107	67	74	-7.0
SG-23	922	1,162	Not Sampled	

The table illustrates the application of the correlation between PSG results with permanent groundwater monitoring wells that were installed shortly after the PSG survey was performed. The estimated concentration of TCE at a groundwater well that is installed in close proximity to SG-23 is 1,162 ug/L. If there are risk-based cleanup levels established at the site for groundwater that would trigger remedial measures, then the equation can be used to establish regions of high risk that should be verified with a permanent groundwater well. Although the inherent assumption with applying the correlation is there are similar soil and groundwater sources with respect to the soil gas mass that was measured with the PSG samplers. In other words, if all the soil gas mass in the correlations were from TCE off-gassing from the groundwater plume, then the same assumption would apply at all the locations where the correlation was applied. If there was a recent release in soil, as an example, the soil gas and groundwater relationship should be used with caution.

CONCLUSIONS

The following summarize the research completed in the study and are not in any particular order of importance.

- The results of a PSG survey resulted in the discovery of an additional groundwater source and a groundwater plume whose areal extent was determined with the results of the survey.
- Follow-up groundwater monitoring wells were installed in Area B to ascertain the results of the PSG survey. Three groundwater monitoring wells were placed near the limits of the PSG survey and the results revealed TCE in the groundwater as indicated by the PSG survey.
- An exponential correlation was established between the PSG results and the groundwater wells for TCE and had a correlation coefficient of 0.98.
- The established correlation was used to estimate the groundwater concentration in the source area and to delineate the extent of significant groundwater risk.

ACKNOWLEDGEMENTS

The authors wish to express their thanks to Mr. Ryan Schneider and Mr. Steven Thornley of Beacon Environmental Services, Inc. for assisting with the implementation of the field testing.

REFERENCES

The Marines Project: A Laboratory Study of Diffusive Sampling/Thermal Desorption/Mass Spectrometry Techniques for Monitoring Personal Exposure to Toxic Industrial Chemicals, April 2002, Warren Hendricks, Methods Developments Team, Industrial Hygiene Chemistry Division, OSHA Salt Lake Technical Center, Salt Lake City, UT 84115-1802.

New Jersey Vapor Intrusion Guidance. 2005. http://www.nj.gov/dep/srp/guidance/vaporintrusion/

Interstate Technology and Regulatory Council. 2007. Vapor Intrusion Pathway: A Practical Guideline. http://www.itrcweb.org/gd_VI.asp

Appendix D

Beacon Environmental's Standard for Passive Soil Gas Testing for Characterization

FIELD KIT GUIDE
FOR
PASSIVE SOIL-GAS INVESTIGATIONS

[PLEASE READ ENTIRE GUIDE BEFORE STARTING SURVEY]

I. General Information

A. BEACON is furnishing this kit to **CLIENT** specifically for use on the **Project Site.** To meet the project objectives the Samplers will be retrieved **approximately 14 days after installation**. Please contact BEACON following installation of the samplers at 1-410-838-8780 with anticipated date when samples will arrive at BEACON's laboratory.

B. ***Before going to the field*** please inventory the contents of the Kit, checking them against the enclosed list to verify item counts and to become familiar with all components. The components are thoroughly cleaned prior to shipment, the inventory should be conducted without opening the plastic bags. Note that Trip Blanks are to remain sealed throughout the Survey.

C. Prior to returning the Kit to BEACON, verify that the caps are tight on the Passive Soil-Gas (PSG) Samplers and that the Samplers are sealed individually in the small Sampler Bags and also in the larger Return Shipment Bag, with an adsorbent pak.

D. Following completion of the survey, the Chain-of-Custody Form should be filled in with the following information: (i) Field Sample IDs, (ii) the name and contact phone number of the person submitting the samples, (iii) the unique number of the custody seal that will be used, and (iv) signature and date of person relinquishing samples. The Chain-of-Custody Form is to be returned with the Field Kit to BEACON. If possible, retain photocopies for your record. Next, pack the Samplers, containers, sampling caps, and requisite documentation in the Field Kit.

Note: Place the Return Shipment Bag, which contains the individually bagged PSG Samplers, in the upper tray and place the tools in the lower compartment of the Kit so they do not damage the Samplers. One trip blank should be included with the Return Shipment Bag.

Affix the tug-tight custody seal to the latch on the Field Kit, pack it in its original cardboard shipping container, and send the shipment via overnight courier (FedEx, UPS, DHL) to:

Beacon Environmental Services, Inc.
Attn: Sample Receiving
2203A Commerce Rd Suite 1
Forest Hill, MD 21050 USA
1-410-838-8780

NOTE: DO NOT PACK IN THE KIT OR SHIPPING BOX STYRENE PEANUTS, NEWSPAPER, OR OTHER MATERIALS THAT COULD CONTAMINATE THE SAMPLES. PLEASE AVOID SMOKING WHILE HANDLING SAMPLERS.

II. Contents

A. This Field Kit contains the components needed for a **50**-point soil-gas survey, plus sufficient additional cartridges for **2** trip blanks (labeled **Trip-1 and Trip-2**, not to be opened), and **2** extra Samplers for use in the event of breakage or accidental contamination. In addition, **2** extra transport vials are provided in case a Sampler Vial breaks during retrieval. **Do not open bags until deployment.**

Code/Item		Quantity
(1)	PASSIVE SOIL-GAS SAMPLERS	**54**
(2)	EXTRA TRANSPORT VIALS	**2**
(3)	SAMPLING CAPS (in container)	**54**
(4)	CAP STORAGE CONTAINERS	**1**
(5)	GAUZE CLOTHS	**54**
(6)	3” x 4” PLASTIC SAMPLER BAGS (for return shipment of samples)	**54**
(7)	12″ LENGTHS OF PIPE	**52**
(8)	12” x 12” PLASTIC RETURN SHIPMENT BAG	**2**
(9)	WIRE CUTTERS	**1**
(10)	PIPE CUTTER	**1**
(11)	VISE GRIPS	**1**
(12)	TAPPING DOWEL	**1**

B. In addition to the materials found in the kit, field teams will need:

- NITRILE GLOVES
- CLEAN TOWEL
- HAMMER
- ELECTRIC ROTARY HAMMER DRILL WITH:
  ½”-DIAMETER BIT WITH AT LEAST 36 INCHES OF CUTTING LENGTH and
  1¼” to 1½” DIAMETER BIT WITH AT LEAST 12 INCHES OF CUTTING LENGTH
- PIPE WRENCH (to dislodge drill bits should they become stuck)
- BALL-POINT PEN and CLIPBOARD
- PIN FLAGS, WOODEN STAKES, or OTHER LOCATION MARKERS
- SMALL SCREWDRIVER or SCRATCH AWL
- FLAGGING TAPE
- BOX OF ALUMINUM FOIL

C. Additional materials necessary only for deployment through asphalt or concrete:

- DRY CONCRETE MORTAR MIX and ASSOCIATED EQUIPMENT (for temporary patching of the sample holes) including:
  SMALL PAIL, WATER, SMALL PLASTIC PUTTY KNIFE
- CHISEL or SCREWDRIVER (to remove the temporary patch)
- ASPHALT COLD PATCH or CEMENT (for final repair of the sample holes)

III. Instructions

A. GENERAL:

Deployment and retrieval of Samplers requires only one person. Separate step-by-step procedures are detailed below for sampling through vegetation or bare soils and for sampling in areas covered by asphalt, concrete, or gravel. **Keep exposure of sample cartridges to ambient air to a minimum.**

Note: Do not deploy Samplers within 10 feet of a monitoring well, penetrometer, hydropunch shaft, or other intrusive sampling apparatus that potentially creates a preferential pathway for gases.

REMEMBER: TRIP BLANKS ARE NOT TO BE OPENED.

B. SAMPLER DEPLOYMENT:

Note: Each Sampler contains two sets of adsorbent cartridges. BEACON will analyze one set per Sampler; however, the second set in each Sampler can be analyzed as a field sample duplicate. Please note at which locations, if any, duplicates are to be analyzed by writing separate entries corresponding to the sample location followed by the letter "D" (*i.e*, 3, 3-D, 4, 4-D) on the Chain-of-Custody Form. It is not necessary to alter the deployment pattern to have the duplicate samples analyzed. There is an additional per sample charge for analysis of any duplicates.

Vegetation or Bare Soils:

1. At each survey point, clear vegetation as necessary and, using a hammer drill and drill bit, create a 1¼"- to 1½"-diameter hole approximately 12-14 inches deep. Then, using the ½" drill bit, extend the hole to a three foot depth. **Note**: In areas of very organic topsoil or landscaped areas (ie, mulched areas, gardens, etc.) it is important to get beneath the organic soil layer to the underlying soil below.

2. When the holes have been drilled, take a 12-inch length of 1"-diameter metal pipe and lower it into the sample hole, being careful not to touch the inside of the pipe. Any portion of pipe above grade is cut flush with the ground surface, using the pipe cutter. With the tapping dowel and a hammer, push or tap the pipe one inch into the base of the drilled hole (see **attached figure**).

3. Remove one of the Samplers (a glass vial containing ***two sets of hydrophobic*** adsorbent cartridges) and unwind the retrieval wire wrapped around it. Holding the capped end of the vial in one hand, pull the wire tight (to straighten it) with the other hand. Remove the solid cap on the Sampler Vial and replace it with a Sampling Cap (a one-hole cap with a screen meshing insert). Place the solid cap in the Field Kit.

Note: At each sampling location, verify that the (black) sampling cap is on the vial before installing the Sampler.

4. Lower the Sampler, open-end down, into the metal pipe approximately four inches so that the retrieval wire sticks out of the hole. Cover the open end of the pipe with a balled up **wad** of aluminum foil, pressing it tightly on top of the pipe with the tapping dowel. Next, cover the hole to grade with local soils or sand, leaving the end of the wire exposed above the surface of the ground. Using the hammer, collapse the soils above the Sampler. **Coil the wire and lay it**

flat on the ground surface. Place the solid cap in the Cap Storage Container. Clearly mark the sample location with a pin flag or wooden stake.

5. Close the Field Kit, and on the Chain-of-Custody record: (a) sample-point number; (b) date/time of emplacement (to nearest minute); and (c) other relevant information (*e.g.*, soil type, vegetation, proximity to potential source areas). Mark the sample location and take detailed notes (*i.e.*, compass bearings and distances from fixed reference points).

6. Move to next location.

7. After installing all field samples place the Trip Blank in a 3” x 4” Sampler Bag. Store the bagged Trip Blank in the “Return Shipment” bags until retrieval, with one (1) Trip Blank in each Return Shipment bag.

<u>Concrete, Asphalt, or Gravel Covered Areas:</u>

1. At each survey point, drill a 1¼”- to 1½”-diameter hole through the asphalt/concrete/gravel to bare soil using a rotary hammer drill or comparable equipment. This hole should be approximately 12-14 inches deep. **Note**: When one person is performing fieldwork, it is often more efficient to drill all sample-point holes before beginning Sampler deployment.

2. When the hole through concrete/asphalt/gravel has been completed, using the ½” drill bit, extend the hole to a three foot depth. Next, take a 12-inch length of 1”-diameter metal pipe and lower it into the sample hole, being careful not to touch the inside of the pipe. Any portion of pipe above grade is cut flush with the ground surface, using the pipe cutter. With the tapping dowel and a hammer, push or tap the pipe one inch into the base of the drilled hole (see **attached figure**).

3. Remove one of the Samplers (a glass vial containing ***two sets of hydrophobic*** adsorbent cartridges) and unwind the retrieval wire wrapped around it. Holding the capped end of the vial in one hand, pull the wire tight (to straighten it) with the other hand. Remove the solid cap on the Sampler Vial and replace it with a Sampling Cap (a one-hole cap with a screen meshing insert). Place the solid cap in the Field Kit.

Note: At each sampling location, verify that the (black) sampling cap is on the vial before installing the Sampler.

4. Lower the Sampler, open-end down, into the metal pipe approximately four inches.

   <u>If sampling through asphalt or concrete</u>, bend the end of the wire over the top of the pipe so that the coil of wire hangs over the top and outside of the pipe. Next, plug the top of the hole with a wad of aluminum foil. Using the tapping dowel, push down the aluminum foil so it forms a seal on the metal pipe and rests ¼” below the surfacing. Cover the hole to grade with a **¼” thick** concrete patch. [**Note**: A ¼” thick patch is all that is required. If it is thicker it will be difficult to remove during retrieval.] Next, place the solid cap in the Cap Storage Container.

   <u>If sampling through gravel</u>, extend the retrieval wire out of the pipe and plug the pipe with a wad of aluminum foil. Using the tapping dowel, push down the aluminum foil so it forms a seal on the metal pipe. Bend the wire over the aluminum foil plug and while the wire is extended out of the hole, cover the aluminum foil with local soil or sand. **Coil the wire and lay it flat on the ground surface.** Next, place the solid cap in the Cap Storage Container.

If a hole deeper than 12 inches is created, it will be necessary to use more than one wad of aluminum foil. In these situations, extend the wire out of the pipe. While holding onto the wire, plug the top of the pipe and hole loosely with as many wads as needed. Before inserting the last wad of foil, bend the wire so it rests below the uppermost wad of foil. This will make it easy to retrieve the Sampler during retrieval.

5. Close the Field Kit, and on the Chain-of-Custody record: (a) sample-point number; (b) date and time of emplacement (to nearest minute); (c) type of surfacing and approximate thickness; and (d) other relevant information (*e.g.*, surfacing material, proximity to potential source areas). Be sure to mark the sample location and take detailed notes (*i.e.*, compass bearings and distances from fixed reference points).

6. Move to next location.

7. After installing all field samples place the Trip Blank in a 3” x 4” Sampler Bag. Store the bagged Trip Blank in the “Return Shipment” bags until retrieval, with one (1) Trip Blank in each Return Shipment bag.

C. SAMPLER RETRIEVAL:

Prior to retrieving samples, seal each Trip Blank in a 3”x4” Sampler Bag, and place the bagged Trip Blank in a separate larger bag marked “Return Shipment Bag.” One trip blank should be included with each Return Shipment Bag. Stow the sampler blocks, with the Transport vials and extra samplers, in the lower compartment of the kit. The sampler blocks are to be returned to BEACON’s lab along with the samples.

Note: Each Sampler contains two sets of adsorbent cartridges. BEACON will analyze one set per Sampler; however, the second set in each Sampler can be analyzed as a field sample duplicate. Please note at which locations, if any, duplicates are to be analyzed by writing separate entries corresponding to the sample location followed by the letter “D” (*i.e,* 3, 3-D, 4, 4-D) on the Chain-of-Custody Form. It is not necessary to alter the deployment pattern to have the duplicate samples analyzed. There is an additional per sample charge for analysis of any duplicates.

Vegetation or Bare Soils:

1. At each sample location open the Field Kit and place it and the wire cutters within easy reach. Remove a square of gauze cloth and place it and a clean towel on the open Kit. Remove a solid cap from the Cap Storage Container and place it on the Kit, also.

2. Remove the aluminum foil plug, using vise grips and the scratch awl or small screwdriver, if necessary, and retrieve the Sampler from the hole.

3. Holding the Sampler upright, clean the sides of the vial with the clean towel (especially close to the Sampling Cap). Remove the Sampling Cap, cut the wire from the vial with the wire cutters, and clean the vial threads completely with the gauze cloth.
[**Note**: **Completely remove the wire to ensure the cap fits tight on the vial and no soil is returned in the field kit**.]

4. Firmly screw the solid cap on the Sampler Vial and clean the vial completely with the gauze cloth. With a **ballpoint pen** record the sample number, corresponding to the sample location, on the cap's label. [**Note**: Do not use a Sharpie marker.]

5. Place the sealed and labeled Sampler Vial in the smaller 3" x 4" plastic Sampler Bag and record the sample number on the white block using a ballpoint pen. Then place the individually bagged and labeled sampler into the larger bag labeled "Return Shipment Bag."

Note: Each Sampler must be individually bagged and placed in a Return Shipment Bag with the trip blank. If you know or suspect some sample(s) collected unusually high levels of contaminants, please place these sample(s) in the provided extra bag.

6. On the Chain-of-Custody, record: (a) date and time of retrieval (to nearest minute); and (b) any other relevant information.

7. After all samples have been retrieved, verify that the caps on each Sampler are sealed tightly and that the seals on the Sampler Bags are closed. Verify that all Samplers are stored in the Return Shipment Bag, which contains an adsorbent pak. Seal the Return Shipment Bag and place it in the upper tray of the Field Kit, and place the provided tools and materials in the lower compartment of the Field Kit.

Note: Please do not return the sampling caps, used pipe, or the wire with the Field Kit as they could bias the samplers. Return *all* the other materials and equipment (blocks, extra samplers, tools, containers, *etc.*).

Asphalt, Concrete, or Gravel:

1. At each sample point covered by gravel, clear away the soil or sand to expose the aluminum-foil plug. For those locations covered by asphalt or concrete, use a small chisel and hammer to remove the concrete patch to expose the aluminum foil.

2. Next, open the Field Kit and place it and the wire cutters within easy reach. Remove a square of gauze cloth and place it and a clean towel on the open Kit. Remove a solid cap from the Cap Storage Container and place it on the Kit, also.

3. While securely holding onto the retrieval wire, remove the aluminum-foil plug, using the scratch awl or small screwdriver, as necessary. Holding the Sampler upright, clean the sides of the vial with the clean towel (especially close to the Sampling Cap). Remove the Sampling Cap, cut all the wire from the vial with the wire cutters, and clean the vial threads completely with gauze cloth.
[**Note**: **Completely remove the wire to ensure the cap fits tight on the vial and no soil is returned in the field kit**.]

4. Firmly screw the solid cap on the Sampler Vial and clean the vial completely with the gauze cloth. With a **ballpoint pen** record the sample number, corresponding to the sample location, on the cap's label. [**Note**: Do not use a Sharpie marker.]

5. Place the sealed and labeled Sampler Vial in the smaller 3" x 4" plastic Sampler Bag and record the sample number on the white block using a ballpoint pen. Then place the individually bagged and labeled sampler into the larger bag labeled "Return Shipment Bag."

Note: Each Sampler must be individually bagged and placed in a Return Shipment Bag with the trip blank. If you know or suspect some sample(s) collected unusually high levels of contaminants, please place these sample(s) in the provided extra bag.

6. On the Chain-of-Custody, record: (a) date and time of retrieval (to nearest minute); and (b) any other relevant information.

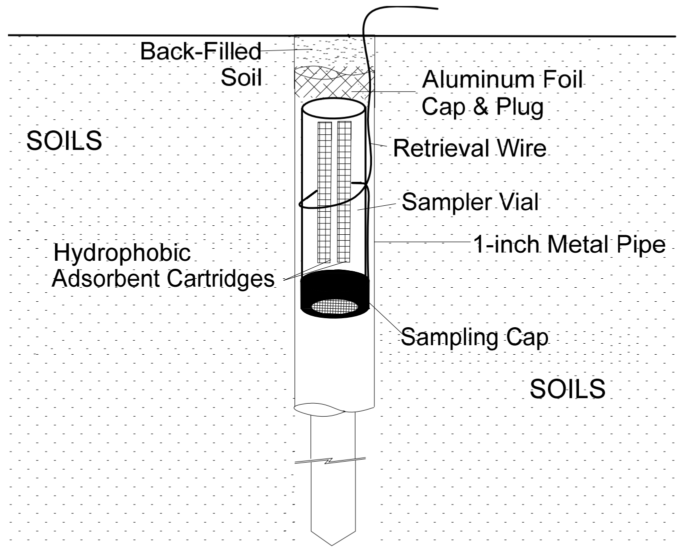
7. After all samples have been retrieved, verify that the caps on each Sampler are sealed tightly and that the seals on the Sampler Bags are closed. Verify that all Samplers are stored in the Return Shipment Bag, which contains an adsorbent pak. Seal the Return Shipment Bag and place it in the upper tray of the Field Kit, and place the provided tools and materials in the lower compartment of the Field Kit.

8. **Note: Please do not return the sampling caps, used pipe, or the wire with the Field Kit as they could bias the samplers. Return *all* the other materials and equipment (blocks, extra samplers, tools, containers, *etc.*).**

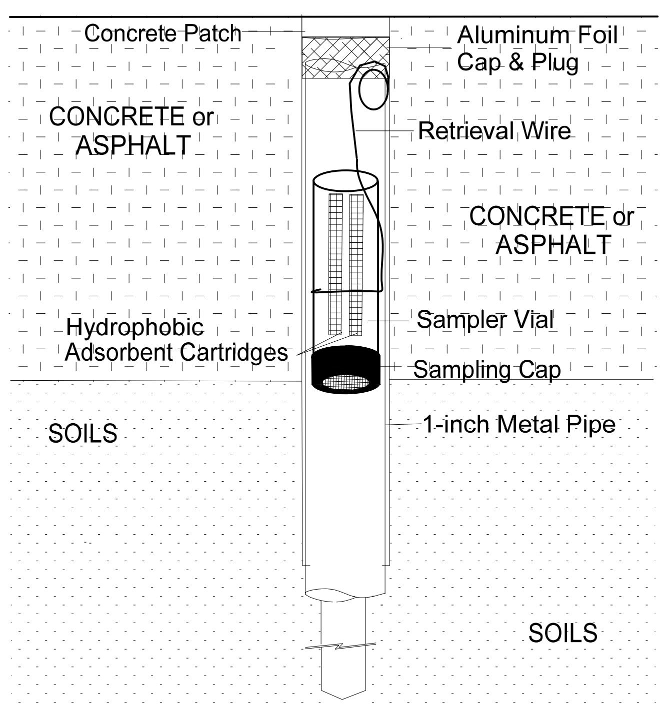
9. Fill sampling holes to grade with an asphalt cold patch or cement.

BEACON'S PASSIVE SOIL-GAS SAMPLER

DEPLOYMENT THROUGH SOILS



DEPLOYMENT THROUGH AN ASPHALT/CONCRETE CAP



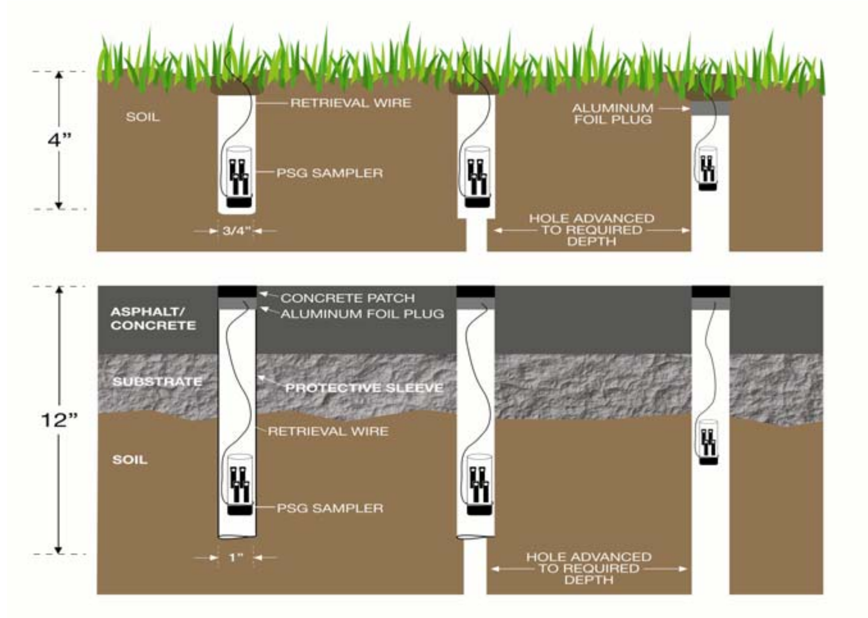
Attachment 1

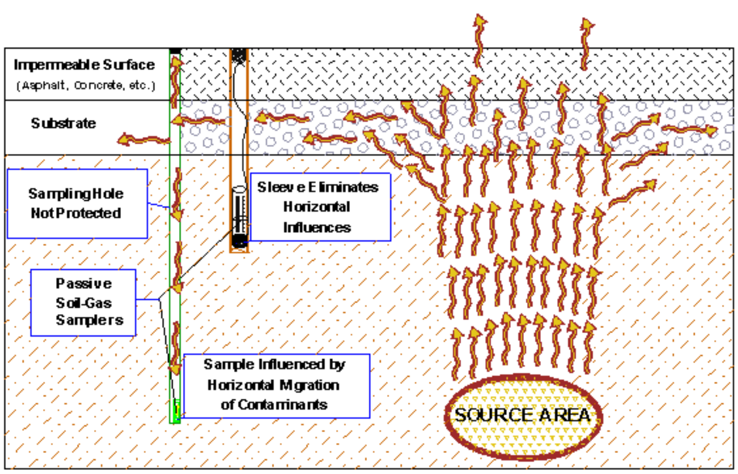
EFFECTIVE PASSIVE SOIL-GAS SAMPLING PROCEDURES

PSG Samplers need only be installed to a shallow depth in some applications because of the sensitivity of the method. However, the method is extremely versatile and installation procedures can be adapted to meet project objectives or client requirements.

When a PSG Sampler is installed in the ground, the top of the hole is completely sealed by collapsing the soils above the Sampler or patching the drilled hole through the surfacing. Other vendors use a permeable cork to plug their installation hole, which allows subsurface gases to escape before the adsorbent captures the organic compounds (reducing sensitivity) *and* permits vapors from above the surface, as well as surface water, to enter the hole (false positives). BEACON's PSG Samplers are not susceptible to these influences because they are effectively sealed in the subsurface.

As mentioned above, BEACON's Samplers are versatile and for some projects a higher sensitivity is required because contaminants are present at low concentrations or soils are fairly impermeable. In these situations, the sampling hole is advanced to a greater depth using a hammer drill, slide hammer, or direct push equipment. *Because the soil vapors that enter the hole will migrate upwards in this newly created preferential pathway, it is not necessary to push the Sampler to the bottom of the hole.* Therefore, the Sampler can still be installed in the upper portion of the hole





Samplers installed through an impermeable surface are sleeved in pre-cleaned protective metal sleeves (provided by BEACON). These sleeves prevent any horizontal migration of vapors in the more porous subgrade from influencing the soil-gas Samplers. As the accompanying diagram shows, the metal sleeves are advanced below the subgrade and tapped into the underlying soils so that the Samplers will only be adsorbing compounds in soil gas that are moving vertically through the soils beneath, and not in the vapors that may be migrating laterally through the more porous subgrade. Other soil-gas vendors simply create a hole 2 to 3 feet deep, and leave their samplers unprotected to the horizontal migration of vapors in the subgrade. This easy-to-perform but important procedure is yet another reason why BEACON's method has achieved the reputation as being the most accurate and reliable soil gas technology available.

Appendix E

ATC's Standard Field Procedures for Groundwater Monitoring, Sampling, and Laboratory Analysis

ATC Group Services

STANDARD FIELD PROCEDURES FOR GROUNDWATER MONITORING AND SAMPLING

ATC will notify ACEH a minimum of 72 hours in advance of commencing fieldwork.

The historical monitoring and analytical data of each monitoring well shall be reviewed prior to performing monitoring activities to determine the order in which the wells will be monitored (i.e. lowest concentrations to highest concentrations). Groundwater monitoring should not be performed when the potential exists for surface water to enter the well (i.e. flooding during a rainstorm).

Prior to groundwater sample collection, the locking well caps will be removed to let the pressure inside the well equilibrate with atmospheric pressure for approximately 20 to 30 minutes. If any of the wells are likely to contain phase separated hydrocarbons aka non-aqueous phase liquid (NAPL), an electronic interface probe will be used to detect the presence, and measure the thickness if the layer, if present. If NAPL is present, a bailer cut will be retrieved, the bailer cut photographed for confirmation, and the well will not be sampled. To prevent cross-contamination, monitoring equipment that comes in contact with groundwater will be scrubbed with a solution of Alconox® detergent and rinsed with rinsate water prior to use in each well.

Both the static groundwater level and total depth of the well will be measured from a reference point on the top of the well casing and recorded. Fluid measurements will be recorded to the nearest 0.01-foot. The static groundwater level and total depth of the well will then be used to calculate the total volume of water in the well.

Prior to the collection of groundwater samples, a minimum of three well volumes (casing and sand pack) will be purged from each well using a 2-inch Grundfos® submersible pump or a disposable polyethylene bailer. During purging, periodic measurements of temperature, pH, and specific electrical conductivity will be measured at casing volume multiples. When three successive stabilized readings are obtained, the well will be sampled. If the well is low yielding and is pumped or bailed dry, the well will be allowed to recover at least 80% of the static groundwater level. If the well does not recover 80% within a 24-hour period, a sample will be collected and recovery noted on the Groundwater Sampling Log.

Groundwater samples will be collected from the well using a disposable polyethylene bailer. Each sample will be collected in laboratory certified clean 40-milliliter volatile organic analysis (VOA) vials and 1-liter glass bottles. Preservatives will be pre-added by the laboratory as appropriate for the analyses selected. Each VOA vial will be filled completely with sample to eliminate headspace and create a positive meniscus. Each VOA vial will be capped with a convex Teflon® septa. Each vial will be observed to ensure that no air bubbles are present within the vial.

Samples will be marked for identification, placed in a cooler chilled with ice, and transported to a State-certified laboratory for analyses. Chain-of-custody records will be maintained and accompany samples to the analytical laboratory. Groundwater purged from the well will be stored on-site in 55-gallon drums pending proper disposal.

LABORATORY ANALYSES OF COLLECTED GROUND WATER SAMPLES

All soil and groundwater samples will be analyzed as follows:

EPA Method 8015M	**EPA Method 200.8.**
Total Petroleum Hydrocarbons as Gasoline	Total organic lead
Total Petroleum Hydrocarbons as Diesel (TPHd) without Silica Gel Cleanup	
Total Petroleum Hydrocarbons as Diesel (TPHd) with Silica Gel Cleanup	
EPA Method 8260B	
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	Tertiary Amyl Methyl Ether (TAME)
Methyl Tertiary-Butyl Ether (MTBE)	1,2-Dichloroethane (1,2-DCA)
Tertiary Butyl Alcohol (TBA)	Ethyl Dibromide (EDB)
Di-Isopropyl Ether (DIPE)	Naphthalene[1]
Ethyl Tertiary Butyl Ether (ETBE)	

[1] Soil samples collected from the upper 10 feet of the vadose zone are to be analyzed for naphthalene to supply data used in the Direct Contact to Outdoor Air Exposure evaluation of the LTCP.

MANAGEMENT OF INVESTIGATION DERIVED WASTE

All investigative derived wastes (IDW) including soil cuttings, wash water, decontamination rinsate water, and purge water will be contained in Department of Transportation (DOT) approved 55-gallon drums. The drums will be labeled as non-hazardous waste and will be temporarily staged onsite pending laboratory results. Disposition of the IDW will be conducted by an appropriate waste disposal subcontractor and will be managed in accordance with State and local guidelines.