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May 19, 2015

RECEIVED
By Alameda County Environmental Health 3:51 pm, May 19, 2015

Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Attention: Mr. Mark Detterman, Senior Hazardous Materials Specialist

TRANSMITTAL LETTER
SITE MITIGATION AND CONTINGENCY PLAN FOR REDEVELOPMENT CONSTRUCTION
6701 – 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

Dear Mr. Detterman:

Submitted herewith for your review is *Site Mitigation and Contingency Plan for Redevelopment Construction, 6701 – 6707 Shellmound Street, Emeryville, California* dated May 19, 2015, prepared by PES Environmental, Inc.

I declare, under penalty of perjury, that the information contained in the above-referenced report for the subject property are true and correct to the best of my knowledge.

Very truly yours,

ANTON EMERYVILLE, LLC

R. Green

Rachel Green
Development Manager

PES Environmental, Inc.
Engineering & Environmental Services

A Report Prepared for:

Anton Emeryville, LLC
1415 L Street, Suite 450
Sacramento, California 95814

SITE MANAGEMENT AND CONTINGENCY PLAN FOR REDEVELOPMENT CONSTRUCTION
6701 – 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

MAY 19, 2015

By:

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1.0 INTRODUCTION

PES Environmental, Inc. (PES) has prepared this Site Management and Contingency Plan (SMP) on behalf of Anton Emeryville, LLC (Anton) for redevelopment construction at the property located at 6701 - 6707 Shellmound Street (previously known as Bay Street) in Emeryville, California (the site or subject property, as shown on Plate 1). The redevelopment will consist of: demolition and removal of two existing commercial buildings; site grading; construction of the foundation system for the new building including drilled piers and limited excavations for foundations and underground utility installations; and construction of a new multi-story residential building and associated parking, open space and landscaped areas. PES was retained by Anton to develop procedures for soil and groundwater management, environmental health and safety during construction, and contingency planning.

The subject property is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case with Alameda County Environmental Health Services (ACEH) as the lead environmental regulatory agency. It is listed under Mike Roberts Color Production (MRCP) at 6707 Bay Street, and the database lists other solvents and non-petroleum hydrocarbons as the potential contaminants of concern. PES is assisting Anton in working with ACEH to obtain SLIC case closure as part of the site redevelopment process. Based on known and/or suspected soil and groundwater contamination at and beneath the site, and information from ACEH, submittal and ACEH approval of a SMP is required to facilitate redevelopment of the site for residential purposes and support ACEH's closure of the SLIC case.

1.1 Purpose

The objective of this SMP is to describe procedures to be followed by environmental consultants, construction contractors and workers, and other property owner representatives during redevelopment construction and in the future. The SMP includes a summary of existing soil and groundwater data for the site, identifies safety and training requirements for construction workers, and establishes procedures for assessing and managing contaminated soil and groundwater that could be encountered during construction activities (e.g., demolition, grading, and excavation) and potential subsurface work in the future. Soil management procedures will be implemented in a manner that are protective of human health and the environment and that are consistent with the planned redevelopment. Specifically, this SMP provides the following information and procedures:

- A description of the site and summary of previous investigation and remedial activities, including information on the areas and contaminants subject to soil management requirements. The summary is presented in Appendix A;

- A summary and review of information and data from previous site investigations and characterization activities that provides data relevant to building design criteria, soil and other media management, worker safety, and protection of human health and the environment;

- Provisions for site redevelopment activities (e.g., building demolition and foundation slab removal, asphalt parking lot removal/installation, site grading/excavation activities, building and parking structure foundation construction, and utility trench construction);
- Health and Safety Plan (HASP) procedures for workers to follow during pre-construction and construction activities (not including asbestos-containing materials or other hazardous materials in existing building materials). The HASP is included as Appendix D;
- Field screening and observation during intrusive construction activities;
- Soil matrix sampling/characterization protocols;
- Soil and groundwater management practices (e.g., segregation/storage/transportation of soils, dust control, and decontamination procedures);
- A soil and groundwater management and contingency plan;
- Implementing contingencies to manage presently unknown environmental conditions (e.g., suspect soil conditions, encountering underground storage tanks [USTs] or other subsurface features, elevated vapor concentrations, etc.). Appropriate contingency measures may include sampling, testing, and disposal, in the event that such conditions are identified during site demolition or redevelopment construction;
- An Intrusive Earthwork Guidance Plan for post-construction site operations, with procedures for protecting workers conducting subsurface work at the site including decommissioning of groundwater monitoring wells (included as Appendix E); and
- A Post-Construction Operations and Management Plan (included as Appendix F).

1.2 Regulatory Framework

Based on a review of historical site documents, several environmental site assessments, sampling investigations, groundwater monitoring events, and remedial actions have been conducted at the site since 1989. The site was initially investigated as follow up to a January 1989 ACEH inspection of the facility that was operated by Mike Roberts Color Production (MRCP) at that time. Based on the inspection, ACEH issued a Notice of Violation (NOV) to MRCP for hazardous waste management and storage violations including lack of an United States Environmental Protection Agency (U.S. EPA) identification number, no copies of hazardous waste manifests on-site, on-site storage of hazardous waste for more than 90 days, and hazardous waste storage areas that lacked secondary containment (ACEH, 1989).

In response to the ACEH inspection and NOV, LW Environmental Services, Inc. (LW Environmental) conducted characterization for 90 drums of hazardous waste stored at the west end of the facility (i.e., former drum storage area shown on Plate 2) in March 1989. Based on the characterization results the drums were profiled and properly disposed off-site. LW Environmental identified additional environmental concerns at the site including a sump on the west side of the warehouse building that collected chemical wastes from drains in the warehouse (and connected to the municipal sewer system), a ditch area along the western property boundary that received runoff from paved areas including the drum storage area, and three USTs that were located in the eastern portion of the site. Soil in the sump and ditch areas was excavated and the USTs were removed and transported off-site for disposal in October 1989. The location of the former sump and ditch excavations and approximate extent of the former UST excavation are shown on Plate 2.

The USTs were reportedly used by Dymo Industries, Inc. (Dymo), which manufactured label tape and label tape punchers at the site from approximately 1963 to 1979, to store methyl isobutyl ketone (MIBK, which is also known as 4-methyl-2-pentanone) and methyl ethyl ketone (MEK, which is also known as 2-butanone) for their manufacturing processes (Bechtel, 1992). Discovery and reporting of impacts related to these USTs led to the leaking underground storage tank (LUST) case (ACEH fuel leak case number RO0000548) that has been closed by ACEH. According to the Underground Tank Closure/Modification Plans form submitted to ACEH, the USTs historically contained MIBK and MEK solvents and had capacities of 1,650, 2,000, and 3,200 gallons. Approximately 1,075 gallons of liquid, which was profiled as MEK and water, was pumped from the USTs and transported off-site for disposal. Soil that was excavated during the removal of the USTs was placed back into the excavation and a soil vapor extraction system was installed in 1990 to remediate this soil. Groundwater extraction and treatment was also conducted during 1990. These remediation systems were decommissioned in 1993.

From 1991 to 1996, additional assessment and groundwater monitoring related to the former USTs was conducted. Based on results of the final monitoring event, which was conducted in May 1996, Subsurface Consultants, Inc. indicated that all measures required in the *Addendum No. 1, Work Plan and Revised Request for "No Further Action"* were completed and requested confirmation that "no further action" was required for the site and that the site may be closed (Subsurface Consultants, Inc., 1995a and 1996).

A deed notice was provided to the ACEH on February 1, 1995, as a requirement by the ACEH and the California Regional Water Quality Control Board for the San Francisco Bay Region for closure of the UST case (Pettit & Martin, 1995). The deed notice was recorded and imposed conditions and/or restrictions on the use of the property related to groundwater use, soil excavation and potential future construction activities. Subsequently in December 1996, following the completion of groundwater monitoring activities at the site, ACEH issued a conditional site closure letter stating that further remediation and/or monitoring related to the former USTs removed from the site is not required, but the recorded deed notice must be modified to change specific information regarding risk management measures (ACEH, 1996).

No information was obtained by PES that indicated the deed notice had been modified to be consistent with the December 1996 ACEH letter.

According to the California State Water Resources Control Board (SWRCB) LUST database, the LUST case (ACEH fuel leak case number RO0000548) has been conditionally closed by ACEH under conditions associated with a deed notice. The site remains listed as an open remediation case in the SLIC database (GeoTracker Global ID T0600100894) with ACEH as the lead environmental regulatory agency. As noted above, the case is listed under MRCP (6707 Bay Street), and the database lists other solvents and non-petroleum hydrocarbons as the potential contaminants of concern.

U.S. EPA involvement with the subject property includes a Preliminary Assessment (PA) in 1990 and a Site Inspection (SI) in 1992. ICF Technology Incorporated (ICF) conducted a PA of the subject property in 1990 on behalf of the U.S. EPA (ICF, 1990). U.S. EPA requested the PA because the subject property was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database in February 1989 due to a telephone complaint concerning the storage of drums behind the warehouse. Based on the PA report's findings, U.S. EPA recommended the site for low priority SSI (site status information). Bechtel conducted a SI of the subject property in 1992 on behalf of U.S. EPA (Bechtel, 1992). Based on the SI's findings, U.S. EPA concluded that no further action was required under the authority of CERCLA.

This SMP, including the attached HASP (Appendix A), has been prepared in accordance with the conditions in 1995 deed notice and related modifications requested by ACEH in 1996, to mitigate potential exposure to residual waste materials at the site during the planned redevelopment construction. In conjunction with redevelopment of the site, Anton plans to prepare and submit an environmental land use covenant (LUC) to ACEH for approval. The new LUC will be recorded and will replace the existing deed notice. The LUC document will be prepared using a Model Alameda County Covenant and Environmental Restriction provided by ACEH. The LUC will identify the contamination at the site, restrictions on development and use of the site, restrictions on use of underlying groundwater, and requirements for maintenance of the site and notification to ACEH.

1.3 Redevelopment Overview

Current improvements on the subject property, as shown on Plate 2, consist of two commercial buildings (a two-story office building and a single-story warehouse building), surface-level parking, and landscaped areas on approximately 2.27 acres identified by Alameda County Assessor's Parcel Number (APN) 049-14906-02. The site has most recently been operated by Nady Systems, Inc. (Nady) for packaging and distribution of communication systems, such as wireless microphones and specialty audio systems.

The redevelopment plans for the subject property are to construct a new multi unit residential building with related amenities and facilities including parking, bike storage, fitness areas, lobby, leasing office and mail room. The building will be a seven-story at-grade (i.e., no basement levels) structure that will occupy the majority of the subject property (refer to Plate 2). The ground level (first floor) and second floor will be comprised primarily of parking areas with some residential units and the lobby and amenities areas, with five levels of residential units on the upper floors. Common areas (main entrance and lobby, fitness room, bike repair room/storage, dog spa) will be located on the first floor in the east portion of the new building along Shellmound Street. Elevators will provide access from the ground level to floors two though seven. New sidewalk and landscaping will be installed on the east side (front) of the building site along Shellmound Street. Vehicle access will be via a new driveway entrance off Shellmound Street at the southeast corner of the site (replacing the existing entrance off Shellmound Street). Open spaces consisting of concrete pathways, synthetic turf and landscape rock over turf block, and planter areas will be located around the north, west and south perimeters of the site. A dog park area is planned to occupy the southwest corner of the site. After redevelopment, the entire site will be covered by the building and paved parking areas and sidewalks with the exception of planter and landscaped areas. The conceptual post-redevelopment ground floor plan is shown on Plate 4.

Construction redevelopment activities related to this SMP include: (1) removal of existing building foundations/slabs, surface parking, curbs, sidewalks, trees, planting areas, and light poles; (2) decommissioning of existing groundwater monitoring wells; (3) grading; (4) excavation and installation of building foundations; (5) trench excavation and underground utility installation; and (6) installation of new curbs, sidewalks, landscape/planting areas, trees, and new pole-mounted lights.

1.4 Site Setting

The site is located at 6701, 6705, and 6707 Shellmound Street (previously known as Bay Street), in a mixed industrial, commercial, and residential area of Emeryville, Alameda County, California. According to the United States Geological Survey (USGS) *Oakland West, California* Quadrangle 7.5-minute series topographic map dated 1993, the site is situated at an elevation of approximately 18 feet above mean sea level. The site is relatively flat, but the vicinity slopes gently to the west/southwest. The closest surface water body is San Francisco Bay, located approximately 1,000 feet to the west.

1.4.1 Site History

The land on which the site is located historically consisted of San Francisco Bay tidal mud flats and was below sea level until the mid- to late-1930s, when a levee was built west of the subject property and a highway (Eastshore Highway, now Interstate 80) was constructed on the levee. From that time until the early to mid-1950s the area between the highway and the former shoreline, including the subject property and vicinity, were filled in by non-native soils to create buildable land. The existing site buildings were constructed over fill materials in approximately 1963.

Dymo operated at the site from approximately 1963 to 1979, and manufactured label tape and label tape punchers. As discussed above, Dymo's production operations used chemicals including MIBK and MEK that were stored in three USTs that were located in the eastern portion of the site and removed in 1989. MRCP operated at the site from 1979 to 1989, and initially manufactured and printed colored postcards. They later expanded into color printing, lithography, and off-set printing operations (Bechtel, 1992). These operations produced waste that included printing ink, solvent cleaning compounds, volatile and semi-volatile hydrocarbons, and color pigments, which were stored in 55-gallon drums on the west side of the warehouse building (i.e., in the former drum storage area shown on Plate 2). Nady purchased the property from MRCP in 1990 and has continued to operate at the site to the present. The site is used for offices and for storage of electronic sound equipment, product shipping and receiving, and minor equipment repair. Nady has used only limited amounts of chemicals in its operations.

1.4.2 Physical Setting

Based on the results of investigations performed on the subject property and in the vicinity, the site is underlain by fill material overlying deposits of native silts and clays known locally as Old Bay Mud. The fill material ranges in thickness from approximately 10 to 19 feet and consists primarily of coarse-grained sands and gravels that contain varying amounts of fines, and fine-grained silts and clay. The fill material has been encountered throughout the site and is generally most abundant on the western half of the site and at depths below approximately 8 to 10 feet below ground surface (bgs). The fill material often contains debris (e.g., brick, concrete, metal, asphalt, glass, wood, fabric, and rubber). Fine-grained soils are present directly below the fill material. These soils generally consisted of dark-colored clays and occasional silts with organic material that represent Old Bay Mud deposits. Depth to groundwater varies locally but is generally shallow. Shallow groundwater at the site is present at depths ranging from approximately at approximately 8 to 12 feet bgs. Based on topography and the results of historical groundwater investigations performed at the site, the predominant groundwater flow direction beneath the site is to the south-southwest toward the San Francisco Bay with localized flow towards the west-northwest in the area of the former USTs in the eastern portion of the site.

There are currently five groundwater monitoring wells known to exist at the site that were installed during previous investigations and are consistent with locations in previous investigation reports (MW-1, MW-3, MW-7, MW-8 and MW-9). No current indications of other monitoring wells installed during previous investigations (MW-5, MW-6 and MW-10) have been observed at the reported locations. The disposition of wells MW-5, MW-6 and MW-10 is not known. There are five existing vapor wells (SG-1 through SG-5) that were installed in 2013. Locations of the known existing monitoring wells and vapor wells are shown on Plate 3.

1.5 Project Contacts

The following section provides the contact information for representatives involved with redevelopment activities and implementation of this SMP.

Property and Redevelopment Representative:
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Owner's Environmental Consultant:
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2.0 SUMMARY OF PRIOR ENVIRONMENTAL INVESTIGATIONS AND REMEDIAL ACTIONS

A summary of prior environmental investigations and remedial actions implemented at the site, as well as a list of environmental documents prepared for the site, is presented in Appendix A.

3.0 SUMMARY OF ENVIRONMENTAL SITE CONDITIONS

As summarized in Appendix A – Summary of Environmental Investigations and Remedial Actions, numerous soil and groundwater characterization, removal, and remediation activities have been performed at the site since 1989. Environmental conditions have been characterized, and analytical data from previous investigations indicate that petroleum hydrocarbons quantified as gasoline, diesel, and motor oil (TPHg, TPHd, and TPHmo, respectively), oil & grease, volatile organic compounds (VOCs); benzene, toluene, ethylbenzene, and xylenes (BTEX); semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs); metals; soluble metals; and/or the pesticide DDT have been detected in soil and groundwater. VOCs have been detected in soil vapor samples. Remediation has been conducted to address areas of the site affected by stored hazardous materials and the former USTs. A discussion of the subsurface conditions and analytical results is provided below.

The distribution of the contaminants of concern (COCs) found in the subsurface at the site is summarized below. COCs are related to the historical fill materials originally used to create the subject property. The site is underlain by heterogeneous fill placed to create buildable land, like much of the filled bay-shore area of Emeryville. As such, sporadic and various chemicals can be detected when samples of soil, soil gas, and/or groundwater are tested. In addition, releases associated with the former USTs and the site's historical use have contributed to chemical constituents detected in soil, groundwater, and soil vapor samples collected during environmental investigations conducted at the site.

The occurrence of methane in soil gas has been documented in the Emeryville shoreline area. As described previously, the site vicinity was a former tidal marsh, a depositional environment that is conducive to accumulation of organic-rich silts and clays related to the breakdown of marsh vegetation. Atmospheric oxygen is limited and dissolved oxygen is quickly depleted by bacteria as the organic materials decompose, potentially resulting in anaerobic or reducing conditions. A similar process occurs with the breakdown of petroleum hydrocarbons in soil and groundwater, where anaerobic conditions prevail. Once sufficient reducing conditions are reached, methanogenesis results in the production of methane gas. Methane is nontoxic to humans; however, it is a combustible gas when present between 5 and 15 percent by volume in air. As discussed in subsequent sections (Sections 4.4 and 8.0), installation and maintenance of a vapor mitigation system (e.g., vapor barrier and passive vents) beneath all areas of the ground floor except the parking garage is being incorporated into the redevelopment design plans to address potential methane and VOCs in subsurface soil vapor.

3.1 Subsurface Conditions

Subsurface conditions consist of fill material from below the ground surface to depths ranging from 10 to 19 feet bgs. The fill materials generally consist of clayey, and/or silty sand and gravel material with debris (e.g., brick, concrete, metal, asphalt, glass, wood, fabric, and rubber). The fill overlies Old Bay Mud, which is generally described as dense silty clay, with minor amounts of sand and gravel and occasional silts with organic material. Shallow groundwater at the site is present at depths ranging from approximately 8 to 12 feet bgs. Petroleum odor and staining were noted in the boring logs prepared during subsurface investigations conducted at the site.

3.2 Soil Analytical Results

TPHg, TPHd and TPHmo were detected at maximum concentrations of 300, 290 and 1,400 milligrams per kilogram (mg/kg), respectively. Detected concentrations of oil & grease ranged from 20 mg/kg to 45,000 mg/kg. VOCs detected in soil include MIBK, MEK, BTEX, and dichlorobenzenes (1,2-, 1,3-, and 1,4-DCB). Relatively low concentrations of the SVOCs including chrysene, fluoranthene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and ideno(1,2,3-cd)pyrene were reported in soil samples. PCBs (Aroclors 1260, 1262, and 1268) were detected in soil with concentrations of Aroclor 1260 ranging from 0.013 to 14 mg/kg. Trace concentrations of the organochlorine pesticide DDT (maximum concentration of 0.42 mg/kg) were also detected in soil samples.

Results of Title 22 metals analyses indicate that detected concentrations of lead (1,100 to 10,000 mg/kg) in 10 soil samples collected at depths ranging from 5.5 to 15.5 feet bgs were above the lead Total Threshold Leaching Concentration (TTLC) criteria of 1,000 mg/kg. Results of California Wet Extraction Test (WET) analysis showed that concentrations of lead in six soil samples from depths of 2 to 8 feet bgs ranged from 7.5 to 39 milligrams per liter (mg/L), exceeding the Soluble Threshold Leaching Concentration (STLC) lead limit of 5.0 mg/L. One soil sample collected at boring location SB1 at 5.5 feet bgs had a Toxicity Characteristic Leaching Procedure (TCLP) lead concentration of 6.1 mg/L which is above the TCLP lead limit of 5.0 mg/L. The detected concentration of vanadium (11,000 mg/kg) in one soil sample collected from 10 feet bgs at location SB18 was above the vanadium TTLC criteria of 2,400 mg/kg. The reported concentrations of zinc (5,400 to 6,200 mg/kg) in three soil samples collected at depths ranging from 9 to 16 feet bgs were above the zinc TTLC criteria of 5,000 mg/kg.

The concentrations of lead detected in soil samples from PES' 2013 investigations are included on the cross sections presented in Appendix G.

3.3 Groundwater Monitoring and Analytical Results

Groundwater monitoring was conducted at the site on a periodic basis related to the former USTs from 1994 to 1996. The monitoring data indicate the predominant direction of shallow groundwater flow is to the south-southwest with localized flow toward the west-northwest in the vicinity of the former USTs. During this period the depth to water ranged from 5.15 feet bgs (MW-7; 5/9/95) to 11.7 feet bgs (MW-10; 11/13/95). Analysis of the groundwater samples has included: TPHg; TPHd; TPHmo; oil & grease; total recoverable hydrocarbons (TPH analysis by U.S. EPA Method 418.1); total extractable hydrocarbons (TEH); total volatile hydrocarbons (TVH); VOCs; BTEX; SVOCs; PCBs; and/or Title 22 metals.

Results for oil & grease in groundwater samples collected in 1989 to 1994 from monitoring wells MW-1, MW-3, MW8, MW-9 and MW-10 were non-detectable (ND) with laboratory detection limits of 5 and 10 mg/L, except for one detection of 14 mg/L (14,000 μg/L) for well MW-8 in November 1993. TPH analysis by U.S. EPA Method 418.1 detected concentrations ranging from 500 μg/L (in well MW-1) to 103,000 μg/L (in well MW-8) in 1990. Groundwater samples were collected from these wells in 1994 to 1996, and detected THE concentrations ranged from 430 μg/L for well MW-3 to 4,400 μg/L for well MW-10. The reported concentrations of TVH ranged from 60 μg/L (MW-3) to 7,200 μg/L (MW-8). Groundwater samples collected from sampling locations SG-1, SG-4, and SG-5 by ENVIRON in April 2013 had reported concentrations of 920 to 58,000 μg/L TPHd, and 5,600 to 12,000 μg/L TPHmo.

Relatively low concentrations of SVOCs were detected in groundwater samples collected in 1989 from monitoring wells MW-1, MW-3, MW-5, and MW-6 (LW Environmental, 1989d). Bis-(2-ethylhexyl)phthalate was detected in groundwater samples from all the wells at concentrations of 20 to 80 μg/L. The groundwater sample from well MW-5 also had detectable concentrations of three other SVOCs (2,4-dimethylphenol at 6 μg/L, naphthalene at 5 μg/L, and 2-methyl-naphthalene at 16 μg/L). No SVOCs were detected at concentrations greater than or equal to the laboratory reporting limit in groundwater samples collected in 1990 from monitoring wells MW-1, MW-3, MW-5, MW-6, MW-7, and MW-8 (SCS Engineers, 1990). A groundwater sample collected from monitoring well MW-1 in 1989 was analyzed for CAM 17 metals and no metals were reportedly detected at concentrations above the Title 22 STLC values (LW Environmental, 1989d). No PCBs were detected at or above concentrations greater than or equal to the laboratory reporting limit in one groundwater sample collected in 1989 from well MW-1.

VOCs most commonly detected historically in groundwater include MIBK, MEK, BTEX, acetone, chlorobenzene, and naphthalene (naphthalene is a VOC and SVOC analyte). As summarized below, other VOCs have been sporadically detected in groundwater samples. In 1989, four VOCs (vinyl chloride at 4 μg/L, trans-1,2-DCE at 8 μg/L, benzene at 8 μg/L, and ethylbenzene at 6 μg/L) were detected in a groundwater sample collected from monitoring well MW-5. In 1990, benzene was detected in groundwater from well MW-5 at a concentration of 12 μg/L. From 1990 to 1996, VOCs analysis was conducted on groundwater samples collected from monitoring wells MW-1, MW-3, MW-8, MW-9, and/or MW-10. The following is a summary of the results.

<u>MIBK (4-methyl-2-pentanone)</u>

- MW-8 - 840 to 160,000 μg/L detected in 13 samples from 1990 to 1996;
- MW-9 – 120 μg/L detected in one sample in 1994; and
- MW-10 – 23 μg/L detected in one sample in 1994.

MEK (2-butanone)

- MW-8 – 10,000 and 78 μg/L detected in 2 samples from 1990 and 1995, respectively.

Benzene

- MW-8 - 63 to 2,100 μg/L detected in 5 samples from 1990 to 1995;
- MW-10 – 6.6 to 31 μg/L detected in 6 samples from 1994 to 1996; and
- MW-1 – 7 μg/L detected in one sample in 1990.

Acetone

- MW-8 - 3,200 and 40 μg/L detected in 2 samples from 1990 and 1995, respectively.

Low concentrations of chlorobenzene (3 to 11 μg/L) and carbon disulfide (3 μg/L) were detected in wells MW-8 and MW-10 in 1995 and 1996.

During the final monitoring event in May 1996, groundwater samples from wells MW-1, MW-8, MW-9 and MW-10 were analyzed for VOCs. MIBK was detected at a concentration of 15,000 μg/L in groundwater samples collected from well MW-8, and benzene and chlorobenzene were detected in samples collected from well MW-10 at concentrations of 7.5 μg/L and 3.5 μg/L, respectively.

The most recent groundwater sampling and analysis was conducted in April and November 2013 by ENVIRON and PES, respectively. In addition to groundwater analysis for TPHd and TPHmo conducted by ENVIRON in April 2013 (results discussed above), groundwater samples from locations SG-1, SG-4 and SG-5 were analyzed for VOCs and Title 22 metals (total). Groundwater samples collected by PES in November 2013 from location GGW-1 through GGW-6 were analyzed for Title 22 metals (dissolved).

Groundwater samples collected from sampling locations SG-1, SG-4, and SG-5 by ENVIRON in April 2013 were analyzed for VOCs. Benzene was detected in the groundwater samples from locations SG-4 and SG-5 at concentrations of 2 and 8.1 μg/L, respectively. Analysis of the sample from SG-5, located in the southwest portion of the site, indicated the presence of ethylbenzene (45 μg/L), naphthalene (84 μg/L), and xylenes (59 μg/L). Other VOCs detected in groundwater at SG-5 were n-butlybenzene, sec-butlybenzene, isopropylbenzene, 4-isopropyltoluene, n-propylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. Low concentrations of carbon disulfide (1.1 μg/L) and chlorobenzene (4.4 μg/L) were detected in the sample from location SG-1. Low concentrations of sec-butlybenzene (1.3 μg/L), carbon disulfide (3.9 μg/L), cis-1,2-DCE (0.69 μg/L), isopropylbenzene (1.1 μg/L), and toluene (0.54 μg/L) were detected in the sample from location SG-4.

Analysis of groundwater samples collected during the April 2013 investigation conducted by ENVIRON, indicated the presence of elevated concentrations (i.e., exceeding California MCLs and ESLs) of total metals (antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, silver, vanadium and zinc). Groundwater samples from locations SG-4 and SG-5 had reported total lead concentrations of 26,000 and 60,000 μg/L which are above the Title 22 STLC value (hazardous waste criteria) of 5,000 μg/L. Additionally, total copper was reported at a concentration of 34,000 μg/L for the sample from SG-5, above the Title 22 STLC value of 25,000 μg/L.

Analysis of groundwater samples collected during the November 2013 PES investigation indicated the presence of the following dissolved metals: arsenic, barium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, vanadium and zinc. The reported concentrations of dissolved lead at locations GGW-1, GGW-2, and GGW-3 (17 to 190 μg/L) exceeded the California Maximum Contaminant Level (MCL) of 15 μg/L. The reported concentration of dissolved arsenic at GGW-3 (32 μg/L) exceeded the California MCL of 10 μg/L. No reported concentrations of dissolved metals were above the Title 22 STLC values.

As discussed previously, PES believes that based on a comparison of dissolved lead and other metals results obtained during PES' November 2013 investigation to those obtained during ENVIRON's April 2013 investigation, it appears that the April 2013 metal results were anomalously high and not representative of groundwater conditions beneath the site.

3.4 2013 Soil Vapor Analytical Results

As part of the April 2013 investigation, ENVIRON collected soil gas samples at locations SG-1 through SG-5 for analysis of VOCs. VOCs were detected in soil gas samples collected from locations SG-1 through SG-5. Benzene was detected at locations SG-1, SG-3, SG-4 and SG-5 at concentrations of 8.6 to 73 micrograms per cubic meter (μg/m^3). The concentration of 73 μg/m^3 detected at SG-3 is above the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Environmental Screening Level (ESL) for shallow soil gas at residential sites which is 42 μg/m^3. The presence of tracer gas and elevated levels of oxygen and argon in the soil gas sample from SG-3, suggest that the sample may have been affected by ambient air and therefore may not be representative of subsurface conditions.

3.5 2015 Soil Vapor Analytical Results

During a meeting at ACEH on April 8, 2015, a limited soil vapor and sub-slab investigaiton was agreed to be conducted to further evaluate subsurface conditions in the vicinity of the former USTs and beneath concrete slab of the existing warehouse building. The additional investigation included conducting soil gas and sub-slab vapor sampling for VOCs, methane, carbon dioxide, and oxygen in order to advance the open SLIC case towards closure and assess the site for potential vapor intrusion concerns. Accordingly, on April 24, 2015, PES and its subcontractor collected soil gas samples from three exterior locations at approximate depths of

5 and 10 feet bgs and sub-slab vapor samples from four interior locations at the site for analysis of VOCs (including MEK and MIBK), methane, carbon dioxide, and oxygen. Samples of vapor within the shroud and soil vapor samples were also analyzed for the leak detection compound, 1,1-difluoroethane (1,1-DFA). A detailed description of PES' April 2015 soil gas and sub-slab vapor investigation is presented as Appendix B to this SMP.

Soil Vapor Sampling and Analysis Results

The analytical results indicate residual levels of VOCs, including BTEX compounds, MEK, and MIBK, are present in soil gas at approximate depths of 5 and 10 feet bgs in the vicinity of the former USTs. Benzene was detected in one soil gas sample (location SV2 at a depth of 5 feet bgs) at a concentration above applicable ESLs developed for a residential setting, but well below the respective ESLs developed for commercial/industrial settings. Other VOCs detected in soil gas were below applicable residential ESLs. Methane was not detected in the soil vapor samples at or above the laboratory reporting limit, carbon dioxide was detected at levels ranging from 4.52 percent by volume (%volume) to 13.6 %volume, and oxygen levels ranged from 6.53 %volume to 15.9 %volume. The leak detection compound, 1,1-DFA, was not detected at or above the laboratory reporting limit in any of the soil vapor samples.

Sub-Slab Vapor Sampling and Analysis Results

Low levels of VOCs, including PCE, 1,1,1-trichloroethane (1,1,1-TCA), styrene, and MEK were detected in sub-slab vapor samples collected beneath the warehouse building. Using the DTSC recommended attenuation factor of 0.05 for estimation of indoor air concentrations based on sub-slab vapor analytical results, PCE reported in sample SSV1 is above the concentration which would theoretically result in an indoor air concentration above the applicable residential ESL. The result is also slightly above the concentration which would theoretically result in an indoor air concentration above the applicable commercial/industrial ESL. The reported results for other VOCs are well below the concentrations which would theoretically result in indoor air concentrations above applicable ESLs. Methane was not detected in the sub-slab vapor samples at or above the laboratory reporting limit, carbon dioxide was detected in three of the four samples at levels ranging from 0.272 % volume to 4.25 %volume, and oxygen levels ranged from 8.97 %volume to 19.1 %volume. The leak detection compound, 1,1-DFA, was not detected at or above the laboratory reporting limit in any of the sub-slab vapor samples.

As discussed in Section 4.4, a vapor mitigation system will be designed and installed beneath the floor slab to mitigate the potential accumulation and migration of VOCs in soil vapor into ground floor building areas following the proposed redevelopment of the site. The system will consist of impermeable vapor barriers with passive venting. Based on the findings of this investigation and the proposed vapor intrusion mitigation measures, additional soil gas and/or sub-slab vapor investigation activities at the site does not appear warranted.

3.6 General Distribution of Contaminants of Concern in the Subsurface

The distribution of the COCs found in the subsurface at the site is summarized below. COCs are related to the historical fill materials originally used to create the subject property and residual contamination related to historical site operations including a release from the former USTs. There may also be residual contamination (TPH and VOCs) in the southwest portion of the site related to historical operations/features in this area (former drum storage area, sump and ditch). Otherwise, the residual contamination in soil/fill and related impacts to groundwater (TPH, oil & grease, metals, PCBs, low levels of VOCs including BTEX, and SVOCs) are attributed to the historical fill material that was placed to originally create the land occupied by the subject property and adjacent areas along the Emeryville bay front.

The highest concentrations of TPH, oil & grease, and metals (primarily lead) in soil were generally found at depths of approximately 8 to 12 feet bgs which coincide with the depth interval of groundwater fluctuations beneath the site. Concentrations generally increase with depth to 8 to 12 feet bgs, then decrease with additional depth. However, the subsurface fill material is heterogeneous and significant contaminant concentrations were found at various depths across the entire site. SVOCs and PCBs were detected sporadically across the site and appear to coincide with areas of elevated TPH concentrations. The most current subsurface characterization data indicate that residual impacts from VOCs, including MIBK, associated with the former USTs have been remediated and/or attenuated.

There may be residual VOC and TPH impacts in groundwater related to historical site operations; however, based on the distribution of COCs detected in groundwater (TPH, oil & grease, metals, and low concentrations of VOCs and SVOCs not related to site operations), their presence in groundwater is primarily the result of associated impacts from the soil/fill material beneath the site. These residual groundwater impacts are distributed across the site and other adjacent and nearby properties that overly the historical soil/fill materials.

Soil vapor sampling and analysis for VOCs conducted in April 2013 indicated that areas of VOCs in soil vapor were present primarily at locations SG-3, SG-4 and SG-5, located in the western portion of the site. In addition to BTEX, other VOCs were detected in soil vapor samples that have also been found in soil and groundwater indicating that the source of these constituents may be the soil/fill and groundwater beneath the site. Available data indicate that concentrations of VOCs in soil vapor are relatively low and with the possible exception of benzene, the reported concentrations are below the ESLs for residential site uses.

3.7 Conceptual Site Model (CSM)

A conceptual site model (CSM) has been prepared based on data and information from previous environmental investigations and plans for site redevelopment and future use (PES, 2015). The CSM was developed using data from previous environmental investigations and site characteristics to identify potential human receptors and evaluate potentially complete exposure pathways at the site for the COCs present in soil, groundwater and soil gas. The planned future land use at the site is residential with some commercial use. Human receptors at the site include future residents, current and future indoor commercial workers and future construction workers. Potential exposure pathways and receptors for construction work during redevelopment and future site occupants were evaluated. Existing and planned engineering and institutional controls were also considered in developing the CSM.

The detected concentrations of COCs at the site were compared to residential risk-based screening levels including U. S. EPA Region 9, January 2015 Regional Screening Levels (RSLs) and RWQCB December 2013 Tier 1 ESLs for residential soil (shallow soil and non-drinking water). ESLs have been developed for specific exposure scenarios and receptors including direct exposure and vapor intrusion for volatile chemicals. Soil and groundwater concentrations were also compared to direct exposure ESLs and vapor intrusion ESLs for volatile COCs that may be potentially applicable to the site. Vapor intrusion ESLs for residential receptors and ESLs for direct exposure for construction and trench workers were used for comparisons.

One potentially complete exposure pathway was identified in the CSM:

- Incidental ingestion of or dermal contact by future construction and maintenance workers with subsurface soil.

As described previously, the site will be paved or covered by buildings and no direct contact or soil incidental ingestions/dermal contact pathway exists for users of the site. Direct exposure for construction workers via contact with soil during temporary subsurface excavation or trenching will be regulated at the site by this SMP and the associated HASP (Appendix D) and Intrusive Earthwork Guidance Plan (Appendix E) that stipulate procedures for conducting subsurface work in the future (i.e., post-construction) that are protective of the public and workers involved in subsurface work at the site.

For construction and trench worker direct contact criteria, concentrations exceed the direct exposure ESLs for TPH, arsenic, lead, vanadium, benzo(a)pyrene, and PCBs. The potential for direct exposures to soil for construction and trench workers will be addressed by implementing procedures and controls included in this SMP and associated HASP.

The indoor air inhalation pathway and outdoor air ambient volatilization are not considered significant based on existing information. The concentration of benzene detected in soil gas at one sampling location in 2013 exceeded the ESL; however, benzene concentrations at four other sampling locations were below the ESL. As noted above and in Appendix A, the soil gas sampling results suggest this sample was affected by ambient air and may not be representative of subsurface conditions. Benzene concentrations in soil and groundwater are below applicable ESLs and continued attenuation is expected. Concentrations for other COCs were below the applicable ESL concentrations for soil vapor and vapor intrusion concerns.

There is a potential for future generation and migration of methane in the subsurface. Therefore as a precautionary measure, the potential for migration of VOC vapors and methane to indoor air will be mitigated by installing a vapor intrusion mitigation system, comprised of a physical barrier and passive venting system, beneath enclosed ground-floor portions of the new building that will be occupied (parking garage not included) as well as elevator pits.

Based on development and evaluation of the CSM, conditions at the site are summarized below:

- No significant unacceptable exposure scenarios for future site residents and workers were identified;
- The potential for construction worker exposure to COC residuals in the subsurface will be mitigated by the requirements of this SMP and appended HASP. The potential for future maintenance worker exposure will be mitigated by the requirements in the appended Intrusion Earthwork Guidance Plan, and Operations and Maintenance Plan that will be implemented for redevelopment construction and future maintenance at the site. These documents specify health and safety precautions to be implemented for any significant subsurface work;
- There are no identified preferential pathways of significance;
- VOC residuals in the vicinity of the former USTs have been remediated and attenuated to concentrations below risk-based concentrations; and
- Natural attenuation of organic COCs will continue to reduce residual levels.

In summary, investigation, remediation and monitoring activities conducted at the site since 1989 have adequately defined the extent of contamination and associated risks from COCs at the site. The information supports the planned redevelopment in conjunction with prescribed institutional and engineering controls.

3.8 Human Health Risk Assessment (HHRA)

A human health risk assessment (HHRA) has been prepared for the site by SLR International Corporation (SLR) to evaluate potential human health risks associated with exposure to chemicals detected in soil, groundwater, and soil gas during and following redevelopment of the site.. The risk assessment was conducted consistent with guidance provided by CalEPA, RWQCB, and USEPA. The approach used in the HHRA is consistent with Tier 1 outlined by the RWQCB (2013b). Where relevant, chemicals exceeding the Tier 1 ESLs are then quantitatively evaluated in a baseline risk assessment, which generally corresponds to Tier 3 of the guidance. A copy of the HHRA is presented as Appendix C to this SMP.

The following hypothetical future onsite receptors were identified in the HHRA as likely present at the site:

- Construction worker receptor
- Maintenance/utility worker receptor
- Commercial worker receptor
- Residential receptor (adult and child)

The construction worker receptor was assumed to work at the site during redevelopment. This receptor would potentially contact soil at depths down to 12 feet bgs. The maintenance/utility worker receptor was assumed to work at the site following redevelopment for short periods of time, to maintain underground utility lines and/or landscaping. This receptor would potentially contact soil at depths down to 12 feet bgs, the maximum depth of utility lines planned for the redevelopment. Retail worker receptors were assumed to work at the site following redevelopment in retail space located on the first two floors. Adult and child residential receptors were assumed to live in units on all floors, but primarily on the third floor and above. All of these hypothetical future onsite receptors are shown on Plate 3 of the HHRA (Appendix C).

On the basis of the discussions provided in the HHRA, the following exposure pathways were identified as potentially (or theoretically) complete and were evaluated in Tier 1:

- Future onsite construction worker receptor:
  - Direct contact with soil via ingestion and dermal exposure; and
  - Inhalation of vapors and dusts in outdoor air.
- Future onsite maintenance/utility worker receptor:
  - Direct contact with soil via ingestion and dermal exposure; and
  - Inhalation of vapors and dusts in outdoor air.
- Future onsite commercial (retail) worker receptor:
  - Direct contact with soil via ingestion and dermal exposure;
  - Inhalation of vapors in indoor air due to subsurface vapor intrusion; and
  - Inhalation of dusts and vapors in outdoor air.

- Future onsite residential receptor:
  - Direct contact with soil via ingestion and dermal exposure;
  - Inhalation of vapors in indoor air due to subsurface vapor intrusion; and
  - Inhalation of dusts and vapors in outdoor air.

As discussed in the HHRA (Appendix C), the Tier 1 evaluation utilizes screening levels, some of which are receptor- and pathway-specific. Therefore, in addition to identifying chemicals that should be further evaluated, Tier 1 also serves to distinguish potentially complete but insignificant pathways from those that are potentially complete and significant for the two receptors that are most likely to have complete exposure scenarios at the site, the construction and maintenance/utility worker receptors. The exposure scenarios identified for onsite future commercial and residential receptors assume no mitigation measures will occur to manage potential vapor intrusion. However, a vapor mitigation system (consisting of a vapor barrier and venting system) will be installed beneath occupied spaces of the proposed development, eliminating any potential exposure via this pathway. Therefore, only the two invasive receptors (future onsite construction worker and future onsite maintenance/utility worker) were further evaluated beyond Tier 1 in the HHRA.

Site data were screened against residential, commercial, and construction worker-based ESLs, and six chemicals in soil exceeding construction worker-based ESLs were quantitatively addressed in the HHRA (benzo(a)pyrene, total PCBs, arsenic, lead, vanadium, and TPHd). Although some chemical concentrations also exceeded residential and commercial ESLs for contact with soil (and three chemicals for vapor intrusion), the LUC and this SMP will preclude exposure by these receptors to chemicals in site soil. Vapor intrusion ESLs for benzene were exceeded at several groundwater sampling locations, but only two values in soil gas exceeded the ESL and only for residential land use. Vinyl chloride exceeded the groundwater ESL, but was only detected in one groundwater sample and was not detected in soil gas. Additionally, PCE was detected in one subslab soil gas sample at a concentration that exceeded the adjusted indoor air ESLs, but was not detected in soil or groundwater, and was detected in soil vapor in a single sample below ESLs. Development plans indicate that only a small fraction of the first floor will be comprised of commercial or residential space, and it is unlikely that vapors from these limited locations could affect people in the building in the future. Additionally, a vapor mitigation system will be installed beneath ground level residential units, elevator pits, and common and amenity areas.

One location with high vanadium concentrations led to an Hazard Index (HI) above one for the construction worker receptor from dust inhalation, and arsenic exposures resulted in a lifetime excess cancer risk (LECR) of 7×10^{-6} for this receptor. Benzo(a)pyrene, PCBs, arsenic, and lead concentrations resulted in a LECR of 9×10^{-6} for the maintenance/utility worker receptor. Arsenic concentrations, which are responsible for the majority of soil LECR estimates for these receptors, are likely consistent with background conditions. As a conservative measure the HHRA assumed these workers would ignore this SMP and HASP; however, actual exposures should be well below levels of concern once this document is provided to these receptors and the measures contained in this SMP are followed for redevelopment and post-redevelopment activities.

Overall, based on the specific site redevelopment plans there is a complete lack of future exposure scenarios for residential and commercial/retail worker receptors. Given the lack of exposure scenarios, there is also no unacceptable risk to these receptors from detected chemicals at the site. Risks to future construction and maintenance/utility workers assuming no health and safety requirements are followed will likely be mitigated by the clean fill cap and by the required adherence to this SMP.

4.0 CONSTRUCTION PLANNING ACTIVITIES

The following sections summarize construction activities and planning for the redevelopment work.

4.1 Scope of Intrusive Earthwork Construction Activities

The various intrusive earthwork construction activities that are likely to encounter COC-affected soil and or groundwater are described below. These activities will be conducted in a manner consistent with the procedures and protocols described herein and the HASP (Appendix D).

Existing utilities, including sanitary sewer, storm drain, and electrical utilities, will be excavated and capped/terminated at locations that do not conflict with planned construction and/or are convenient for establishing future connections. New utility trenches will be excavated to replace these utilities as needed, and to install drinking water, fire water, recycled water, natural gas, and communications (telephone, data, and television) lines. The excavations for sanitary sewer and storm are expected to range from 9 to 12 feet bgs, while those for the other utilities will typically range up to 4 to 5 feet bgs.

Grading will be performed to create the building pad, surrounding open and landscaped areas, and associated amenities and driveway on the eastern portion. To conform to existing grades and elevations, the maximum depth of grading is not expected to exceed approximately 3 feet bgs.

The preliminary foundation design for the new building consists of drilled displacement piers and associated pier caps. Auger pressure-grouted displacement (APGD) piers will be installed with a specialized auger that laterally displaces soil by means of mechanical compaction as the auger is advanced and withdrawn from the borehole. Little to no cuttings are generated during installation. Soil surrounding the piers will be excavated to approximately 4 feet bgs so that pier caps and other structural foundation elements (e.g., grade beams) can be constructed.

The selected foundation design technique results in little or no excavated soil or fill material generated and therefore significant management and removal of soil from the site is anticipated.

Landscape design for the project includes planters for various types of ornamental vegetation. Along Shellmound Street planter boxes for trees will be excavated to approximately 5 feet bgs. Structural soil and treatment soil (i.e., a planting mix designed for both moisture retention and infiltration), along with drain rock, will be used to backfill the planter boxes in preparation for planting. Additional planter boxes for ornamental grasses and shrubs will require shallower excavations to approximately 2 feet bgs. A minimum 2 feet-thick layer of clean soil/fill material will be placed at the surface for planter and landscaped areas.

Small localized excavations or boreholes will be advanced for non-structural purposes such as light poles, signs, and parking bollards.

Decommissioning of five existing monitoring wells (MW-1, MW-3, MW-7, MW-8 and MW-9) and five soil vapor probes (SG-1 through SG-5) will require drilling to depths of up to approximately 30 feet bgs. Well and vapor probe decommissioning permits will be obtained from Alameda County Department of Public Works Agency-California Water Resources prior to conducting the work. A California licensed drilling contractor will be retained to permanently abandon the existing groundwater monitoring wells and soil vapor probes in accordance with California Department of Water Resource Water Well Standards (Bulletin 74-90). It is assumed the wells and probes will be decommissioned by over-drilling using a hollow-stem auger drill rig or equivalent and each borehole will be tremie-grouted from the bottom of the borehole to the ground surface. The decommissioning work will be conducted under the supervision of a California-registered geologist or engineer. Waste generated during the well destructions will be containerized in 55-gallon drums, classified through laboratory analysis, and subsequently transported offsite for disposal.

4.2 Pre-Demolition Survey for Hazardous Materials

Prior to the commencement of building demolition activities, a pre-demolition sampling program will be performed to assist in the project planning and provide additional current data to: (1) protect the health and safety of workers, nearby receptors, and visitors to the site; (2) assess whether previously unidentified environmental conditions exist that might pose a risk to human health or the environment; and (3) assist in planning for management/disposal of demolition and construction debris.

A survey of the existing building for hazardous construction materials such as asbestos containing materials (ACM), lead-based or lead-containing paints (LBP or LCP), lead-containing materials (LCM), and PCB-containing fluorescent light ballasts will be performed as part of pre-demolition activities. Sampling will be performed by a California Department of Occupation Safety and Health (Cal-OSHA) Certified Asbestos Consultant (CAC) and California Department of Public Health (CDPH) LBP Inspector/Assessors.

The materials survey task is not an explicit component of this SMP, but is included here for completeness.

4.3 Pre-Construction Sampling

No additional sampling or site characterization activities are planned prior to construction and site redevelopment. This may change based on conditions or unforeseen circumstances encountered in the field and, if so, will be handled consistent with the Contingency Procedures outlined below in Section 6.0.

Adequate site characterization data exists from previous site investigations to: (1) protect the health and safety of workers, nearby receptors, and visitors to the site; (2) assess whether environmental conditions exist that might pose a risk to human health or the environment; (3) facilitate building design criteria (e.g., vapor mitigation system); and (4) assist in planning for management/disposal of soil and groundwater.

For the purposes of subsurface construction work at the site and this SMP, all subsurface media (existing soil/fill, groundwater, and soil vapor) is considered to be affected by COCs. As such, the appropriate measures, procedures and protocols included in this SMP will be implemented to reduce potential exposures to COCs and properly manage affected media during construction.

A site-specific HASP has been prepared in accordance with applicable OSHA and Alameda County Health Services regulations and consistent with the existing property deed notice and future LUC to be submitted to ACEH, and is included as Appendix D. The HASP provides information that addresses the health risks and hazards for each site task, employee training assignments to assure compliance with Title 8 of the California Code of Regulations, personal protective equipment, personnel monitoring, site control measures, decontamination procedures, and an Emergency Response Plan. The Emergency Response Plan addresses reasonably foreseeable accident or upset conditions and outlines the procedures to be followed in the event of an emergency at the site. Emergencies that may occur at the site can include chemical spills, fires, explosions, and personal injuries. The HASP will be updated to address new findings and information and changes in site conditions, as appropriate.

4.4 Vapor Intrusion Mitigation

The new building plans include ground floor residential units on the west and north sides of the building, elevator pits in the center area of the building, and common and amenity areas in the east portion of the building (Plate 4). To mitigate for potential accumulation and migration of VOCs and methane in soil vapor into these ground floor building areas, a vapor mitigation system will be designed and installed beneath the floor slab underlying these portions of the building. The system will consist of impermeable vapor barriers with passive venting. The vapor mitigation system will be incorporated into the building design and details and specifications will be provided in the building plans.

5.0 MANAGEMENT PROCEDURES

5.1 Phase-Specific Implementation Plan

Prior to commencement of redevelopment activities, a phase-specific Implementation Plan Memorandum (IPM) will be developed for that conforms to the framework of this SMP and outlines the planned construction phases. The IPM will serve as a guide for construction worker and contractors working at the site and will include information regarding the environmental concerns and related procedures and protocols to be followed. The IPM will identify known areas affected by COCs and will focus on final construction design and features involving subsurface work. (e.g., utility trench locations, building foundation design, vapor mitigation system design, and identification of grading/excavation areas).

The soil, groundwater, and soil vapor data will be evaluated, interpreted, and utilized to confirm adherence to the procedures specified within the SMP and the need for other mitigation measures during construction. The soil and groundwater data will be evaluated to confirm that sufficient data has been collected for preliminary waste disposal characterization and other purposes. Although not anticipated to be needed, procedures for characterizing and transporting waste soil for off-site disposal, and for managing groundwater during construction are included below.

5.2 Segregation of Soil

Based on the construction and foundation plans and due to space constraints, extensive soil stockpiling is not likely to occur during the redevelopment process. In the event that small quantities of waste soil are retained temporarily on site, soil stockpiles will be constructed with plastic sheeting beneath (unless the ground surface is paved) and above the soil to prevent run-on/runoff, fugitive dust, and/or odor emissions. Stockpiled soil will be covered and secured at the end of each day. Stockpiles will be removed from the site after the excavations are completed, waste characterized, and disposal facility approvals have been obtained.

Plans are to re-use all excavated soil on-site, and therefore transportation and off-site disposal is not anticipated. However, if appropriate, waste soil that may be unsuitable for re-use will be segregated during excavation into discrete waste streams and handled in a manner appropriate for that material including possible transportation and disposal off-site. If necessary, data obtained during the previous investigations will be used to select appropriate landfills for the disposal of the waste soil. The existing soil analytical data may be sufficient for landfill acceptance criteria. However, once the landfill site(s) are identified, the soil will be profiled and additional waste characterization testing may be performed as required by the landfill waste acceptance criteria.

5.3 Transportation and Disposal Plan for Soil

If transportation and off-site disposal of soil becomes necessary, the soil will be loaded into licensed haul trucks (end-dumps or transfers) and transported off the site following appropriate California and federal waste manifesting procedures, after acceptance at an appropriate disposal facility (more than one facility may be required based on the characterization results). The waste manifest documentation will be provided to the truck driver hauling the soil offsite.

As each truck is filled, an inspection will be made to verify that the soil and solid waste is securely covered and that the tires of the haul trucks are reasonably free of accumulated soil prior to leaving the site. Soil residue on the excavator tracks/tires and truck tires will be removed using a combination of wet and dry methods. During dry conditions, soil residues will be removed by dry brushing with a stiff-bristled broom and/or wire brush. Soil that cannot be removed by this procedure will be removed from equipment by washing with high-pressure hot water in a prepared decontamination area. During wet conditions, high-pressure hot water washing will be used in a prepared decontamination area to remove material residues and mud from the tracks and tires of equipment. Water generated during decontamination activities will be contained for analysis and appropriate disposal/recycling.

The work areas will be kept clean and free of excessive soil or debris. A street sweeper will be made available, as needed, to keep the loading area and haul roads clean. The soil will be wetted, as necessary, to reduce the potential for dust generation during loading and transportation activities. To verify that trucks are loaded within appropriate weight limits, the weight of initial trucks will be verified using scales integral to the trucks, portable scales onsite, or nearby stationary scales.

Haul routes from the subject property will use surface streets to access the closest suitable freeway on-ramp. Truck traffic travelling along this surface street route will pass through commercial and light industrial areas only. No residential areas will be entered. Once on the freeway, the exact truck route will be dependent on the location of the applicable disposal facility. Specific haul routes from the subject property to the selected landfill sites will be determined once appropriate facilities have been identified for the waste soil.

5.4 Groundwater Management

Based on the depth to groundwater at the site (approximately 8 to 12 feet bgs) and the limited depth of planned construction, it is not expected that dewatering activities will be necessary in excavations for foundations and underground utilities. In the event that dewatering becomes necessary (e.g., localized deep excavations for elevator pits or deeper subsurface utilities), the general groundwater management procedures described below shall be applied.

Excavation dewatering, if required, will be conducted in accordance with applicable federal and state regulations. It is anticipated that the dewatering fluids generated during dewatering activities will be discharged under permit to the publicly owned treatment works (POTW) operated by East Bay Municipal Utility District (EBMUD). Based on historical information, groundwater in the excavation area may contain petroleum hydrocarbons, VOCs, SVOCs, metals, and possibly other contaminants. Treatment prior to discharge to the POTW is regulated by EBMUD. The nature and levels of chemical constituents in the groundwater, and the need for treatment prior to discharge, may necessitate pre-excavation investigation of groundwater.

The water will be treated (if necessary) and discharged in compliance with a permit that will be obtained from EBMUD. A treatment system capable of reducing contaminant levels to the extent needed to satisfy EBMUD discharge requirements will be operated on-site. Components of the treatment system may include such equipment as settling tanks, an oil-water separator, particulate filters, activated carbon units, and other filtration media to remove dissolved metals. Effluent discharge compliance sampling will be performed in accordance with permit requirements.

In the event that small quantities of groundwater are generated or effluent criteria are not attainable, the fluids may be temporarily stored on-site in applicable storage containers or conveyed to tanker trucks for transport to a permitted facility.

5.5 Dust and Odor Management Plan

Depending upon the soil and weather conditions during excavation, there is a potential to have a nuisance dust condition. Water will be applied to the work area where soil is being disturbed on an as needed basis to mitigate the potential for dust generation. Dust level monitoring of air will be conducted to evaluate the potential exposure to site personnel and to offsite downwind receptors. The presence of airborne dust will be evaluated through the use of real time personal sampling equipment and perimeter air sampling. The dust standard will be based on a ceiling level of no more than 50 micrograms per cubic meter difference between upwind and downwind sampling locations. If this level is exceeded additional dust suppression activities such as water application, will be conducted in the areas of active soil excavation and handling. Information gathered will be used to verify the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of personal protection, at the discretion of the Site Safety Officer. Dust level monitoring for air is further described below.

Stockpile management practices discussed in the previous section will also be used to control fugitive odor or dust emissions in the stockpile staging area. Trucks used for transporting affected soil will be covered to reduce the potential for fugitive dust during transport to the disposal facility. Street sweeping will be used to remove soil/dust from public roadways as required. Swept material will be added to the soil stockpile for subsequent disposal off-site.

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of portable monitoring equipment. Information gathered will be used to ensure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of personal protection, at the discretion of the Site Safety Officer and as described in the site-specific Health and Safety Plan (Appendix D).

The following air sampling equipment will/may be utilized for dust and odor monitoring:

- Photo-Ionization Detector (PID); and
- Dust monitor (MiniRAM, Dataram, or similar).

The PID will serve as the primary instrument for personal exposure monitoring during excavation. The instrument will utilized to fully characterize potential employee exposure and the need for equipment upgrades/downgrades.

Dust monitoring will be conducted to characterize the potential for exposure to site personnel during soil disruption operations using a direct-reading dust monitor. In addition, perimeter or “fence line” monitoring will be performed at a location(s) downwind of site operations on a periodic basis. After initial site screening, personal sampling and/or perimeter air monitoring shall be conducted periodically (e.g., every 30 minutes) or anytime site conditions might be altered (i.e., weather, drilling, excavation, spills, etc.). Pending the initial screening results, the need for continued use of real time personal sampling equipment and perimeter air sampling will be evaluated.

Integrated Industrial Hygiene (IH) sampling for lead will be conducted during the excavation process and/or loading operation. Lead was selected on the basis of its detection in site soil above the RWQCB direct exposure ESL for commercial/industrial workers and for construction/ trench workers of 320 mg/kg for lead in soil. This IH sampling will be performed to properly characterize potential employee exposures and/or to establish baseline levels. Sampling may include personnel monitoring and fence line sampling. The duration of such monitoring will be determined based upon analytical results, regulatory requirements, etc.

> Results of monitoring information shall be recorded, including time, date, location operations, and any other conditions that may contribute to potential exposures. Maintenance and calibration information shall be maintained and made available upon request. The monitoring equipment will be calibrated in accordance with the manufacturer’s specifications, and the records of such maintained with the project health and safety plan.

Dust mitigation measures will be specified based on the results of the dust monitoring.
The best (most reasonable) available control measures will be used to minimize dust emissions. The preferred method of dust control at this site is spraying water over the dust source(s) periodically to keep the exposed surface moist. Plastic sheets will be used to cover stockpiled

soil and construction debris as well as other exposed areas. If the wind speed rises to greater than 15 miles per hour (mph), operations will cease.

Control measures for fugitive dust include, but are not limited to, the following procedures:

- Dust monitoring;
- Watering the area of demolition and/or excavation at least twice daily;
- Covering construction debris and/or soil stock piles with plastic tarps or equivalent;
- Ceasing operation during high wind (greater than 15 mph);
- Sufficiently watering and/or securely covering material transported offsite;
- Minimizing the area that requires excavation and earth moving operation;
- Impose site speed limits for all vehicles to less than 5 miles per hour; and
- Minimizing the drop height of soil from the excavator bucket to the soil stockpile and haul truck bed.

5.6 Stormwater Management

A storm water pollution prevention plan (SWPPP) to address monitoring and mitigation of potential surface stormwater impacts during construction will be prepared by others as part of general construction permitting and planning; as such, it is not a part of the SMP.

5.7 Worker Health and Safety

In addition to following the SMP, each contractor engaged in subsurface construction activities conducted under this SMP will have its workers comply with the site-specific HASP provided in Appendix D. The purpose of the HASP is to provide: (1) health and safety guidelines for those who may potentially encounter chemicals during site excavation for construction of subgrade portions of the building, and in areas where earthwork will be performed outside of the building footprint (e.g., dewatering well installation, underground utility work, etc.); and (2) contingency procedures to be implemented by contractors to protect worker health and safety should hazardous materials be encountered. A HASP has been prepared for the project in accordance with California Occupational Safety and Health Administration (CAL-OSHA) Construction Safety Orders within Title 8 of the California Code of Regulations (CCR). A copy of the HASP is included as Appendix D. All environmental consultants implementing this SMP at the project site are required to be 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)-trained. In addition, contractors working on-site are required to be 40-hour HAZWOPER-trained if they are:

- Working in areas where suspect soil conditions have been identified based on site characterization data or field screening; and
- Conducting activities where exposure to shallow groundwater might occur, such as deeper excavations and monitoring well decommissioning.

However, at the discretion of the construction contractor/manager, in consultation with the environmental consultant, the information gathered during the field screening protocol discussed in Appendix D may be used as the basis for downgrading from the requirement to be 40-hour HAZWOPER-trained.

6.0 CONTINGENCY PROCEDURES

The following contingency measures will be implemented in the event that previously unknown suspect soil conditions or subsurface features (e.g., USTs) are identified during site redevelopment. Contingency measures will be conducted by HAZWOPER-trained environmental professionals and/or workers following the HASP. Preliminary assessment in the vicinity of the previously unidentified suspect soil will include confirmation that access control measures installed by the construction contractor/manager are adequate to provide necessary protection to on-site workers and the public during the evaluation phase. Confirmation will consist of visual assessment of the installed barriers as well as monitoring of the air outside the secured area.

Air sampling will be conducted around the perimeter of the secured area using a combination handheld PID meter to measure VOCs in the breathing zone and a handheld lower explosive limit (LEL)/oxygen (O_2) meter to measure concentrations of combustible gases and available oxygen. If the air sampling suggests that the control measures are improperly positioned to provide necessary protection to on-site workers, the barriers will be relocated as necessary.

The environmental consultant will conduct a preliminary assessment to determine if the previously unidentified suspect soil is considered a significant risk to human health or the environment. The preliminary assessment will be conducted as follows:

1. A soil sample will be collected from the same location and depth as the suspect sample location and 1-foot below this depth. Additional samples will also be collected at the same depths at a minimum of four step-out locations to assess soil condition around the suspect sample location. The four step-out location will be located approximately 5 feet to the north, south, east, and west of the suspect sample location. Each sample will be observed for evidence of odors and staining and screened for VOCs using a PID. Soil samples to be field screened with the PID will be placed in a re-sealable bag and after a minimum waiting period of 30 seconds the PID probe tip will be placed near the soil to obtain a headspace reading in the bag; and

2. If any of the samples show evidence of odors and staining and VOCs are detected above 10 ppmv then environmental sample(s) will be collected following the procedures discussed below. If field observations suggest that the suspect conditions are *de minimus* and: (1) do not present a threat to human health or the environment; or (2) would generally not be subject of an enforcement action if brought to the attention of appropriate governmental agencies; then the consultant will terminate the contingency plan process and release the suspect area to the construction contractor/manager.

If conditions in the suspect area are not considered *de minimus*, the consultant shall evaluate the nature and extent of the potentially chemically-affected soil. This evaluation will include collecting representative sample(s) using hand and/or mechanized equipment at an appropriate frequency determined by the environmental contractor and consultant. The suspect soil sample(s) will then be submitted to a State-certified analytical laboratory for testing in accordance with U.S. EPA-approved methods. The analytical program will be developed by the environmental contractor and consultant based on on-site historical chemical use, visual observations, and field measurements.

After the evaluation is complete, the environmental contractor and consultant shall provide the Owner and construction contractor/manager with conclusions regarding potential risks of the suspect material to human health and the environment as well as recommendations for proper removal and disposal of the affected soil. If soil removal is recommended then the procedures presented in Section 5.0 will be used to manage the soil.

7.0 SMP IMPLEMENTATION REPORTING

Following the completion of subsurface construction and environmental management activities performed under this SMP, an SMP Implementation Report will be prepared to document the completed activities. Depending on the timing and duration of the redevelopment phases, one or more implementation reports may be prepared (i.e., a report may cover one or more construction phases). The reports will describe, as applicable: (1) subsurface environmental features that were encountered, if any, and their disposition; (2) results of additional sampling and analyses, if conducted; (3) description and location of contaminated soil and/or groundwater that were encountered; (4) description of implemented soil and groundwater management procedures; and (5) documentation of offsite soil and groundwater disposal. The report(s) will include applicable permits, maps showing the locations of contaminated soil and/or groundwater encountered, and copies of laboratory analytical reports for soil and/or groundwater samples. The reports will be submitted to ACEH for review and concurrence that the work was completed in accordance with the applicable Deed Covenants and this SMP.

8.0 POST CONSTRUCTION OPERATION AND MAINTENANCE

8.1 Post-Construction Operation and Maintenance Plan

After construction and redevelopment, inspection and maintenance of the surface cap features (concrete building slab, asphaltic concrete parking garage/lot, and open and landscaped areas) and vapor mitigation system will be performed to ensure their condition and performance is maintained consistent with design parameters. The goal of the inspection and maintenance actions is to maintain the integrity and performance of the cap and vapor mitigation system. These activities are outlined along with additional information in the Post-Construction Operation and Maintenance Plan presented in Appendix F. The plan details procedures to be followed and actions to be taken, defines the frequency of inspections/maintenance checks to be performed, and documents reporting requirements.

8.2 Intrusive Earthwork Guidance Plan

An Intrusive Earthwork Guidance Plan (Plan), has been prepared to manage intrusive earthwork activities that may occur post-construction at the site. A copy of the Plan is provided in Appendix E.

The Plan has been developed to provide: (1) an summary of subsurface environmental conditions at the site; (2) a description of unregulated or routine activities which may be conducted at the site; (3) a description of regulated activities to which the Plan applies; (4) procedures to be followed prior to commencement of regulated activities; (5) guidance for Contractor development of a HASP; and (6) soil management procedures to be followed so that potentially hazardous materials, if encountered, are handled, managed and disposed in accordance with applicable regulatory requirements.

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ILLUSTRATIONS

APPENDIX A

SUMMARY OF PRIOR ENVIRONMENTAL INVESTIGATIONS AND REMEDIAL ACTIONS

APPENDIX A

SUMMARY OF PRIOR ENVIRONMENTAL INVESTIGATIONS AND REMEDIAL ACTIONS

The following sections provide a summary of site characterization and remediation activities and other environmental actions conducted at the subject property. Pertinent reference documents are included in Section 9.0, and copies of historical data tables and plates from previous reports are presented in Appendix G. Previous investigation sampling locations are included on Plate 3.

A.1 1989 Site Inspection, Waste Characterization and Disposal, and Site Investigations

The ACEH inspected the MRCP facility in January 1989, and subsequently issued MRCP a Notice of Violation under four sections of the California Code of Regulations (CCR), Title 22. The violations included citations for lack of an EPA identification number, no copies of hazardous waste manifests on-site, on-site storage of hazardous waste for more than 90 days, and hazardous waste storage areas that lacked secondary containment (ACEH, 1989). Following the 1989 ACEH inspection and NOV citation to MRCP, LW Environmental conducted characterization for 90 drums of hazardous waste and other waste materials at the facility which were then profiled and properly disposed off-site (LW Environmental, 1989a). LW Environmental identified additional environmental concerns at the site including a sump on the west side of the warehouse building that collected chemical wastes from drains in the warehouse (and connected to the municipal sewer system), a ditch area along the western property boundary that received runoff from paved areas including the drum storage area, and three USTs that were located in the eastern portion of the site. From April to September 1989, LW Environmental conducted the following site assessment work (LW Environmental, 1989b, 1989c, and 1989d). The three USTs were removed in October 1989 as discussed below.

- The sump area on the west side of the warehouse building was excavated on August 21, 1989. The location of the sump excavation is shown on Plate 3. The confirmation sample collected at 1-foot below ground surface (bgs) from the sump area was nondetect for purgeable organic compounds;

- The ditch area along the western side of the property line where runoff from the asphalt was channeled (Plate 3) was excavated to approximately 3 feet bgs on August 21, 1989. Confirmation samples collected at 1 and 3 feet bgs were analyzed for purgeable organic compounds. Ethylbenzene, total xylenes, and/or toluene were detected in the one-foot depth sample at concentrations of 20 milligrams per kilogram (mg/kg), 360 mg/kg, and 80 mg/kg, respectively. Ethylbenzene and total xylenes were detected in the three-foot depth sample at concentrations of 20 mg/kg, and 77 mg/kg, respectively. Toluene was not detected at or above the laboratory reporting limit of 4,000 mg/kg;

- From April 26 to August 31, 1989, LW Environmental drilled eight borings (IS-1, IS-2, and B-1 through B-6) and installed four groundwater monitoring wells (MW-1 in boring B-1, MW-3 in boring B-3, MW-5 in boring B-5, and MW-6 in boring B-6).

  Soils samples from the boring were analyzed for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylenes, (BTEX), oil & grease, polychlorinated biphenyls (PCBs), halogenated volatile organic compounds (VOCs), and 17 CAM (California Title 22) metals. Analytical results for the soil samples indicated the presence of TPH (as diesel and gasoline), oil & grease, PCBs, and metals (i.e., cadmium, cobalt, copper, lead, nickel vanadium, and zinc). Oil & grease were detected at concentrations up to 36,535 mg/kg. Lead and zinc were detected at concentrations up to 4,300 and 6,040 mg/kg, respectively. Relatively low concentrations of BTEX, and halogenated VOCs (1,2-dichloroethane [1,2-DCA], tri-chloroethene, and chlorobenzene) were also detected in the soil samples.

  Groundwater samples were collected from monitoring well MW-1 on July 8 and September 7, 1989, and from monitoring wells MW-3, MW-5, and MW-6 on September 7, 1989. Groundwater samples were analyzed for TPH as diesel, TPH as gasoline, oil & grease, BTEX, purgeable organics, halogenated VOCs, acid and base neutral extractables (semi-volatile organic compounds [SVOCS]), and CAM metals. Analytical results indicated nondectable concentrations for TPH as diesel, TPH as gasoline, oil & grease, halogenated VOCs, and PCBs. One SVOC, bis-(2-ethylhexyl)phthalate, was detected in groundwater samples from all the wells. The groundwater sample from well MW-5 also had detectable concentrations of three other SVOCs (2,4-dimethylphenol, naphthalene, and 2-methyl-naphthalene), and four VOCs (vinyl chloride, trans-1,2-dichloroethene [trans-1,2-DCE], benzene and ethylbenzene). The groundwater sample from well MW-1 was analyzed for the list of CAM (Title 22) 17 metals and no metals were reportedly detected at concentrations above the Title 22 Soluble Threshold Limit Concentration (STLC) values; and

- Groundwater elevation data collected on September 7, 1989 indicated a local groundwater flow direction towards the northwest.

Based on the results of the investigations, LW Environmental recommended that hydrocarbon impacts to shallow soils at the rear of the site (assumed to be ditch area along the western side of the property) should be further delineated and excavated, and continued groundwater sampling for the existing monitoring wells should be conducted to monitor contaminant concentrations.

A.2 1989 Underground Storage Tank Removal

On October 2, 1989, LW Environmental oversaw the removal of the contents of the three USTs located on the eastern side of the subject site (LW Environmental, 1989e). The approximate extent of the former UST excavation and confirmation sample locations are shown on Plate 3. According to the Underground Tank Closure/Modification Plans form submitted to ACEH, the USTs historically contained solvents and had capacities of 1,650, 2,000, and 3,200 gallons. Approximately 1,075 gallons of liquid, which was profiled as MEK and water, was pumped from the USTs and transported off-site for disposal.

On October 5, 1989, the USTs were removed and transported off-site for disposal. Soil excavated during the removal was stockpiled on-site. After the USTs were removed, soil confirmation samples were collected (under the direction of an ACEH inspector) along the excavation walls at both ends of the USTs (sample IDs SS-1 through SS-6). The samples were analyzed for total petroleum hydrocarbons quantified as diesel (TPHd) and TPH quantified as gasoline (TPHg), BTEX, and halogenated VOCs. The confirmation samples analytical results indicated the presence of TPHg, TPHd, BTEX, 1,2-dichlorobenzene (1,2-DCB), 1,3-dichlorobenzene (1,3-DCB), and 1,4-dichlorobenzene (1,4-DCB).

Based on a December 19, 1989 letter from SCS Engineers to Mr. John Nady, the soil that was excavated during the removal of the USTs was placed back into the excavation upon agreement with LW Environmental (SCS Engineers, 1989) because it contained "relatively high concentrations of methyl-isobutyl-ketone." SCS Engineers indicated in the letter that a soil vapor extraction system would be installed to remediate this soil.

A.3 1989 Phase I Review of Documents and Verification of Groundwater Flow Direction

In November 1989, McLaren prepared a review of the environmental work performed to date at the site and verified groundwater flow direction (McLaren, 1989). The scope of work included a site visit (including a building walk through) and neighborhood drive-by, a review of published lists for known hazardous waste sites, surveying of four existing site groundwater wells, and measurement of the water levels in the wells to verify the groundwater flow direction.

Results of McLaren's work verified that the apparent groundwater flow direction is to the northwest in the vicinity of the USTs. Based on their review findings, McLaren recommended:

- Further review of neighboring sites and historical chemical use to determine if off-site contamination is migrating onto the site;
- Further excavation in the UST area and additional soil and groundwater sampling in this area;

- Conduct a second round of sampling on the four on-site monitoring wells to establish baseline conditions; and

- Install wells and soil borings upgradient of well MW-5 to determine whether contaminated groundwater is migrating onto the subject site from the adjacent 6601/6603 Shellmound Street property to the south.

A.4 1990 Environmental Assessment

SCS Engineers' Environmental Assessment of the site consisted of: (1) performing an off-site records search and assessment, and a reconnaissance of the site and surrounding areas; and (2) conducting a subsurface investigation in January 1989 (SCS Engineers, 1990). The subsurface investigation involved drilling five borings (i.e., B-9 through B-13) and installing two groundwater monitoring wells (i.e., MW-7 and MW-8). Well MW-8 was installed within 10 feet to the northwest (downgradient) of the UST excavation and MW-7 was installed in the former drum storage area in the southwest portion of the site. These monitoring wells and the four existing wells (i.e., MW-1, MW-3, MW-5, and MW-6) were sampled as part of their investigation activities.

SCS Engineers concluded that their off-site records search and assessment indicated that there is a possibility that the site was being impacted by contamination from off-site sources and that the site may possibly be located over an abandoned landfill. Construction and fill debris was found in the borings advanced during the investigation. Soil saturated with black oil-like substance was observed in samples from borings B-9, B-10, B-11 and MW-7.

In summary, the subsurface investigation found contamination in vadose zone soil and groundwater beneath the site. Oil & grease (up to 45,000 mg/kg) was detected in all of the soil samples, and diesel (up to 5,050 mg/kg) and PCBs (up to 4.2 mg/kg) were detected in some of the soil samples. Metals were detected in the soil samples with lead concentrations as high as 3,000 mg/kg in boring B-12. Low levels of VOCs (including MIBK at 8.3 mg/kg in boring MW-8 and BTEX in borings B-7, B-9, B-10 and B-11) were found in soil. SVOCs, including chrysene, fluoranthene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, benzo (a) anthracene, and benzo (a) pyrene, were also detected in soil from several borings. The groundwater monitoring well samples showed little or no contamination in most of the wells except:

- Benzene in wells MW-5 (at 12 micrograms per liter [μg/L]) and MW-8 (up to 2,100 μg/L);

- TPH (analyzed by U.S. EPA Method 418.1) at concentrations ranging from 500 μg/L (in well MW-1) to 103,000 μg/L (in well MW-8); and

- MIBK (160,000 μg/L) in well MW-8.

Based on the results of their investigations, SCS Engineers concluded that the MIBK impacts near the former USTs was the primary concern at the site and recommended the installation of soil vapor extraction system and groundwater extraction and treatment system in the vicinity of the former USTs to remove and treat MIBK in soil and groundwater. SCS Engineers also recommended installation of a system in the southwest portion of the site using either well MW-5 or MW-7 to extract and treat groundwater to address TPH contamination in this area. The source of other contaminants in soil (heavy oil & grease, PCBs, SVOCs, and metals) was primarily attributed to sources in the fill material and former landfill.

A.5 1990 Preliminary Assessment

ICF conducted a PA of the subject property in 1990 on behalf of the U.S. EPA (ICF, 1990). The U.S. EPA requested the PA because the subject property was identified as a potential hazardous waste site and entered into CERCLIS on February 13, 1989. The site was entered into the CERCLIS files in February 1989 due to a telephone complaint concerning the storage of drums behind the warehouse. ICF's PA report discussed the site's facility process and waste management, apparent problems, regulatory involvement with the site, operation history, investigation efforts and results to date, and hazard ranking system factors, which assesses the relative threat associated with actual or potential releases of hazardous substances at the site. Based on the report's findings, U.S. EPA recommended the site for low priority SSI (site status information).

A.6 1991 Interim Report for Construction and Operation of the Remediation Systems

SCS Engineers prepared this document to provide updated information regarding subsurface conditions beneath the site, and to discuss construction and operation of the remediation systems installed at the site (SCS Engineers, 1991). The report indicated that SCS Engineers had conducted the following work since January 1990:

- Pump test at MW-7 and MW-8 were conducted in July 1990;
- Construction of the remediation systems took place from June through September 1990;
- The vapor extraction and treatment system began operating in July 1990 and the groundwater extraction and treatment system began operating in October 1990; and
- The groundwater remediation effluent and influent were sampled in November and December of 1990 and the rate of flow from the system was measured to determine the amount of water being discharged to the landscaped area.

The report indicated a vapor extraction system was installed in the area of the former USTs, and groundwater extraction and treatment systems were installed in the vicinity of the UST excavation using well MW-8 as an extraction well and in the southwest portion of the site using MW-7 as an extraction well.

The vapor extraction system ran from late July to late September 1990 and the influent vapor stream readings dropped to 2 parts per million (ppm) before the system was shutdown to allow contaminants to buildup in the vicinity of the extraction wells. The report indicated that after the shutdown the system had not exceeded 10 ppm since October 22, 1990. Based on these results they concluded that the system appeared to have been successful.

The report also discussed pre-remediation groundwater results for wells MW-7 and MW-8 versus results for samples collected 2-months into remediation. Lower TPH concentrations were detected in both wells, and lower concentrations of benzene and MIBK were detected in well MW-8.

A.7 1991 Investigation of Site Conditions Near the Former USTs

PES prepared a report in 1991, which was addressed to the ACEH, summarizing results of the investigation of site conditions in the vicinity of the former USTs conducted in September 1991 (PES, 1991). The investigation consisted of:

- Drilling two soil borings (i.e., PB-1 and PB-2) in the area of the former USTs and collecting soil samples for laboratory analysis; and

- Sampling and analysis of groundwater from three existing monitoring wells (MW-1, MW-3, and MW-8) in the area of the former USTs to evaluate groundwater conditions.

No contaminants were detected in the soils in the vicinity of the former USTs. Based on these results PES concluded that the soil vapor extraction system appeared to have been effective in reducing MIBK concentrations in unsaturated soils in the vicinity of the former USTs. In the report, PES recommended that the ACEH approve no further action with respect to soil contamination in the former UST area and allow the system to be abandoned.

The groundwater results indicated that detectable amounts of MIBK were present in the area of the former USTs. Analysis of groundwater from MW-8 showed the presence of MIBK at 150,000 μg/L. Groundwater from MW-1 showed the presence of benzene at 7 μg/L, toluene at 8 μg/L, and xylenes at 3 μg/L. PES indicated that MIBK had not been detected in any well other than MW-8. PES also noted that benzene, toluene, and xylenes were detected in MW-1 for the first time and that no toluene and xylenes have been detected in the vicinity of the former USTs. Groundwater monitoring for three additional quarters was recommended to monitor the apparent lack of MIBK migration and sporadic low concentrations of benzene, toluene, and xylenes.

A.8 1992 Site Inspection

Bechtel conducted a site inspection of the subject property in 1992 on behalf of the U.S. EPA (Bechtel, 1992). As discussed above, a PA of the subject property was conducted for the EPA by ICF in 1990. The inspection report indicated that MIBK, lead, copper, zinc, benzene, and toluene were detected in groundwater at the site and subsurface soil sampling indicates the presence of MIBK, lead, copper, zinc, and BTEX. Bechtel's report discussed the site's operational history, investigation efforts and results to date, and hazard ranking system factors, which assesses the relative threat associated with actual or potential releases of hazardous substances at the site. Based on the report's findings, U.S. EPA recommended no further action was required under the authority of CERCLA.

A.9 1993 Treatment System Decommissioning

As discussed in the *Quarterly Groundwater Monitoring and Treatment System Decommissioning* prepared by Subsurface Consultants, Inc., the treatment systems were decommissioned in May 1993 (Subsurface Consultants, Inc., 1993a).

A.10 1994 Supplemental MIBK Contamination Assessment

Subsurface Consultants, Inc. conducted a supplemental investigation to further investigation the extent of MIBK in the vicinity of the former USTs (Subsurface Consultants, Inc., 1994c). The investigation involved:

- Drilling nine borings (i.e., T1 through T7 and the two well boreholes indicated below) to depths of approximately 15 feet bgs;
- Installing monitoring wells in two of the boring (i.e., MW-9 and MW-10);
- Sampling wells MW-8, MW-9, and MW-10 in April 1994, well MW-8 in May 1994, and wells MW-1, MW-3, MW-8, MW-9, and MW-10 in August 1994; and
- Performing slug tests in monitoring wells MW-3, MW-8, MW-9, and MW-10 to estimate the hydraulic conductivity of soils in the former UST area.

In soil, MIBK was detected in 5 of 16 samples at concentrations ranging from 6 micrograms per kilogram (μg/kg) to 7,800 μg/kg (in the 14 feet bgs sample collected from boring T7). In groundwater, MIBK was detected at concentrations ranging from 23 μg/L in well MW-10 (April event) to 140,000 μg/L in well MW-8 (May event).

Based on the results of the investigation Subsurface Consultants, Inc. concluded that significant soil and groundwater remediation had occurred in the area of the former USTs, but elevated levels of MIBK still remained, predominantly within clayey soil and in groundwater downgradient of the former USTs.

A.11 Deed Notice

As discussed previously, a deed notice was provided to the ACEH on February 1, 1995 as a requirement by the ACEH and the California Regional Water Quality Control Board for the San Francisco Bay Region for closure of the UST case (Pettit & Martin, 1995). The deed notice imposed the following conditions and/or restrictions on the use of the property:

1. If soil is excavated, it may be considered hazardous waste under state and federal law;
2. Groundwater from the site is not usable for domestic, irrigation or industrial purposes;
3. If future construction includes structures extending below the ground level (that being approximately 7 to 10 feet), groundwater generated during dewatering operations will require treatment prior to discharge;
4. An approved Health and Safety Plan will be required by the Alameda County Health Care Services Agency (ACHCSA) prior to any work requiring significant subsurface excavations; and
5. An environmental risk assessment may be required by the ACHCSA if any significant change in land use is proposed.

Subsequently in December 1996, following the completion of groundwater monitoring activities at the site, the ACEH issued a conditional site closure letter stating that further remediation and/or monitoring related to the former USTs removed from the site is not required, but the recorded deed notice must be modified to include the following risk management measures (ACEH, 1996):

1. The shallow groundwater beneath the site shall not be used. This statement should replace condition #2 as recorded in the previous deed notice.
2. Appropriate Health and Safety plans shall be prepared prior to and followed during any activities involving exposure to pollution in soil or groundwater. This statement should replace condition #4.
3. A health risk assessment shall be required if a change in land use, structural configuration or site activities are proposed such that more conservative scenarios should be evaluated. This statement should replace condition #5.
4. Potential vertical conduits between the shallow and deep aquifers shall not be created. This statement should replace condition #6.

No information was obtained by PES that indicated the deed notice had been modified to be consistent with the December 1996 letter.

A.12 1993 to 1996 Groundwater Monitoring Activities

Subsurface Consultants, Inc. conducted periodic groundwater monitoring from 1993 to 1996 which included sampling and analysis for VOCs for monitoring wells MW-1, MW-3, MW-8, MW-9 and MW-10. The monitoring activities, results and data are presented in associated monitoring reports (Subsurface Consultants, Inc., 1993a, 1993b, 1994a, 1994b, 1995b, 1995c, and 1996). The following summarizes the monitoring data:

- No VOCs were detected in groundwater samples from wells MW-1 and MW-3;

- With the exception of MIBK detected at a concentration of 120 μg/L in April 1994, no VOCs were detected in groundwater samples from well MW-9;.

- For well MW-10, MIBK was detected at a concentration of 23 μg/L in April 1994, and benzene was detected at concentrations ranging from 6.6 to 31 μg/L in April 1994 to May 1996. Low concentrations of chlorobenzene (3.0 to 3.5 μg/L) were reported in groundwater samples from well MW-10 in February and May 1995, and May 1996. Carbon disulfide was reported at a concentration of 3.0 μg/L in May 1995; and

- For well MW-8, MIBK was detected at concentrations ranging from 840 to 140,000 μg/L during 1993 to 1996, benzene was detected at concentrations of 63 to 69 μg/L in February to November 1995, and acetone and MEK were detected at concentrations of 40 and 78, μg/L, respectively in February 1995. Low concentrations of chlorobenzene (10 and 11 μg/L) were reported in groundwater samples from well MW-8 in February and May 1995.

During the final monitoring event, which was conducted on May 9, 1996, water samples were collected from wells MW-1, MW-8, MW-9, and MW-10. Constituents detected during this event included:

- MIBK at a concentration of 15,000 μg/L in well MW-8;

- Benzene and chlorobenzene in well MW-10 at concentrations of 7.5 μg/L and 3.5 μg/L, respectively;

- Total extractable hydrocarbons (TEH) at concentrations ranging from 1.0 to 5.7 milligrams per liter (mg/L); and

- Total volatile hydrocarbons (TVH) at concentrations ranging from 0.05 to 3.6 mg/L.

Subsurface Consultants, Inc. indicated that all measured required in the *Addendum No. 1, Work Plan and Revised Request for "No Further Action"* were completed and requested confirmation that "no further action" was required for the site and that the site may be closed (Subsurface Consultants, Inc., 1995a).

A.13 April 2013 Phase I Site Assessment and Phase II Investigation

ENVIRON International Corporation (ENVIRON) conducted a Phase I ESA and Phase II investigation of the site in April 2013. The findings of their Phase I ESA and Phase II investigation are presented in the July 3, 2013 draft report titled Phase I Environmental Site Assessment (ENVIRON, 2013b). The results of the Phase II investigation are also presented in ENVIRON's document titled Summary of Environmental Findings (ENVIRON, 2013a).

During the Phase II investigation, ENVIRON collect soil, soil gas, and/or grab groundwater samples from locations SG-1 through SG-5. The analytical results for the investigation are summarized below:

- Soil: Impacted with TPHd and TPH quantified as motor oil (TPHmo). PCBs were detected at concentrations above regulatory screening levels at locations SG-3 (at 14 mg/kg) and SG-4 (at 8 mg/kg). The pesticide DDT was detected at 4 of the 5 locations, but at concentrations below regulatory screening levels. Elevated concentrations of metals (primarily arsenic and lead) where detected in most of the soil samples;

- Grab Groundwater: Impacted with TPHd and TPHmo at concentrations above regulatory screening levels. Groundwater on the western portion of the site (SG-5) is also impacted with VOCs including benzene, ethylbenzene, naphthalene, and xylenes. Elevated concentrations of total metals (antimony, arsenic, barium, cadmium, cobalt, copper, lead, mercury, molybdenum, nickel, silver, vanadium and zinc) were detected. Subsequent groundwater sampling and analysis for dissolved metals indicated these findings were anomalous[1]; and

- Soil Gas: VOCs were detected in soil gas samples collected from locations SG-1 through SG-5. Benzene was detected at locations SG-3 and SG-4 at concentrations that are above the California Human Health Screening Levels[2] (CHHSLs) for shallow soil gas at residential sites. The presence of tracer gas and elevated levels of oxygen and argon in the soil gas sample from SG-3, suggest that the sample may have been affected by ambient air and therefore may not be representative of subsurface conditions.

Based on findings of these Phase I ESA and Phase II investigation, ENVIRON identified the following RECs in connection with the property:

- Soil, soil gas, and groundwater contamination detected during environmental investigations conducted at the site;

- Residual contamination from prior environmental remediation activities; and

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[1] As discussed in Section 2.14, subsequent sampling and analysis indicates that the reported values of metals in groundwater are not reflective of actual site conditions.

[2] DTSC, 2005. Use of *California Human Health Screening Levels in Evaluation of Contaminated Properties*. January.

- Open SLIC Case. The site is listed on the SLIC database as being the focus of an open remediation case at the ACEH Local Oversight Program (LOP).

A discussion of each of these RECs is presented in ENVIRON's report.

A.14 November 2013 Supplemental Subsurface Investigation

In November 2013, PES conducted a supplemental subsurface investigation at the subject property (PES, 2014a). The investigation consisted of drilling, logging and sampling at 18 soil borings at exterior (SB1 through SB13) and interior (SB14 through SB18) locations. Large diameter continuous soil cores were retrieved from the soil borings and logged to evaluate subsurface lithologic and fill material conditions. In addition, groundwater samples were collected through temporary well casings from six borings (GGW-1 through GGW-6) advanced in the exterior portions of the site.

In summary, the results of the supplemental investigation indicated:

- Fill material ranging from 14 to 19 feet thick underlies the entire, and is generally thinner in the central portion of the site and toward the west, and thickest toward the northern and southern portions of the site. Fill material debris, including brick, metal, concrete, asphalt, glass, wood, fabric, and rubber, has been encountered throughout the site, but is generally most abundant on the western half of the site and at depths below approximately 8 to 10 feet bgs. Fine-grained Bay Mud deposits were encountered directly below the fill material;

- The soil results for samples collected from the fill material suggest the presence of elevated concentrations (i.e., equal to or above regulatory screening levels[3]) of SVOCs, PCBs, and metals (i.e., antimony, arsenic, cadmium, cobalt, copper, lead, nickel, vanadium, and zinc). The concentrations of lead in five of the samples and vanadium in one sample also exceeded their respective Total Threshold Limit Concentration (TTLC) values;

- Waste Extraction Test (WET) was performed on seven selected samples; five of the seven results were at concentrations above the STLC lead limit of 5.0 milligrams per liter (mg/L). The Toxicity Characteristic Leaching Procedure (TCLP) was performed on eight soil samples with elevated total lead concentrations. Only one sample contained a concentration that was above the TCLP lead limit of 5.0 mg/L; and

- Groundwater is impacted with dissolved metals (i.e., arsenic and lead) that exceed State of California Maximum Contaminant Levels (MCLs[4]).

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[3] U.S. Environmental Protection Agency (U.S. EPA), Region 9, November 2013 Regional Screening Levels (RSLs) for residential soil.

[4] California Department of Public Health Maximum Contaminant Levels (MCLs).

The maximum concentration of dissolved lead detected in groundwater during PES investigation was 190 μg/L in boring GGW-2. This boring was advanced on the western portion of the site. PES indicated that based on a comparison of dissolved lead and other metals results to those obtained during the April 2013 investigation, it appears that the April 2013 metal results were anomalously high and, therefore, not representative of groundwater conditions beneath the site.

A.15 November 2013 Phase I Site Environmental Site Assessment

PES conducted a Phase I ESA of the site in November 2013. The findings are presented in the Phase I ESA report dated January 17, 2014 (PES 2014b) and summarized below.

The subject property consists of land reclaimed by filling from San Francisco Bay and has been the subject of industrial uses since the early 1960s. Numerous environmental investigations have been undertaken to evaluate the site, as well as several remedial actions to mitigate documented environmental conditions. The LUST case has been closed under conditions associated with a deed notice. The SLIC case for the site is still open.

Based on findings of the Phase I ESA, PES identified the following RECs in connection with the property.

- The site is underlain by heterogeneous fill placed to create buildable land, like much of the filled bay-shore area of Emeryville. As such, sporadic and various chemicals can be detected when samples of soil, soil gas, and/or groundwater are tested. In addition, releases associated with the former USTs and the site's historical use may have contributed to chemical constituents detected in soil, groundwater, and soil gas samples collected during environmental investigations conducted at the site; and

- Environmental investigations at the site have identified the presence of primarily non-chlorinated VOCs in soil, soil vapor, and groundwater. If these VOCs in the subsurface are unmitigated, there is a potential for vapor intrusion on the subject property.

The following Controlled REC[5] has been identified at the subject property:

- Three USTs were removed from the subject property in 1989. The LUST case for the former USTs has been closed under conditions associated with a deed notice.

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[5] A Controlled REC is defined in the American Society for Testing and Materials guidelines for Phase I Environmental Site Assessments (ASTM E 1527-13) as a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

In addition, PES noted the following observations during the performance of the Phase I ESA:

- The presence of four unlabelled 55-gallon drums, which are located adjacent to the southwest corner of the warehouse building. Three of the four drums were covered. The uncovered drum appears to contain soil. The content of the remaining drums is not known. The drums are aged and discolored, but appeared to have maintained their integrity and no evidence of staining was observed. Characterization and proper off-site disposal of the drums should be conducted; and

- Numerous groundwater monitoring wells associated with the closed LUST case and vapor wells installed during prior investigations are currently located on the subject property. These wells should be properly destroyed under permit.

A discussion of each of these RECs and observations is presented in PES' report.

APPENDIX B

2015 SOIL VAPOR INVESTIGATION

APPENDIX B

2015 SOIL VAPOR INVESTIGATION

1.0 INTRODUCTION

This report has been prepared by PES Environmental, Inc. (PES) on behalf of Anton Emeryville, LLC (Anton) to document the results of a limited soil vapor and sub-slab vapor sampling investigation conducted at the property located at 6701-6707 Shellmound Street (previously known as Bay Street) in Emeryville, California (the site, as shown on Plates 1 and 2 of the Site Management and Contingency Plan [SMP]).

The subject property is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case with Alameda County Environmental Health Services (ACEH) as the lead environmental regulatory agency. The SLIC case is listed in the State Water Resources Control Board (SWRCB) GeoTracker database under Mike Roberts Color Production (MRCP) at 6707 Bay Street, and the database lists other solvents and non-petroleum hydrocarbons as the potential contaminants of concern. PES is assisting Anton in working with ACEH to obtain SLIC case closure as part of the site redevelopment process.

During a meeting at ACEH on April 8, 2015, a limited soil vapor and sub-slab investigation was agreed to be conducted to further evaluate subsurface conditions in the vicinity of the former underground storage tanks (USTs) and beneath concrete slab of the existing warehouse building. The additional investigation included conducting soil gas and sub-slab vapor sampling for VOCs, methane, carbon dioxide, and oxygen in order to advance the open SLIC case towards closure and assess the site for potential vapor intrusion concerns. Accordingly, on April 24, 2015 soil vapor samples were collected from three exterior locations at approximate depths of 5 and 10 feet below ground surface (bgs) and sub-slab vapor samples were collected from four interior locations on the site and analyzed for VOCs including methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK), and methane, carbon dioxide, and oxygen.

This report is organized as follows:

- Section 2 summarizes the field activities and methods utilized for the soil vapor and sub-slab vapor investigations;
- Section 3 summarizes the soil vapor and sub-slab vapor laboratory analytical results; and
- Section 4 contains a discussion of the investigation results and presents recommendations based on the findings of this investigation.

2.0 SOIL VAPOR AND SUB-SLAB VAPOR SAMPLING ACTIVITIES AND METHODS

On April 24, 2015, soil vapor and sub-slab vapor samples were collected from select areas beneath the site (Plate B-2). The following sections present the field activities and methods and analytical results for the soil vapor and sub-slab vapor investigations. The survey followed the procedures outlined in the document titled *Advisory – Active Soil Gas Investigations* (ASGI; DTSC, 2012)[1]. Drilling and sampling activities were conducted with oversight by a licensed California Professional Geologist.

2.1 Pre-Field Activities

PES coordinated with the property owner and site occupants to arrange for access to the site, and a subsurface drilling permit (Well Permit No. W2015-0338) was obtained from the Alameda County Public Works Agency, Water Resources Section (ACPWA). A copy of the permit is provided in Appendix B-A. PES updated the existing Health and Safety Plan (HASP) for the site, which complies with applicable federal and California Occupational Safety and Health Administration (OSHA) guidelines, for use during the soil vapor and sub-slab vapor sampling activities.

Underground Service Alert was contacted more than 48 hours before beginning drilling activities and C. Cruz Sub-Surface Locators, Inc. of Milpitas, California was retained to clear the soil vapor sample locations for subsurface utilities. PES retained Environmental Control Associates, Inc. (ECA) of Santa Cruz, California, a State of California C-57-licensed drilling contractor, to install the soil vapor probes and sub-slab sampling ports.

2.2 Soil Vapor Sampling

Soil vapor samples were collected on April 24, 2015 at the three locations (SV1, SV2, and SV3) shown on Plate B-2 to assess current soil vapor conditions at multiple depths in the vicinity of the former underground storage tanks (USTs).

Under PES oversight, the temporary soil vapor sampling probes were installed by ECA using a limited access, hydraulically-driven, direct push Geoprobe™ drill rig. Soil samples were collected continuously for lithologic description, field screening for VOCs using a photoionization detector (PID). Reusable drilling and soil sampling equipment coming in contact with subsurface material were decontaminated between sampling points using an Alconox™ wash and potable water rinse.

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[1] (DTSC, 2012). *Advisory - Active Soil Gas Investigations*. Jointly developed by the California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board – Los Angeles Region (LARWQCB) and RWQCB - San Francisco Region (SFRWQCB). April.

Upon reaching the target depth of 10.25 feet bgs at boring location SV1, a new ceramic soil vapor probe was placed at approximately 10 feet bgs within a #2/12 sand pack extending three inches above and below the sampling interval, and attached to ¼-inch diameter Teflon™ tubing extending to ground surface. One foot of dry granular bentonite was placed on top of the sand pack to preclude the infiltration of hydrated bentonite grout into the sand pack. The borehole annular space between approximately 8.75 and 5.25 feet bgs was filled with hydrated bentonite. At boring locations SV2 and SV3, groundwater was encountered at a depth of approximately 10 feet bgs, therefore the probe tip was placed at 9.5 feet bgs within a sand pack extending three inches above and below the sampling interval, one foot of dry granular bentonite was placed on top of the sand pack, and the borehole annular space between approximately 8.25 and 5.25 feet bgs was filled with hydrated bentonite.

A shallower soil vapor probe was installed within the same borehole as the deeper probe at each boring location. The shallow ceramic probe tip was placed at approximately 5 feet bgs within a #2/12 sand pack extending three inches above and below the sampling interval, and attached to ¼-inch diameter Teflon™ tubing extending to ground surface. One foot of dry granular bentonite was placed on top of the sand pack. The borehole annular space from approximately 3.75 feet bgs to ground surface was filled with hydrated bentonite. The upper end of the tubing for each probe was capped with a vapor-tight fitting and marked at the surface to identify the probe location and depth. Boring logs and soil vapor probe construction details are included in Appendix B-A.

Each soil vapor probe was allowed to equilibrate for a minimum of two hours after installation. Prior to purging and collecting the soil vapor samples, shut-in leak testing was performed. The shut-in test consisted of assembling the above-ground sampling apparatus (e.g., valves, lines and fittings downstream from the top of the probe), and evacuating the lines to a measured vacuum of approximately 100 inches of water column (inH$_2$O), then shutting the vacuum in with closed valves on each end of the sampling train. A vacuum gauge was then used to assess any observable loss of vacuum for a minimum period of one minute prior to purging and the collection of soil vapor samples. If observable vacuum loss was noted, then the sample train was re-assembled and the shut-in test was repeated. This process was repeated as necessary until a successful shut-in test was performed.

The volume of the sampling tubing, soil vapor probes, and sand pack void space was then calculated and a minimum of three volumes were purged using a six-liter SUMMA™ canister prior to collecting each soil vapor sample.

Following completion of the shut-in leak test and purging, sample train leak testing was performed using 1,1-difluoroethane (1,1-DFA) as a propellant tracer in combination with a shroud box. The tracer shroud box consisted of a polycarbonate box equipped with a sampling port. The sample train was connected to a 1-liter batch-certified clean SUMMA™ canister, a second SUMMA™ canister was set up to sample air within the shroud box, and the shroud box was placed over the soil vapor probe and sample train. Prior to sampling, the shroud box was charged by spraying 1,1-DFA propellant into the shroud box through an access

port. The shroud box was allowed to remain in place for the duration of sampling.
In accordance with the ASGI, purging and collection of soil vapor samples was performed using a flow rate of 100 to 200 milliliters per minute (mL/min) and maintaining a vacuum of less than 100 inH2O. Each sample canister was filled until the vacuum gauge read approximately 5 inches of mercury (inHg).

Following the completion of the soil vapor sampling at each location, ECA removed the sampling probe and backfilled the boring with neat cement grout. The ground surface was repaired to match the surrounding surface. Investigation-derived waste (IDW) soil was contained in one 5-gallon bucket and stored onsite pending profiling and transportation to an appropriate waste disposal or recycling facility.

2.3 Sub-Slab Vapor Port Installation and Sampling

On April 24, 2015, sub-slab vapor samples were collected at the four locations (SSV1 through SSV4) shown on Plate B-2 to assess concentrations of VOCs beneath the onsite warehouse building.

Under PES oversight, ECA installed four sub-slab vapor sampling ports at locations in the warehouse. The sub-slab vapor ports were co-located with previous borings SB14, SB16, SB17 and SB18, which were advanced by PES in November 2013 (Plate B-2).

Each sub-slab sampling port was installed by drilling a 5/8-inch diameter hole through the concrete slab and into the underlying fill material using a hand-operated rotary hammer drill. A sub-slab implant, consisting of a three inch long purpose-made brass barb fitting and silicone sleeve (Vapor Pin™, manufactured by Cox-Colvin & Associates of Plain City, Ohio), was then hammered into the drill hole using a dead blow mallet. A secondary seal consisting of a 1-inch thick layer of hydrated bentonite was then placed at the interface between each implant and the surrounding concrete slab. Each implant barb was then fitted with a vapor- and water-tight rubber cap. Each sub-slab vapor sampling point was allowed to equilibrate for a minimum of two hours after installation.

Each implant was then connected to a clean laboratory-provided vapor purging and sampling apparatus using new Teflon™ tubing, followed by a shut-in test on each sampling apparatus for a minimum one minute period, as described in Section 2.2. Following a successful shut-in test, the sample tubing and sub-slab implant were purged of a minimum of three volumes. Purging and collection of sub-slab vapor samples was performed using a flow rate of 100 to 200 mL/min and maintaining a vacuum of less than 100 inH_2O to mitigate ambient air breakthrough into the samples. Sample train leak testing was performed using 1,1-DFA as a propellant tracer in combination with a shroud box as described in Section 2.2. Each sample canister was filled until the vacuum gauge read approximately 5 inHg.

Following the completion of the sub-slab vapor sampling at each location, ECA removed the sub-slab vapor port and the slab was sealed with neat cement and concrete and repaired to match the surrounding surface.

2.4 Sample Analysis

Following completion of soil vapor and sub-slab vapor sampling, each SUMMA™ canister was transported under chain-of-custody protocol to K Prime Inc. (K Prime) of Santa Rosa, California, a State of California-certified laboratory. The soil vapor and sub-slab vapor samples were analyzed for VOCs including MEK and MIBK using U.S. Environmental Protection Agency (U.S. EPA) Method TO-15; 1,1-DFA by U.S. EPA Method TO-3; and methane, carbon dioxide, and oxygen using ASTM International (ASTM) Method D1946. The shroud samples were analyzed for 1,1-DFA by U.S. EPA Method TO-3.

3.0 LABORATORY ANALYTICAL RESULTS

The following sections summarize the laboratory analytical results for the soil vapor and sub-slab vapor samples. Analytical results for the soil vapor and sub-slab vapor samples are summarized on Tables B-1 and B-2, respectively. The soil vapor and sub-slab vapor laboratory analytical reports are presented in Appendix B-B.

3.1 Soil Vapor Sample Analytical Results

The soil vapor results were compared to soil vapor environmental screening levels (ESLs) developed by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB)[2] for residential land use. The laboratory analytical results for soil vapor are summarized below:

Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)

- Benzene was detected in four of the six soil vapor samples at concentrations ranging from 5.72 micrograms per cubic meter ($\mu g/m^3$) (sample SV1-10.0) to 76.3 $\mu g/m^3$ (SV2-5.0). One of the four soil vapor samples (SV2-5.0) yielded a benzene concentration of 76.3 $\mu g/m^3$, above the applicable RWQCB ESL of 42 $\mu g/m^3$ for soil vapor in a residential setting. Benzene concentrations were reported below ESLs in the remaining soil vapor samples. Laboratory reporting limits for benzene in sample SV3-9.5 were elevated above the residential ESL due to interference in the sample; and

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[2] SFRWQCB, 2013. *December 2013 Update to Environmental Screening Levels*. December 23.

- Toluene was detected in three of the six soil vapor samples analyzed, and m,p-xylene was detected in two of the six soil vapor samples analyzed. Reported concentrations of toluene and m,p-xylene were well below applicable ESLs. Ethylbenzene and o-xylene were not detected above laboratory reporting limits in any of the soil vapor samples analyzed.

MEK and MIBK

- MEK was detected in three of the six soil vapor samples at concentrations of 28.6 μg/m^3 (SV1-5.0), 37.0 μg/m^3 (SV2-9.5), and 28.9 μg/m^3 (SV3-5.0). MIBK was detected in two of the six $^{\text{soil}}$ vapor samples analyzed at concentrations of 397 μg/m^3 (SV2-5.0) and 518 μg/m^3 (SV2-9.5). Reported concentrations of MEK and MIBK were well below applicable ESLs.

Chlorinated VOCs

- PCE, TCE, cis-1,2-$^{\text{DCE}}$, vinyl chloride, and other chlorinated VOCs were not detected at or above the respective laboratory reporting limits in any of the soil vapor samples.

Other VOCs

- Other VOCs were not detected above laboratory reporting limits in any of the soil vapor samples.

Methane

- Methane was not detected in the soil vapor samples at or above the laboratory reporting limit.

Carbon Dioxide and Oxygen

- Carbon dioxide was detected in the soil vapor samples at levels ranging from 4.52 percent by volume (%volume) to 13.6 %volume, and oxygen levels ranged from 6.53 %volume to 15.9 %volume.

1,1-DFA

- The leak detection compound, 1,1-DFA, was not detected at or above the laboratory reporting limit in any $^{\text{of}}$ the soil vapor samples.

3.2 Sub-Slab Vapor Sample Analytical Results

The sub-slab vapor results were compared indirectly to indoor air environmental screening levels (ESLs) developed by the RWQCB for residential land use and adjusted using an attenuation factor of 0.05 as recommended by the DTSC[3] for estimation of indoor air concentrations based on sub-slab vapor analytical results. The laboratory analytical results for sub-slab vapor are summarized below:

BTEX

- BTEX compounds were not detected above laboratory reporting limits in any of the sub-slab vapor samples.

MEK and MIBK

- MEK was detected in each of the four sub-slab vapor samples at concentrations ranging from 8.60 $\mu g/m^3$ (SSV4) to 15.8 $\mu g/m^3$ (SSV2). MIBK was not detected above laboratory reporting limits in any of the sub-slab vapor samples. Reported concentrations of MEK were well below applicable indoor air ESLs as modified using the DTSC sub-slab vapor to indoor air attenuation factor of 0.05.

Chlorinated VOCs

- PCE was detected in one of the four sub-slab vapor samples at a concentration of 43.8 $\mu g/m^3$ (SSV1). Using the DTSC recommended attenuation factor of 0.05 for estimation of indoor air concentrations based on sub-slab vapor analytical results, PCE reported in sample SSV1 (2.19 $\mu g/m^3$) is above the concentration which would theoretically result in an indoor air concentration above the applicable residential indoor air ESL (0.41 $\mu g/m^3$). The result is slightly above the concentration which would theoretically result in an indoor air concentration above the applicable commercial/industrial indoor air ESL (2.1 $\mu g/m^3$);

- 1,1,1-trichloroethane (1,1,1-TCA) was detected in one of the four sub-slab vapor samples analyzed at a concentration of 6.66 $\mu g/m^3$ (SSV2). Using the DTSC recommended attenuation factor of 0.05, 1,1,1-TCA reported in sample SSV1 is well below the concentration which would theoretically result in an indoor air concentration above the applicable residential indoor air ESL (5,000 $\mu g/m^3$); and

- TCE, cis-1,2-DCE, vinyl chloride and other chlorinated VOCs were not detected at or above the respective laboratory reporting limits in any of the sub-slab vapor samples.

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[3] DTSC, 2011. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. October.

Other VOCs

- Styrene was detected in three of the four sub-slab vapor samples at concentrations of 9.16 μg/m^3 (SSV2), 8.82 μg/m^3 (SSV3), and 8.18 μg/m^3 (SSV4). Using the DTSC recommended attenuation factor of 0.05, the reported results for styrene are well below the concentration which would theoretically result in an indoor air concentration above applicable ESLs; and

- Other VOCs were not detected above laboratory reporting limits in any of the sub-slab vapor samples.

Methane

- Methane was not detected in the sub-slab vapor samples at or above the laboratory reporting limit.

Carbon Dioxide and Oxygen

- Carbon dioxide was detected in three of the four sub-slab samples at levels ranging from 0.272 % volume to 4.25 %volume, and oxygen levels ranged from 8.97 %volume to 19.1 %volume.

1,1-DFA

- The leak detection compound, 1,1-DFA, was not detected at or above the laboratory reporting limit in any of the sub-slab vapor samples.

3.3 Leak Detection Compound and Shroud Sample Analytical Results

As noted above, the leak check compound (1,1-DFA) was not detected in any of the soil vapor or sub-slab vapor samples analyzed. Analysis of samples collected within the shroud box yielded 1,1-DFA at concentrations ranging from 2,370 to 17,100 parts per million by volume (ppmV). Therefore, the soil vapor and sub-slab vapor data presented are deemed valid with respect to sample train competency and lack of leaks and atmospheric dilution. Laboratory analytical reports for the shroud box samples are included in Appendix B-B.

3.4 QA/QC Evaluation of Analytical Results

Data quality for the soil vapor and sub-slab samples was assessed by implementing appropriate QA/QC procedures and through review of analytical data, including evaluation of laboratory QA/QC data. The following is a summary of the data quality review:

- All samples were analyzed within the required holding times for the requested analyses;
- The method blanks did not contain VOCs at or above the laboratory reporting limits; and
- The results of the laboratory control and laboratory control duplicate samples were within acceptable recovery ranges.

4.0 DISCUSSION OF INVESTIGATION RESULTS AND RECOMMENDATIONS

On April 24, 2015, PES collected soil vapor samples from three exterior locations at the site at approximate depths of 5 and 10 feet bgs and sub-slab vapor samples from four interior locations within the site warehouse building for analysis of VOCs, methane, carbon dioxide, and oxygen.

The analytical results indicate residual levels of VOCs, including BTEX compounds, MEK, and MIBK, are present in soil vapor at approximate depths of 5 and 10 feet bgs in the vicinity of the former USTs. Benzene was detected in one soil vapor sample (location SV2 at a depth of 5 feet bgs) at a concentration above applicable residential ESL for soil vapor in a residential setting, but well below ESLs developed for commercial/industrial settings. Other VOCs detected in soil vapor were below applicable residential ESLs.

Low levels of VOCs, including PCE, 1,1,1-TCA, styrene, and MEK were detected in sub-slab vapor samples collected beneath the warehouse building. Using the DTSC-recommended attenuation factor of 0.05 for estimation of indoor air concentrations based on sub-slab vapor analytical results, PCE reported in sample SSV1 is above the concentration which would theoretically result in an indoor air concentration above the applicable residential ESL. Based on the DTSC-recommended attenuation factor, the PCE result for sample SSV1 would theoretically result in an indoor air concentration effectively equal to the applicable commercial/industrial ESL and indicates that the presence of the PCE does not present an unacceptable risk to current site users. The reported results for other VOCs are well below the concentrations which would theoretically result in indoor air concentrations above applicable ESLs.

To mitigate potential accumulation and migration of VOCs in soil vapor into ground floor building areas following the proposed redevelopment of the site, a vapor mitigation system will be designed and installed beneath the floor slab of occupied spaces of the new development. The system will consist of impermeable vapor barriers with passive venting. Based on the findings of this investigation and the proposed vapor intrusion mitigation measures, additional soil vapor and/or sub-slab vapor investigation activities at the site do not appear warranted.

5.0 REFERENCES

California Regional Water Quality Control Board Based - San Francisco Region (SFRWQCB), 2013. *December 2013 Update to Environmental Screening Levels*. December 23.

DTSC, 2012. *Advisory - Active Soil Gas Investigations*. Jointly developed by the California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board – Los Angeles Region (LARWQCB) and RWQCB - San Francisco Region (SFRWQCB). April.

PES, 2014. *Supplemental Subsurface Investigation Report, 6701, 6705, and 6707 Shellmound Street, Emeryville, California*. January 13.

PES, 2015. *Conceptual Site Model, 6701 - 6707 Shellmound Street, Emeryville, California*. February 6.

TABLES

Table B-1
Summary of Soil Vapor Analytical Results
2015 Limited Soil Vapor and Sub-Slab Investigation
6701 - 6707 Shellmound Street, Emeryville, California

Sample Location	Date Sampled	Sample ID	Sample Depth (feet bgs)	PCE (µg/m^3)	TCE (µg/m^3)	cis-1,2-DCE (µg/m^3)	Vinyl Chloride (µg/m^3)	Benzene (µg/m^3)	Toluene (µg/m^3)	Ethylbenzene (µg/m^3)	m,p-Xylene (µg/m^3)	o-Xylene (µg/m^3)	1,2,4-TMB (µg/m^3)	1,3,5-TMB (µg/m^3)	MEK (µg/m^3)	MIBK (µg/m^3)	Chloromethane (µg/m^3)	Other VOCs (µg/m^3)	Methane (%vol)	Carbon Dioxide (%vol)	Oxygen (%vol)	1,1,-DFA (ppmV)
SV1	4/24/2015	SV1-5.0	5.0	ND(6.78)	ND(5.37)	ND(3.97)	ND(2.56)	**6.68**	**6.41**	ND(4.34)	**34.2**	ND(4.34)	ND(4.92)	ND(4.92)	**28.6**	ND(8.18)	ND(2.07)	All ND	ND(0.100)	**11.4**	**6.92**	ND(10.0)
	4/24/2015	SV1-10.0	10.0	ND(6.78)	ND(5.37)	ND(3.97)	ND(2.56)	**5.72**	**6.86**	ND(4.34)	**31.6**	ND(4.34)	ND(4.92)	ND(4.92)	ND(5.89)	ND(8.18)	ND(2.07)	All ND	ND(0.100)	**13.6**	**6.53**	ND(10.0)
SV2	4/24/2015	SV2-5.0	5.0	ND(136)	ND(107)	ND(79.3)	ND(51.1)	**76.3**	ND(75.4)	ND(86.8)	ND(86.8)	ND(86.8)	ND(98.3)	ND(98.3)	ND(118)	**397**	ND(41.3)	All ND	ND(0.100)	**4.52**	**15.9**	ND(10.0)
	4/24/2015	SV2-9.5	9.5	ND(13.6)	ND(10.7)	ND(7.93)	ND(5.11)	**19.6**	**14.0**	ND(8.68)	ND(8.68)	ND(8.68)	ND(9.83)	ND(9.83)	**37.0**	**518**	ND(4.13)	All ND	ND(0.100)	**6.57**	**15.4**	ND(10.0)
SV3	4/24/2015	SV3-5.0	5.0	ND(13.6)	ND(10.7)	ND(7.93)	ND(5.11)	ND(6.39)	ND(7.54)	ND(8.68)	ND(8.68)	ND(8.68)	ND(9.83)	ND(9.83)	**28.9**	ND(16.4)	ND(4.13)	All ND	ND(0.100)	**6.17**	**12.4**	ND(10.0)
	4/24/2015	SV3-9.5	9.5	ND(136)	ND(107)	ND(79.3)	ND(51.1)	ND(63.9)	ND(75.4)	ND(86.8)	ND(86.8)	ND(86.8)	ND(98.3)	ND(98.3)	ND(118)	ND(164)	ND(41.3)	All ND	ND(0.100)	**7.74**	**11.2**	ND(10.0)
Residential land use ESL *(note 1)*				*210*	*300*	*3,700*	*16*	*42*	*160,000*	*490*	*52,000*		*NE*	*NE*	*2,600,000*	*1,600,000*	*47,000*	--	*NE*	*NE*	*NE*	*NE*
Commercial/industrial land use ESL *(note 1)*				*2,100*	*3,000*	*31,000*	*160*	*420*	*1,300,000*	*4,900*	*440,000*		*NE*	*NE*	*22,000,000*	*13,000,000*	*390,000*	--	*NE*	*NE*	*NE*	*NE*

Notes:

Detections are shown in bold. Results equal to or exceeding regulatory screening level for residential land use are shaded.

µg/m^3 = Micrograms per cubic meter.
ppmV = Parts per million by volume.
%vol = Percent by volume
bgs = Below ground surface.
ND(6.78) = Not detected at or above the indicated laboratory reporting limit.
PCE = Tetrachloroethene.
TCE = Trichloroethene.
cis-1,2-DCE = cis-1,2-dichloroethene.
1,3,5-TMB = 1,3,5-trimethylbenzene.
1,2,4-TMB = 1,2,4-trimethylbenzene.
MEK = methyl ethyl ketone or 2-butanone
MIBK = methyl isobutyl ketone or 4-methyl-2-pentanone.
VOCs = volatile organic compounds.
1,1-DFA = 1,1-difluoroethane (leak check compound).
1. ESL = December 2013 Regional Water Quality Control Board, San Francisco Bay Region (SFRWQCB) Environmental Screening Levels (ESLs), Table E-2 Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion.
NE = Not established.
-- = Not applicable.

Table B-2
Summary of Sub-Slab Vapor Analytical Results
2015 Limited Soil Vapor and Sub-Slab Investigation
6701 - 6707 Shellmound Street, Emeryville, California

Sub-Slab Port Sample Location	Sample ID	Date Sampled	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	cis-1,2-DCE ($\mu g/m^3$)	Vinyl Chloride ($\mu g/m^3$)	1,1,1-TCA ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	m,p-Xylene ($\mu g/m^3$)	o-Xylene ($\mu g/m^3$)	Styrene ($\mu g/m^3$)	MEK ($\mu g/m^3$)	MIBK ($\mu g/m^3$)	Other VOCs ($\mu g/m^3$)	Methane (%vol)	Carbon Dioxide (%vol)	Oxygen (%vol)	1,1,-DFA (ppmV)
SSV1	**SSV1**	4/24/2015	**43.8** [3]	ND(5.37)	ND(3.97)	ND(2.56)	ND(5.46)	ND(3.19)	ND(3.77)	ND(4.34)	ND(4.34)	ND(4.34)	ND(4.26)	**10.2**	ND(8.18)	All ND	ND(0.100)	**0.462**	**18.5**	ND(10.0)
SSV2	**SSV2**	4/24/2015	ND(6.78)	ND(5.37)	ND(3.97)	ND(2.56)	**6.66**	ND(3.19)	ND(3.77)	ND(4.34)	ND(4.34)	ND(4.34)	**9.16**	**15.8**	ND(8.18)	All ND	ND(0.100)	< 0.100	**19.1**	ND(10.0)
SSV3	**SSV3**	4/24/2015	ND(6.78)	ND(5.37)	ND(3.97)	ND(2.56)	ND(5.46)	ND(3.19)	ND(3.77)	ND(4.34)	ND(4.34)	ND(4.34)	**8.82**	**10.8**	ND(8.18)	All ND	ND(0.100)	**4.25**	**8.97**	ND(10.0)
SSV4	**SSV4**	4/24/2015	ND(6.78)	ND(5.37)	ND(3.97)	ND(2.56)	ND(5.46)	ND(3.19)	ND(3.77)	ND(4.34)	ND(4.34)	ND(4.34)	**8.18**	**8.60**	ND(8.18)	All ND	ND(0.100)	**0.272**	**17.0**	ND(10.0)
Residential land use ESL (Indoor Air) *(notes 1,2)*			*0.41*	*0.59*	*7.3*	*0.031*	*5,200*	*0.084*	*310*	*0.97*	*100*		*940*	*5,200*	*3,100*	--	*NE*	*NE*	*NE*	*NE*
Commercial/industrial land use ESL (Indoor Air) *(notes 1,2)*			*2.1*	*3.0*	*31*	*0.16*	*22,000*	*0.42*	*1,300*	*4.9*	*440*		*3,900*	*22,000*	*13,000*	--	*NE*	*NE*	*NE*	*NE*

Notes:

Detections are shown in bold. Results equal to or exceeding regulatory screening level for residential land use are shaded.

$\mu g/m^3$ = Micrograms per cubic meter.
%vol = Percent by volume
ppmV = Parts per million by volume.
ND(6.78) = Not detected at or above the indicated laboratory reporting limit.
ND = Not Detected
DUP = Duplicate sample.
PCE = Tetrachloroethene.
TCE = Trichloroethene.
cis-1,2-DCE = cis-1,2-dichloroethene.
VOCs = volatile organic compounds.

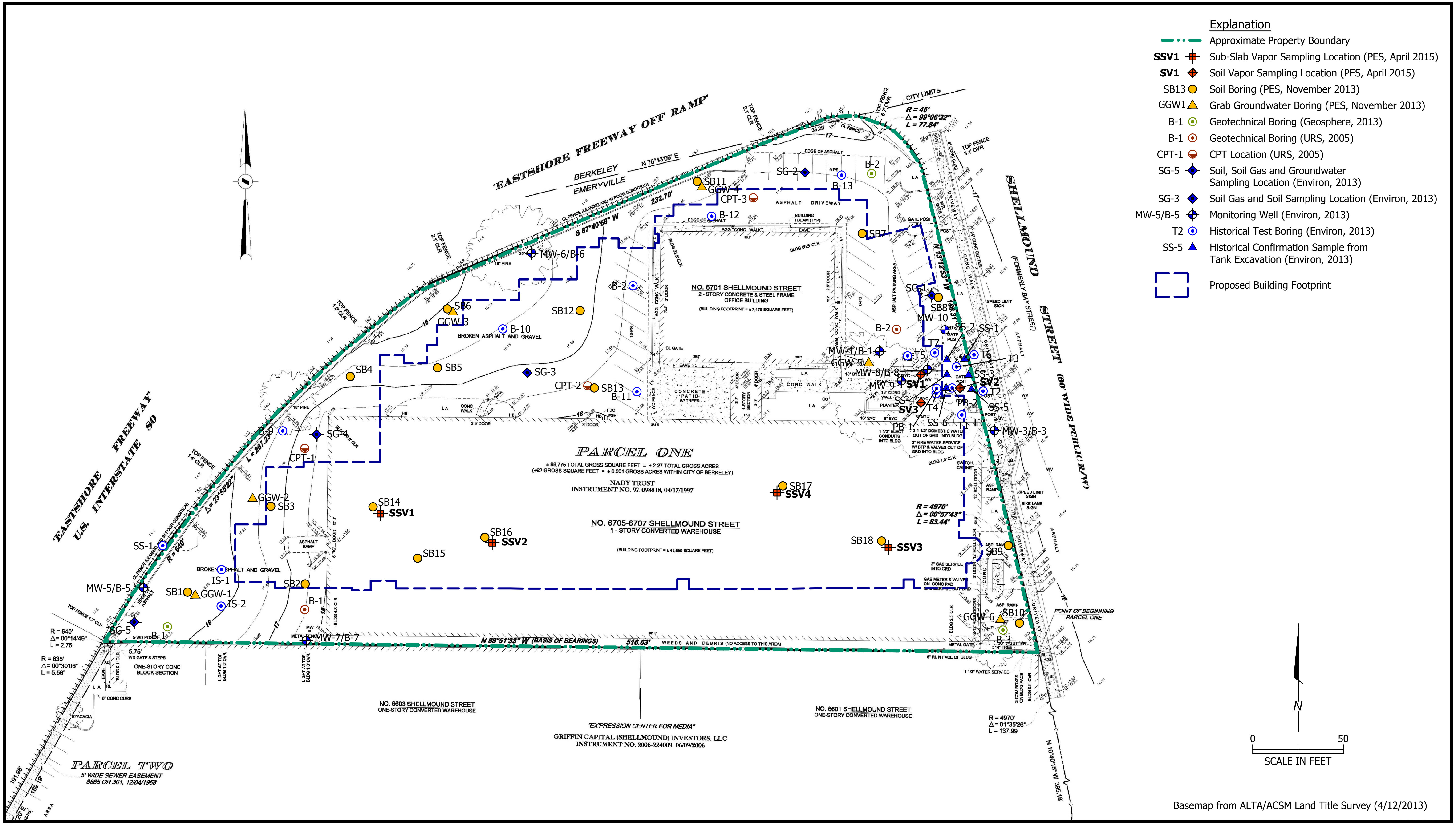
1. ESL = December 2013 Regional Water Quality Control Board, San Francisco Bay Region (SFRWQCB) Environmental Screening Levels (ESLs), Table E-3 Ambient and Indoor Air Screening Levels.

2. In order to estimate concentrations of VOCs in sub-slab vapor which would theoretically result in an indoor air concentration above the applicable indoor air ESL, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC, 2011) recommends applying a default attenuation factor of 0.05 to the sub-slab analytical result.

3. Applying the DTSC-recommended attenuation factor of 0.05, the estimated indoor air concentration based on the sub-slab vapor analytical result for PCE at location SSV1 is 2.19 $\mu g/m^3$.

NE = Not established.

ILLUSTRATIONS



Explanation

	Approximate Property Boundary
SSV1	Sub-Slab Vapor Sampling Location (PES, April 2015)
SV1	Soil Vapor Sampling Location (PES, April 2015)
SB13	Soil Boring (PES, November 2013)
GGW1	Grab Groundwater Boring (PES, November 2013)
B-1	Geotechnical Boring (Geosphere, 2013)
B-1	Geotechnical Boring (URS, 2005)
CPT-1	CPT Location (URS, 2005)
SG-5	Soil, Soil Gas and Groundwater Sampling Location (Environ, 2013)
SG-3	Soil Gas and Soil Sampling Location (Environ, 2013)
MW-5/B-5	Monitoring Well (Environ, 2013)
T2	Historical Test Boring (Environ, 2013)
SS-5	Historical Confirmation Sample from Tank Excavation (Environ, 2013)
	Proposed Building Footprint

Basemap from ALTA/ACSM Land Title Survey (4/12/2013)

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan Showing Soil Vapor and Sub-Slab Vapor Sample Locations
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
B-1

1448.001.01.011	1448-00101011_SVIR_B-1-2	MJ	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

NOTES

Concentrations are in micrograms per cubic meter (μg/m^3).

bgs = below ground surface.

ND(6.78) = Not detected at or above the indicated laboratory reporting limit.

PCE = tetrachloroethene.

1,1,1-TCA = 1,1,1-trichloroethane.

MEK = methyl ethyl ketone or 2-butanone

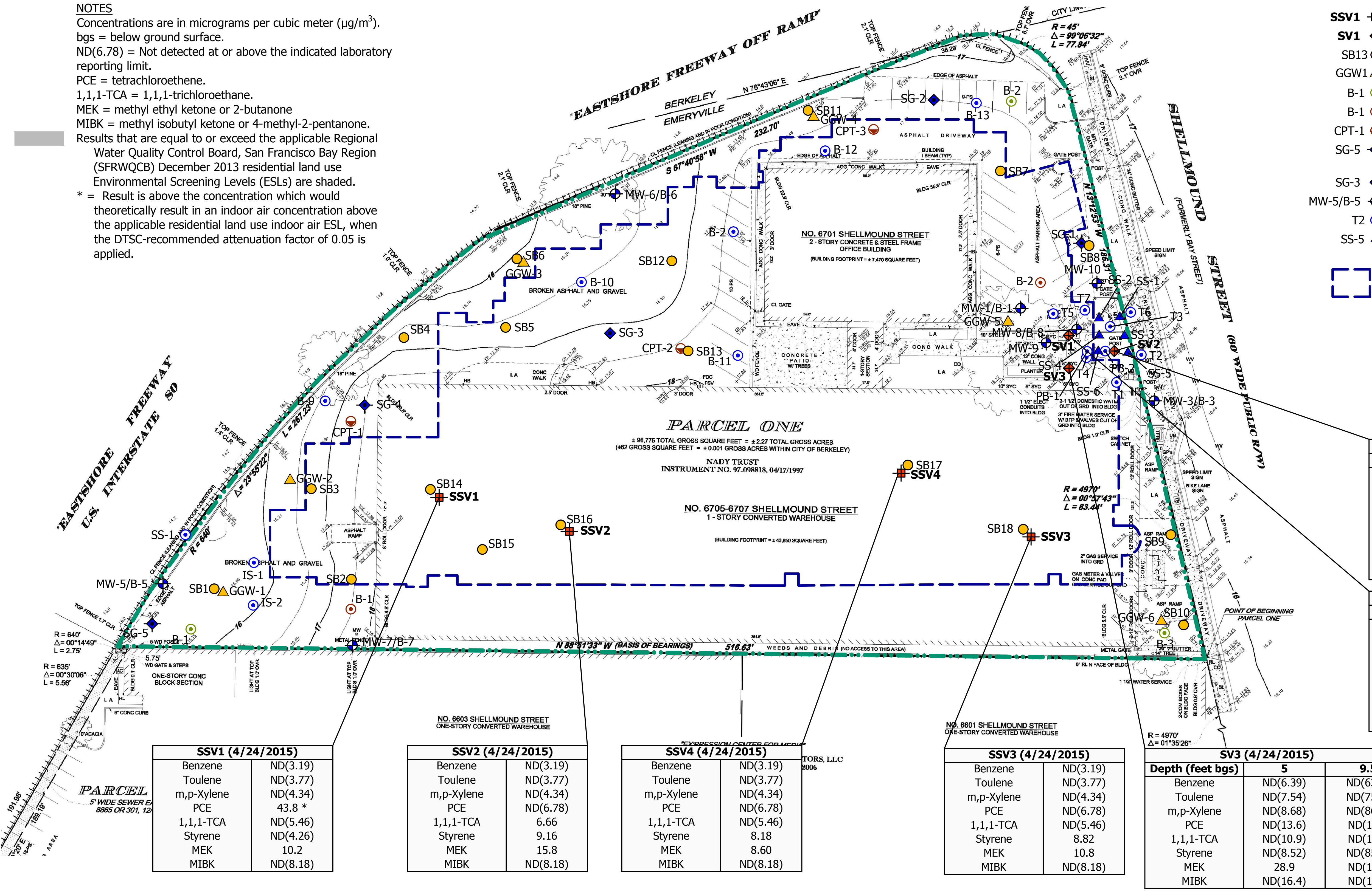
MIBK = methyl isobutyl ketone or 4-methyl-2-pentanone.

▨ Results that are equal to or exceed the applicable Regional Water Quality Control Board, San Francisco Bay Region (SFRWQCB) December 2013 residential land use Environmental Screening Levels (ESLs) are shaded.

* = Result is above the concentration which would theoretically result in an indoor air concentration above the applicable residential land use indoor air ESL, when the DTSC-recommended attenuation factor of 0.05 is applied.

Explanation

— · · —	Approximate Property Boundary
SSV1 ✚	Sub-Slab Vapor Sampling Location (PES, April 2015)
SV1 ◆	Soil Vapor Sampling Location (PES, April 2015)
SB13 ●	Soil Boring (PES, November 2013)
GGW1 ▲	Grab Groundwater Boring (PES, November 2013)
B-1 ⊙	Geotechnical Boring (Geosphere, 2013)
B-1 ⊙	Geotechnical Boring (URS, 2005)
CPT-1 ◒	CPT Location (URS, 2005)
SG-5 ◆	Soil, Soil Gas and Groundwater Sampling Location (Environ, 2013)
SG-3 ◆	Soil Gas and Soil Sampling Location (Environ, 2013)
MW-5/B-5 ⊕	Monitoring Well (Environ, 2013)
T2 ⊙	Historical Test Boring (Environ, 2013)
SS-5 ▲	Historical Confirmation Sample from Tank Excavation (Environ, 2013)
▭	Proposed Building Footprint



SSV1 (4/24/2015)	
Benzene	ND(3.19)
Toulene	ND(3.77)
m,p-Xylene	ND(4.34)
PCE	43.8 *
1,1,1-TCA	ND(5.46)
Styrene	ND(4.26)
MEK	10.2
MIBK	ND(8.18)

SSV2 (4/24/2015)	
Benzene	ND(3.19)
Toulene	ND(3.77)
m,p-Xylene	ND(4.34)
PCE	ND(6.78)
1,1,1-TCA	6.66
Styrene	9.16
MEK	15.8
MIBK	ND(8.18)

SSV4 (4/24/2015)	
Benzene	ND(3.19)
Toulene	ND(3.77)
m,p-Xylene	ND(4.34)
PCE	ND(6.78)
1,1,1-TCA	ND(5.46)
Styrene	8.18
MEK	8.60
MIBK	ND(8.18)

SSV3 (4/24/2015)	
Benzene	ND(3.19)
Toulene	ND(3.77)
m,p-Xylene	ND(4.34)
PCE	ND(6.78)
1,1,1-TCA	ND(5.46)
Styrene	8.82
MEK	10.8
MIBK	ND(8.18)

SV3 (4/24/2015)		
Depth (feet bgs)	**5**	**9.5**
Benzene	ND(6.39)	ND(63.9)
Toulene	ND(7.54)	ND(75.4)
m,p-Xylene	ND(8.68)	ND(86.8)
PCE	ND(13.6)	ND(136)
1,1,1-TCA	ND(10.9)	ND(109)
Styrene	ND(8.52)	ND(85.2)
MEK	28.9	ND(118)
MIBK	ND(16.4)	ND(164)

SV2 (4/24/2015)		
Depth (feet bgs)	**5**	**9.5**
Benzene	76.3	19.6
Toulene	ND(75.4)	14.0
m,p-Xylene	ND(86.8)	ND(8.68)
PCE	ND(136)	ND(13.6)
1,1,1-TCA	ND(109)	ND(10.9)
Styrene	ND(85.2)	ND(8.52)
MEK	ND(118)	37.0
MIBK	397	518

SV1 (4/24/2015)		
Depth (feet bgs)	**5**	**10**
Benzene	6.68	5.72
Toulene	6.41	6.86
m,p-Xylene	34.2	31.6
PCE	ND(6.78)	ND(6.78)
1,1,1-TCA	ND(5.46)	ND(5.46)
Styrene	ND(4.26)	ND(4.26)
MEK	28.6	ND(5.89)
MIBK	ND(8.18)	ND(8.18)

Basemap from ALTA/ACSM Land Title Survey (4/12/2013)

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan Showing Soil Vapor and
Sub-Slab Vapor Analytical Results
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
B-2

1448.001.01.011	1448-00101011_SVIR_B-1-2	MJ	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

APPENDIX B-A

ACPWA PERMIT

Alameda County Public Works Agency - Water Resources Well Permit

Public Works Agency
Alameda County

399 Elmhurst Street
Hayward, CA 94544-1395
Telephone: (510)670-6633 Fax:(510)782-1939

Application Approved on: 04/21/2015 By jamesy

Permit Numbers: W2015-0338
Permits Valid from 04/24/2015 to 04/24/2015

Application Id: 1429298669480
City of Project Site: Emeryville
Site Location: 6701 Shellmound Street, Emeryville, CA
Project Start Date: 04/24/2015
Completion Date: 04/24/2015
Assigned Inspector: Contact Steve Miller at (510) 670-5517 or stevem@acpwa.org

Applicant:	PES Environmental, Inc. - Gary Thomas 1682 Novato Boulevard, Suite 100, Novato, CA 94947	**Phone:** 415-899-1600
Property Owner:	Attn. Frederic D. Schrag Nady Systems, Inc. 6701 Shellmound Street, Emeryville, CA 94608	**Phone:** 510-652-2411 x263
Client:	Attn. Rachel Green Anton Emeryville, LLC 1415 L Street, Suite 450, Sacramento, CA 95814	**Phone:** --
Contact:	Gary Thomas	**Phone:** 415-899-1600 **Cell:** 415-250-7217

Total Due: $265.00
Receipt Number: WR2015-0190 **Total Amount Paid:** $265.00
Payer Name : Gary Thomas Paid By: VISA **PAID IN FULL**

Works Requesting Permits:

Borehole(s) for Investigation-Contamination Study - 6 Boreholes
Driller: Environmental Control Associates, Inc. - Lic #: 695970 - Method: DP **Work Total: $265.00**

Specifications

Permit Number	Issued Dt	Expire Dt	# Boreholes	Hole Diam	Max Depth
W2015-0338	04/21/2015	07/23/2015	6	2.00 in.	10.00 ft

Specific Work Permit Conditions

1. Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings. All cuttings remaining or unused shall be containerized and hauled off site. The containers shall be clearly labeled to the ownership of the container and labeled hazardous or non-hazardous.

2. Boreholes shall not be left open for a period of more than 24 hours. All boreholes left open more than 24 hours will need approval from Alameda County Public Works Agency, Water Resources Section. All boreholes shall be backfilled according to permit destruction requirements and all concrete material and asphalt material shall be to Caltrans Spec or County/City Codes. No borehole(s) shall be left in a manner to act as a conduit at any time.

3. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the Alameda County Public Works Agency, its officers, agents, and employees free and harmless from any and all expense, cost, liability in connection with or resulting from the exercise of this Permit including, but not limited to, properly damage, personal injury and wrongful death.

4. Prior to any drilling activities, it shall be the applicant's responsibility to contact and coordinate an Underground Service Alert (USA), obtain encroachment permit(s), excavation permit(s) or any other permits or agreements required for that Federal, State, County or City, and follow all City or County Ordinances. No work shall begin until all the permits and requirements have been approved or obtained. It shall also be the applicants responsibilities to provide to the Cities or to Alameda County an Traffic Safety Plan for any lane closures or detours planned. No work shall begin until all the permits and requirements have been approved or obtained.

5. Applicant shall contact assigned inspector listed on the top of the permit at least five (5) working days prior to starting, once the permit has been approved. Confirm the scheduled date(s) at least 24 hours prior to drilling.

6. Copy of approved drilling permit must be on site at all times. Failure to present or show proof of the approved permit application on site shall result in a fine of $500.00.

7. NOTE:
Under California laws, the owner/operator are responsible for reporting the contamination to the governmental regulatory agencies under Section 25295(a). The owner/operator is liable for civil penalties under Section 25299(a)(4) and criminal penalties under Section 25299(d) for failure to report a leak. The owner/operator is liable for civil penalties under Section 25299(b)(4) for knowing failure to ensure compliance with the law by the operator. These penalty provisions do not apply to a potential buyer.

8. Permit is valid only for the purpose specified herein. No changes in construction procedures, as described on this permit application. Boreholes shall not be converted to monitoring wells, without a permit application process.

APPENDIX B-B

SOIL VAPOR LABORATORY ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION

SOIL VAPOR AND SUB-SLAB SAMPLE ANALYTICAL REPORTS

K PRIME, Inc.
CONSULTING ANALYTICAL CHEMISTS

3621 Westwind Blvd.
Santa Rosa CA 95403
Phone: 707 527 7574
FAX: 707 527 7879

TRANSMITTAL

DATE: 5/8/2015

TO:
MR. KYLE FLORY
PES ENVIRONMENTAL, INC.
1682 NOVATO BLVD., STE 100
NOVATO, CA 94947

Phone: 415-899-1600
Fax: 415-899-1601
Email: kflory@pesenv.com

ACCT: 9418
PROJ: 1448.001.01

FROM:
Richard A. Kagel, Ph.D.
Laboratory Director
RAK by TJ 05/08/2015

SUBJECT: LABORATORY RESULTS FOR YOUR PROJECT 1448.001.01

Enclosed please find K Prime's laboratory reports for the following samples:

SAMPLE ID	TYPE	DATE	TIME	KPI LAB #
SV1-10.0	AIR	4/24/2015	11:10	132320
SV1-5.0	AIR	4/24/2015	11:29	132321
SV2-9.5	AIR	4/24/2015	11:57	132322
SV2-5.0	AIR	4/24/2015	12:06	132323
SV3-9.5	AIR	4/24/2015	12:42	132324
SV3-5.0	AIR	4/24/2015	12:50	132325
SSV1	AIR	4/24/2015	13:12	132326
SSV2	AIR	4/24/2015	13:30	132327
SSV3	AIR	4/24/2015	13:46	132328
SSV4	AIR	4/24/2015	13:58	132329

The above listed sample group was received on 4/24/2015 and tested as requested on the chain of custody document.

Please call me if you have any questions or need further information.
Thank you for this opportunity to be of service.

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV1-10.0
LAB NO: 132320
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 11:10
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	CAS NO.	MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	ND	5.46	ND
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	1.79	3.19	5.72
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	1.82	3.77	6.86
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	ND	6.78	ND
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	7.28	4.34	31.6
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	ND	4.26	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	ND	5.89	ND
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV1-5.0
LAB NO: 132321
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 11:29
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	CAS NO.	MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	ND	5.46	ND
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	2.09	3.19	6.68
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	1.70	3.77	6.41
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	ND	6.78	ND
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	7.87	4.34	34.2
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	ND	4.26	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	9.70	5.89	28.6
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
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µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV2-9.5
LAB NO: 132322
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 11:57
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	CAS NO.	MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	2.00	ND	9.89	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	2.00	ND	14.0	ND
CHLOROMETHANE	74-87-3	2.00	ND	4.13	ND
VINYL CHLORIDE	75-01-4	2.00	ND	5.11	ND
BROMOMETHANE	74-83-9	2.00	ND	7.77	ND
CHLOROETHANE	75-00-3	2.00	ND	5.28	ND
TRICHLOROFLUOROMETHANE	75-69-4	2.00	ND	11.2	ND
1,1-DICHLOROETHENE	75-35-4	2.00	ND	7.93	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	2.00	ND	15.3	ND
METHYLENE CHLORIDE	75-09-2	2.00	ND	6.95	ND
1,1-DICHLOROETHANE	75-34-3	2.00	ND	8.10	ND
CIS-1,2-DICHLOROETHENE	156-59-2	2.00	ND	7.93	ND
CHLOROFORM	67-66-3	2.00	ND	9.77	ND
1,1,1-TRICHLOROETHANE	71-55-6	2.00	ND	10.9	ND
CARBON TETRACHLORIDE	56-23-5	2.00	ND	12.6	ND
1,2-DICHLOROETHANE	107-06-2	2.00	ND	8.09	ND
BENZENE	71-43-2	2.00	6.12	6.39	19.6
TRICHLOROETHENE	79-01-6	2.00	ND	10.7	ND
1,2-DICHLOROPROPANE	78-87-5	2.00	ND	9.24	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	2.00	ND	9.08	ND
TOLUENE	108-88-3	2.00	3.72	7.54	14.0
CIS-1,3-DICHLOROPROPENE	10061-01-5	2.00	ND	9.08	ND
1,1,2-TRICHLOROETHANE	79-00-5	2.00	ND	10.9	ND
TETRACHLOROETHENE	127-18-4	2.00	ND	13.6	ND
1,2-DIBROMOETHANE	106-93-4	2.00	ND	15.4	ND
CHLOROBENZENE	108-90-7	2.00	ND	9.21	ND
ETHYLBENZENE	100-41-4	2.00	ND	8.68	ND
XYLENE (M+P)	1330-20-7	2.00	ND	8.68	ND
XYLENE (O)	95-47-6	2.00	ND	8.68	ND
STYRENE	100-42-5	2.00	ND	8.52	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	2.00	ND	13.7	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	2.00	ND	9.83	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	2.00	ND	9.83	ND
1,3-DICHLOROBENZENE	541-73-1	2.00	ND	12.0	ND
1,4-DICHLOROBENZENE	106-46-7	2.00	ND	12.0	ND
1,2-DICHLOROBENZENE	95-50-1	2.00	ND	12.0	ND
1,2,4-TRICHLOROBENZENE	120-82-1	4.00	ND	29.7	ND
HEXACHLOROBUTADIENE	87-68-3	2.00	ND	21.3	ND
2-BUTANONE (MEK)	78-93-3	4.00	12.6	11.8	37.0
4-METHYL-2-PENTANONE (MIBK)	108-10-1	4.00	127	16.4	518

NOTES:

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µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TG
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV2-5.0
LAB NO: 132323
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 12:06
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	**CAS NO.**	**MRL**	**SAMPLE CONC**	**MRL**	**SAMPLE CONC**
DICHLORODIFLUOROMETHANE	75-71-8	20.0	ND	98.9	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	20.0	ND	140	ND
CHLOROMETHANE	74-87-3	20.0	ND	41.3	ND
VINYL CHLORIDE	75-01-4	20.0	ND	51.1	ND
BROMOMETHANE	74-83-9	20.0	ND	77.7	ND
CHLOROETHANE	75-00-3	20.0	ND	52.8	ND
TRICHLOROFLUOROMETHANE	75-69-4	20.0	ND	112	ND
1,1-DICHLOROETHENE	75-35-4	20.0	ND	79.3	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	20.0	ND	153	ND
METHYLENE CHLORIDE	75-09-2	20.0	ND	69.5	ND
1,1-DICHLOROETHANE	75-34-3	20.0	ND	81.0	ND
CIS-1,2-DICHLOROETHENE	156-59-2	20.0	ND	79.3	ND
CHLOROFORM	67-66-3	20.0	ND	97.7	ND
1,1,1-TRICHLOROETHANE	71-55-6	20.0	ND	109	ND
CARBON TETRACHLORIDE	56-23-5	20.0	ND	126	ND
1,2-DICHLOROETHANE	107-06-2	20.0	ND	80.9	ND
BENZENE	71-43-2	20.0	23.9	63.9	76.3
TRICHLOROETHENE	79-01-6	20.0	ND	107	ND
1,2-DICHLOROPROPANE	78-87-5	20.0	ND	92.4	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	20.0	ND	90.8	ND
TOLUENE	108-88-3	20.0	ND	75.4	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	20.0	ND	90.8	ND
1,1,2-TRICHLOROETHANE	79-00-5	20.0	ND	109	ND
TETRACHLOROETHENE	127-18-4	20.0	ND	136	ND
1,2-DIBROMOETHANE	106-93-4	20.0	ND	154	ND
CHLOROBENZENE	108-90-7	20.0	ND	92.1	ND
ETHYLBENZENE	100-41-4	20.0	ND	86.8	ND
XYLENE (M+P)	1330-20-7	20.0	ND	86.8	ND
XYLENE (O)	95-47-6	20.0	ND	86.8	ND
STYRENE	100-42-5	20.0	ND	85.2	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	20.0	ND	137	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	20.0	ND	98.3	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	20.0	ND	98.3	ND
1,3-DICHLOROBENZENE	541-73-1	20.0	ND	120	ND
1,4-DICHLOROBENZENE	106-46-7	20.0	ND	120	ND
1,2-DICHLOROBENZENE	95-50-1	20.0	ND	120	ND
1,2,4-TRICHLOROBENZENE	120-82-1	40.0	ND	297	ND
HEXACHLOROBUTADIENE	87-68-3	20.0	ND	213	ND
2-BUTANONE (MEK)	78-93-3	40.0	ND	118	ND
4-METHYL-2-PENTANONE (MIBK)	108-10-1	40.0	97.0	164	397

NOTES:
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µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV3-9.5
LAB NO: 132324
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 12:42
BATCH ID: 050115A1
DATE ANALYZED: 05/07/2015

COMPOUND NAME	CAS NO.	PPB (V/V)		µg/cu. m	
		MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	20.0	ND	98.9	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	20.0	ND	140	ND
CHLOROMETHANE	74-87-3	20.0	ND	41.3	ND
VINYL CHLORIDE	75-01-4	20.0	ND	51.1	ND
BROMOMETHANE	74-83-9	20.0	ND	77.7	ND
CHLOROETHANE	75-00-3	20.0	ND	52.8	ND
TRICHLOROFLUOROMETHANE	75-69-4	20.0	ND	112	ND
1,1-DICHLOROETHENE	75-35-4	20.0	ND	79.3	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	20.0	ND	153	ND
METHYLENE CHLORIDE	75-09-2	20.0	ND	69.5	ND
1,1-DICHLOROETHANE	75-34-3	20.0	ND	81.0	ND
CIS-1,2-DICHLOROETHENE	156-59-2	20.0	ND	79.3	ND
CHLOROFORM	67-66-3	20.0	ND	97.7	ND
1,1,1-TRICHLOROETHANE	71-55-6	20.0	ND	109	ND
CARBON TETRACHLORIDE	56-23-5	20.0	ND	126	ND
1,2-DICHLOROETHANE	107-06-2	20.0	ND	80.9	ND
BENZENE	71-43-2	20.0	ND	63.9	ND
TRICHLOROETHENE	79-01-6	20.0	ND	107	ND
1,2-DICHLOROPROPANE	78-87-5	20.0	ND	92.4	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	20.0	ND	90.8	ND
TOLUENE	108-88-3	20.0	ND	75.4	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	20.0	ND	90.8	ND
1,1,2-TRICHLOROETHANE	79-00-5	20.0	ND	109	ND
TETRACHLOROETHENE	127-18-4	20.0	ND	136	ND
1,2-DIBROMOETHANE	106-93-4	20.0	ND	154	ND
CHLOROBENZENE	108-90-7	20.0	ND	92.1	ND
ETHYLBENZENE	100-41-4	20.0	ND	86.8	ND
XYLENE (M+P)	1330-20-7	20.0	ND	86.8	ND
XYLENE (O)	95-47-6	20.0	ND	86.8	ND
STYRENE	100-42-5	20.0	ND	85.2	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	20.0	ND	137	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	20.0	ND	98.3	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	20.0	ND	98.3	ND
1,3-DICHLOROBENZENE	541-73-1	20.0	ND	120	ND
1,4-DICHLOROBENZENE	106-46-7	20.0	ND	120	ND
1,2-DICHLOROBENZENE	95-50-1	20.0	ND	120	ND
1,2,4-TRICHLOROBENZENE	120-82-1	40.0	ND	297	ND
HEXACHLOROBUTADIENE	87-68-3	20.0	ND	213	ND
2-BUTANONE (MEK)	78-93-3	40.0	ND	118	ND
4-METHYL-2-PENTANONE (MIBK)	108-10-1	40.0	ND	164	ND

NOTES:
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MRL - METHOD REPORTING LIMIT
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µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SV3-5.0
LAB NO: 132325
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 12:50
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	CAS NO.	MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	2.00	ND	9.89	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	2.00	ND	14.0	ND
CHLOROMETHANE	74-87-3	2.00	ND	4.13	ND
VINYL CHLORIDE	75-01-4	2.00	ND	5.11	ND
BROMOMETHANE	74-83-9	2.00	ND	7.77	ND
CHLOROETHANE	75-00-3	2.00	ND	5.28	ND
TRICHLOROFLUOROMETHANE	75-69-4	2.00	ND	11.2	ND
1,1-DICHLOROETHENE	75-35-4	2.00	ND	7.93	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	2.00	ND	15.3	ND
METHYLENE CHLORIDE	75-09-2	2.00	ND	6.95	ND
1,1-DICHLOROETHANE	75-34-3	2.00	ND	8.10	ND
CIS-1,2-DICHLOROETHENE	156-59-2	2.00	ND	7.93	ND
CHLOROFORM	67-66-3	2.00	ND	9.77	ND
1,1,1-TRICHLOROETHANE	71-55-6	2.00	ND	10.9	ND
CARBON TETRACHLORIDE	56-23-5	2.00	ND	12.6	ND
1,2-DICHLOROETHANE	107-06-2	2.00	ND	8.09	ND
BENZENE	71-43-2	2.00	ND	6.39	ND
TRICHLOROETHENE	79-01-6	2.00	ND	10.7	ND
1,2-DICHLOROPROPANE	78-87-5	2.00	ND	9.24	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	2.00	ND	9.08	ND
TOLUENE	108-88-3	2.00	ND	7.54	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	2.00	ND	9.08	ND
1,1,2-TRICHLOROETHANE	79-00-5	2.00	ND	10.9	ND
TETRACHLOROETHENE	127-18-4	2.00	ND	13.6	ND
1,2-DIBROMOETHANE	106-93-4	2.00	ND	15.4	ND
CHLOROBENZENE	108-90-7	2.00	ND	9.21	ND
ETHYLBENZENE	100-41-4	2.00	ND	8.68	ND
XYLENE (M+P)	1330-20-7	2.00	ND	8.68	ND
XYLENE (O)	95-47-6	2.00	ND	8.68	ND
STYRENE	100-42-5	2.00	ND	8.52	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	2.00	ND	13.7	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	2.00	ND	9.83	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	2.00	ND	9.83	ND
1,3-DICHLOROBENZENE	541-73-1	2.00	ND	12.0	ND
1,4-DICHLOROBENZENE	106-46-7	2.00	ND	12.0	ND
1,2-DICHLOROBENZENE	95-50-1	2.00	ND	12.0	ND
1,2,4-TRICHLOROBENZENE	120-82-1	4.00	ND	29.7	ND
HEXACHLOROBUTADIENE	87-68-3	2.00	ND	21.3	ND
2-BUTANONE (MEK)	78-93-3	4.00	9.80	11.8	28.9
4-METHYL-2-PENTANONE (MIBK)	108-10-1	4.00	ND	16.4	ND

NOTES:
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MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID:	SSV1
LAB NO:	132326
SAMPLE TYPE:	AIR
DATE SAMPLED:	04/24/2015
TIME SAMPLED:	13:12
BATCH ID:	050115A1
DATE ANALYZED:	05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	**CAS NO.**	**MRL**	**SAMPLE CONC**	**MRL**	**SAMPLE CONC**
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	ND	5.46	ND
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	ND	3.19	ND
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	ND	3.77	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	6.46	6.78	43.8
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	ND	4.34	ND
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	ND	4.26	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	3.47	5.89	10.2
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SSV2
LAB NO: 132327
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:30
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	CAS NO.	MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	1.22	5.46	6.66
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	ND	3.19	ND
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	ND	3.77	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	ND	6.78	ND
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	ND	4.34	ND
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	2.15	4.26	9.16
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	5.37	5.89	15.8
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:

ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SSV3
LAB NO: 132328
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:46
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

COMPOUND NAME	CAS NO.	PPB (V/V)		µg/cu. m	
		MRL	SAMPLE CONC	MRL	SAMPLE CONC
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	ND	5.46	ND
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	ND	3.19	ND
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	ND	3.77	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	ND	6.78	ND
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	ND	4.34	ND
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	2.07	4.26	8.82
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	3.68	5.89	10.8
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

SAMPLE ID: SSV4
LAB NO: 132329
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:58
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	**CAS NO.**	**MRL**	**SAMPLE CONC**	**MRL**	**SAMPLE CONC**
DICHLORODIFLUOROMETHANE	75-71-8	1.00	ND	4.95	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	1.00	ND	6.99	ND
CHLOROMETHANE	74-87-3	1.00	ND	2.07	ND
VINYL CHLORIDE	75-01-4	1.00	ND	2.56	ND
BROMOMETHANE	74-83-9	1.00	ND	3.88	ND
CHLOROETHANE	75-00-3	1.00	ND	2.64	ND
TRICHLOROFLUOROMETHANE	75-69-4	1.00	ND	5.62	ND
1,1-DICHLOROETHENE	75-35-4	1.00	ND	3.97	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	1.00	ND	7.66	ND
METHYLENE CHLORIDE	75-09-2	1.00	ND	3.47	ND
1,1-DICHLOROETHANE	75-34-3	1.00	ND	4.05	ND
CIS-1,2-DICHLOROETHENE	156-59-2	1.00	ND	3.97	ND
CHLOROFORM	67-66-3	1.00	ND	4.88	ND
1,1,1-TRICHLOROETHANE	71-55-6	1.00	ND	5.46	ND
CARBON TETRACHLORIDE	56-23-5	1.00	ND	6.29	ND
1,2-DICHLOROETHANE	107-06-2	1.00	ND	4.05	ND
BENZENE	71-43-2	1.00	ND	3.19	ND
TRICHLOROETHENE	79-01-6	1.00	ND	5.37	ND
1,2-DICHLOROPROPANE	78-87-5	1.00	ND	4.62	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00	ND	4.54	ND
TOLUENE	108-88-3	1.00	ND	3.77	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00	ND	4.54	ND
1,1,2-TRICHLOROETHANE	79-00-5	1.00	ND	5.46	ND
TETRACHLOROETHENE	127-18-4	1.00	ND	6.78	ND
1,2-DIBROMOETHANE	106-93-4	1.00	ND	7.68	ND
CHLOROBENZENE	108-90-7	1.00	ND	4.60	ND
ETHYLBENZENE	100-41-4	1.00	ND	4.34	ND
XYLENE (M+P)	1330-20-7	1.00	ND	4.34	ND
XYLENE (O)	95-47-6	1.00	ND	4.34	ND
STYRENE	100-42-5	1.00	1.92	4.26	8.18
1,1,2,2-TETRACHLOROETHANE	79-34-5	1.00	ND	6.87	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	1.00	ND	4.92	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	1.00	ND	4.92	ND
1,3-DICHLOROBENZENE	541-73-1	1.00	ND	6.01	ND
1,4-DICHLOROBENZENE	106-46-7	1.00	ND	6.01	ND
1,2-DICHLOROBENZENE	95-50-1	1.00	ND	6.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	2.00	ND	14.8	ND
HEXACHLOROBUTADIENE	87-68-3	1.00	ND	10.7	ND
2-BUTANONE (MEK)	78-93-3	2.00	2.92	5.89	8.60
4-METHYL-2-PENTANONE (MIBK)	108-10-1	2.00	ND	8.18	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SV1-10.0
LAB NO: 132320
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 11:10
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	6.53

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID:	SV1-5.0
LAB NO:	132321
BATCH ID:	042915A2
SAMPLE TYPE:	AIR
DATE SAMPLED:	04/24/2015
TIME SAMPLED:	11:29
DATE RECEIVED:	04/24/2015
DATE ANALYZED:	04/29/2015
UNITS:	%-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	6.92

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/06/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID:	SV2-9.5
LAB NO:	132322
BATCH ID:	042915A2
SAMPLE TYPE:	AIR
DATE SAMPLED:	4/24/2015
TIME SAMPLED:	11:57
DATE RECEIVED:	4/24/2015
DATE ANALYZED:	4/29/2015
UNITS:	%-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	15.4

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SV2-5.0
LAB NO: 132323
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 12:06
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	15.9

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID:	SV3-9.5
LAB NO:	132324
BATCH ID:	042915A2
SAMPLE TYPE:	AIR
DATE SAMPLED:	04/24/2015
TIME SAMPLED:	12:42
DATE RECEIVED:	04/24/2015
DATE ANALYZED:	04/29/2015
UNITS:	%-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	11.2

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SV3-5.0
LAB NO: 132325
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 12:50
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	12.4

NOTES:

ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SSV1
LAB NO: 132326
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:12
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	18.5

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SSV2
LAB NO: 132327
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:30
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	19.1

NOTES:

ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID: SSV3
LAB NO: 132328
BATCH ID: 042915A2
SAMPLE TYPE: AIR
DATE SAMPLED: 04/24/2015
TIME SAMPLED: 13:46
DATE RECEIVED: 04/24/2015
DATE ANALYZED: 04/29/2015
UNITS: %-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	8.97

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.

LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: METHANE, OXYGEN, NITROGEN
REFERENCE: ASTM D 1946

SAMPLE ID:	SSV4
LAB NO:	132329
BATCH ID:	042915A2
SAMPLE TYPE:	AIR
DATE SAMPLED:	04/24/2015
TIME SAMPLED:	13:58
DATE RECEIVED:	04/24/2015
DATE ANALYZED:	04/29/2015
UNITS:	%-V

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
METHANE	0.100	ND
OXYGEN	1.00	17.0

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: CARBON DIOXIDE
REFERENCE: ASTM D 1946

UNITS: %-V

SAMPLE ID	LAB NO.	SAMPLE TYPE	DATE SAMPLED	BATCH ID	DATE ANALYZED	MRL	SAMPLE CONC
SV1-10.0	132320	AIR	04/24/2015	042915A1	04/29/2015	0.100	13.6
SV1-5.0	132321	AIR	04/24/2015	042915A1	04/29/2015	0.100	11.4
SV2-9.5	132322	AIR	04/24/2015	042915A1	04/29/2015	0.100	6.57
SV2-5.0	132323	AIR	04/24/2015	042915A1	04/29/2015	0.100	4.52
SV3-9.5	132324	AIR	04/24/2015	042915A1	04/29/2015	0.100	7.74
SV3-5.0	132325	AIR	04/24/2015	042915A1	04/29/2015	0.100	6.17
SSV1	132326	AIR	04/24/2015	042915A1	04/29/2015	0.100	0.462
SSV2	132327	AIR	04/24/2015	042915A1	04/29/2015	0.100	ND
SSV3	132328	AIR	04/24/2015	042915A1	04/29/2015	0.100	4.25
SSV4	132329	AIR	04/24/2015	042915A1	04/29/2015	0.100	0.272

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TJ
DATE: 05/08/2015

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: 1,1-DIFLUOROETHANE
REFERENCE: EPA TO 3

UNITS: PPMV

SAMPLE ID	LAB NO.	SAMPLE TYPE	DATE SAMPLED	BATCH ID	DATE ANALYZED	MRL	SAMPLE CONC
SV1-10.0	132320	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SV1-5.0	132321	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SV2-9.5	132322	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SV2-5.0	132323	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SV3-9.5	132324	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SV3-5.0	132325	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SSV1	132326	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SSV2	132327	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SSV3	132328	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND
SSV4	132329	AIR	04/24/2015	042815A1	04/29/2015	10.0	ND

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY:
DATE: 05/08/2015

K PRIME, INC.

LABORATORY METHOD BLANK REPORT

METHOD BLANK ID: B050115A1
SAMPLE TYPE: AIR

BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

		PPB (V/V)		µg/cu. m	
COMPOUND NAME	**CAS NO.**	**MRL**	**SAMPLE CONC**	**MRL**	**SAMPLE CONC**
DICHLORODIFLUOROMETHANE	75-71-8	0.500	ND	2.47	ND
DICHLOROTETRAFLUOROETHANE	76-14-2	0.500	ND	3.50	ND
CHLOROMETHANE	74-87-3	0.500	ND	1.03	ND
VINYL CHLORIDE	75-01-4	0.500	ND	1.28	ND
BROMOMETHANE	74-83-9	0.500	ND	1.94	ND
CHLOROETHANE	75-00-3	0.500	ND	1.32	ND
TRICHLOROFLUOROMETHANE	75-69-4	0.500	ND	2.81	ND
1,1-DICHLOROETHENE	75-35-4	0.500	ND	1.98	ND
TRICHLOROTRIFLUOROETHANE	76-13-1	0.500	ND	3.83	ND
METHYLENE CHLORIDE	75-09-2	0.500	ND	1.74	ND
1,1-DICHLOROETHANE	75-34-3	0.500	ND	2.02	ND
CIS-1,2-DICHLOROETHENE	156-59-2	0.500	ND	1.98	ND
CHLOROFORM	67-66-3	0.500	ND	2.44	ND
1,1,1-TRICHLOROETHANE	71-55-6	0.500	ND	2.73	ND
CARBON TETRACHLORIDE	56-23-5	0.500	ND	3.15	ND
1,2-DICHLOROETHANE	107-06-2	0.500	ND	2.02	ND
BENZENE	71-43-2	0.500	ND	1.60	ND
TRICHLOROETHENE	79-01-6	0.500	ND	2.69	ND
1,2-DICHLOROPROPANE	78-87-5	0.500	ND	2.31	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	0.500	ND	2.27	ND
TOLUENE	108-88-3	0.500	ND	1.88	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	0.500	ND	2.27	ND
1,1,2-TRICHLOROETHANE	79-00-5	0.500	ND	2.73	ND
TETRACHLOROETHENE	127-18-4	0.500	ND	3.39	ND
1,2-DIBROMOETHANE	106-93-4	0.500	ND	3.84	ND
CHLOROBENZENE	108-90-7	0.500	ND	2.30	ND
ETHYLBENZENE	100-41-4	0.500	ND	2.17	ND
XYLENE (M+P)	1330-20-7	0.500	ND	2.17	ND
XYLENE (O)	95-47-6	0.500	ND	2.17	ND
STYRENE	100-42-5	0.500	ND	2.13	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	0.500	ND	3.43	ND
1,3,5-TRIMETHYLBENZENE	108-67-8	0.500	ND	2.46	ND
1,2,4-TRIMETHYLBENZENE	95-63-6	0.500	ND	2.46	ND
1,3-DICHLOROBENZENE	541-73-1	0.500	ND	3.01	ND
1,4-DICHLOROBENZENE	106-46-7	0.500	ND	3.01	ND
1,2-DICHLOROBENZENE	95-50-1	0.500	ND	3.01	ND
1,2,4-TRICHLOROBENZENE	120-82-1	0.500	ND	3.71	ND
HEXACHLOROBUTADIENE	87-68-3	0.500	ND	5.33	ND
2-BUTANONE (MEK)	78-93-3	1.00	ND	2.94	ND
4-METHYL-2-PENTANONE (MIBK)	108-10-1	1.00	ND	4.09	ND

NOTES:

ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
MRL - METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
µg/cu. m VALUES ARE CALCULATED FROM PPB RESULTS USING NORMAL TEMPERATURE AND PRESSURE (NPT).

K PRIME, INC.
LABORATORY QUALITY CONTROL REPORT

LAB CONTROL ID: L050115A1
LAB CONTROL DUPLICATE ID: D050115A1

SAMPLE TYPE: AIR
BATCH ID: 050115A1
DATE ANALYZED: 05/04/2015

METHOD: VOC'S IN AIR
REFERENCE: EPA METHOD TO 15 (GC-MS-SCAN)

COMPOUND NAME	SPIKE ADDED (PPB)	REPORTING LIMIT (PPB)	SAMPLE CONC (PPB)	SPIKE CONC (PPB)	SPIKE REC (%)	REC LIMITS (%)
1,1-DICHLOROETHENE	10.0	0.500	ND	9.99	100	60 - 140
TRICHLOROETHENE	10.0	0.500	ND	10.9	109	60 - 140
BENZENE	10.0	0.500	ND	10.2	102	60 - 140
TOLUENE	10.0	0.500	ND	10.8	108	60 - 140
TETRACHLOROETHENE	10.0	0.500	ND	10.7	107	60 - 140

COMPOUND NAME	SPIKE ADDED (PPB)	SPIKE DUP CONC (PPB)	SPIKE DUP REC (%)	RPD (%)	QC LIMITS RPD (%)	QC LIMITS REC (%)
1,1-DICHLOROETHENE	10.0	9.64	96	3.6	25	60 - 140
TRICHLOROETHENE	10.0	10.4	104	5.2	25	60 - 140
BENZENE	10.0	9.82	98	3.8	25	60 - 140
TOLUENE	10.0	10.4	104	4.3	25	60 - 140
TETRACHLOROETHENE	10.0	10.1	101	5.8	25	60 - 140

NOTES:
NA - NOT APPLICABLE OR AVAILABLE
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT

K PRIME, INC.

LABORATORY QC REPORT

METHOD: METHANE, OXYGEN, NITROGEN (BALANCE)
REFERENCE: ASTM D 1946

METHOD BLANK ID:	B042915A2
SAMPLE ID:	L042915A2
DUPLICATE ID:	D042915A2
BATCH #:	042915A2
SAMPLE TYPE:	AIR
UNITS:	%-V
DATE ANALYZED:	04/29/2015

METHOD BLANK

PARAMETER	REPORTING	SAMPLE
	LIMIT	RESULT
METHANE	0.100	ND
OXYGEN	1.00	ND

ACCURACY (MATRIX SPIKE)

PARAMETER	SPIKE	SAMPLE	SPIKE	RECOVERY	LIMITS
	ADDED	RESULT	RESULT	(%)	(%)
METHANE	50.0	ND	49.2	98	90-110
OXYGEN	10.0	ND	10.3	103	90-110
NITROGEN (BALANCE)	40.0	ND	40.5	101	90-110

PRECISION (SPIKE DUPLICATE)

COMPOUND NAME	REPORTING	SPIKE	DUPLICATE	RPD	LIMITS
	LIMIT	RESULT	RESULT	(%)	(%)
METHANE	0.100	49.2	49.8	1.2	±10
OXYGEN	1.00	10.3	10.1	2.0	±10
NITROGEN (BALANCE)	1.00	40.5	40.1	1.0	±10

K PRIME, INC.
LABORATORY QC REPORT

METHOD: CARBON DIOXIDE
REFERENCE: ASTM D 1946

METHOD BLANK ID:	B042915A1
SAMPLE ID:	L042915A1
DUPLICATE ID:	D042915A1
BATCH #:	042915A1
SAMPLE TYPE:	AIR
UNITS:	%-V
DATE ANALYZED:	04/29/2015

METHOD BLANK

PARAMETER	REPORTING LIMIT	SAMPLE RESULT
CARBON DIOXIDE	0.050	ND

ACCURACY (MATRIX SPIKE)

PARAMETER	SPIKE ADDED	SAMPLE RESULT	SPIKE RESULT	RECOVERY (%)	LIMITS (%)
CARBON DIOXIDE	1.00	ND	0.976	98	70-130

PRECISION (SPIKE DUPLICATE)

COMPOUND NAME	REPORTING LIMIT	SPIKE RESULT	DUPLICATE RESULT	RPD (%)	LIMITS (%)
CARBON DIOXIDE	0.050	0.976	0.956	2.0	±20

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED REPORTING LIMIT
NA - NOT AVAILABLE OR APPLICABLE

K PRIME, INC.
LABORATORY QC REPORT

METHOD BLANK ID:	B042815A1
LAB CONTROL SAMPLE ID:	L042815A1
LAB CONTROL DUPLICATE ID:	D042815A1
BATCH ID:	042815A1

METHOD: 1,1-DIFLUOROETHANE
REFERENCE: EPA TO 3

SAMPLE TYPE:	AIR
UNITS:	PPM -V/V

METHOD BLANK

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
1,1-DIFLUOROETHANE	10.0	ND

ACCURACY (LAB CONTROL SAMPLE)

COMPOUND NAME	EXPECTED CONC	MEASURED CONC	PERCENT RECOVERY	LIMITS (PERCENT)
1,1-DIFLUOROETHANE	10000	10900	109	60-140

PRECISION (LAB CONTROL DUPLICATE)

COMPOUND NAME	SAMPLE RESULT	DUPLICATE RESULT	RPD (PERCENT)	LIMITS (PERCENT)
1,1-DIFLUOROETHANE	10900	11200	2.7	±30

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE

9418

PES Environmental, Inc.
Engineering & Environmental Services

CHAIN OF CUSTODY RECORD

1682 NOVATO BOULEVARD, SUITE 100
NOVATO, CALIFORNIA 94947
(415) 899-1600 FAX (415) 899-1601

LABORATORY: K Prime

JOB NUMBER: 1448.001.01

NAME / LOCATION: 6701-6707 Shellmound / Emeryville

PROJECT MANAGER: K. Flory

SAMPLERS: M. Buttress

RECORDER: MB

DATE				SAMPLE NUMBER / DESIGNATION	MATRIX					# of Containers & Preservatives						~~DEPTH IN FEET~~	ANALYSIS REQUESTED										
YR	MO	DY	TIME		Vapor	Water	Soil	Sedim't	KPI#	Unpres.	EnCore	H_2SO_4	HNO_3	HCl	Summa	Can ID	EPA 5035/8010	EPA 5035/8021	EPA 5035/8260B	TPHg by 5035/8015M	TPHd by 8015M	TPHmo by 8015M	EPA 8270C	MNA Parameters (see notes)	VOCs (TO-15)*	Methane, CO_2, Oxygen (ASTM D1946)	1,1-DFA (TO-3)
15	04	24	1110	SV1-10.0	X				132320						1	S-919									X	X	X
			1129	SV1-5.0	X				132321						1	S-114									X	X	X
			1157	SV2-9.5	X				132322						1	S-920									X	X	X
			1206	SV2-5.0	X				132323						1	S-365									X	X	X
			1242	SV3-9.5	X				132324						1	S-360									X	X	X
			1250	SV3-5.0	X				132325						1	S-364									X	X	X
			1312	SSV1	X				132326						1	S-354									X	X	X
			1330	SSV2	X				132327						1	S-363									X	X	X
			1346	SSV3	X				132328						1	S-911									X	X	X
			1358	SSV4	X				132329						1	S-912									X	X	X

NOTES

Turn Around Time: standard

* = Standard list + MEK, MIBK

Page 1 of 1

CHAIN OF COSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
	(VTC)	4/24/15	2:35
(VTC)	Rew-Cook KPI	4/24/15	16:57

DISPATCHED BY: (Signature)	DATE	TIME	RECEIVED FOR LAB BY: (Signature)	DATE	TIME

METHOD OF SHIPMENT:

WHITE-Laboratory COPY YELLOW-Project Office Copy PINK-Field or Office Copy

SHROUD SAMPLE ANALYTICAL REPORTS

K PRIME, Inc.
CONSULTING ANALYTICAL CHEMISTS

3621 Westwind Blvd.
Santa Rosa CA 95403
Phone: 707 527 7574
FAX: 707 527 7879

TRANSMITTAL

DATE: 5/8/2015

TO:
MR. KYLE FLORY
PES ENVIRONMENTAL, INC.
1682 NOVATO BLVD., STE 100
NOVATO, CA 94947

ACCT: 9418
PROJ: 1448.001.01

Phone: 415-899-1600
Fax: 415-899-1601
Email: kflory@pesenv.com

FROM:
Richard A. Kagel, Ph.D.
Laboratory Director

RAK by TJ
05/08/2015

SUBJECT: LABORATORY RESULTS FOR YOUR PROJECT 1448.001.01

Enclosed please find K Prime's laboratory reports for the following samples:

SAMPLE ID	TYPE	DATE	TIME	KPI LAB #
SV1-10.0-SHROUD	AIR	4/24/2015	11:10	132330
SV1-5.0-SHROUD	AIR	4/24/2015	11:29	132331
SV2-9.5-SHROUD	AIR	4/24/2015	11:57	132332
SV2-5.0-SHROUD	AIR	4/24/2015	12:06	132333
SV3-9.5-SHROUD	AIR	4/24/2015	12:42	132334
SV3-5.0-SHROUD	AIR	4/24/2015	12:50	132335
SSV1-SHROUD	AIR	4/24/2015	13:12	132336
SSV2-SHROUD	AIR	4/24/2015	13:30	132337
SSV3-SHROUD	AIR	4/24/2015	13:46	132338
SSV4-SHROUD	AIR	4/24/2015	13:58	132339

The above listed sample group was received on 4/24/2015 and tested as requested on the chain of custody document.

Please call me if you have any questions or need further information.
Thank you for this opportunity to be of service.

K PRIME, INC.
LABORATORY REPORT

K PRIME PROJECT: 9418
CLIENT PROJECT: 1448.001.01

METHOD: 1,1-DIFLUOROETHANE
REFERENCE: EPA TO 3

UNITS: PPMV

SAMPLE ID	LAB NO.	SAMPLE TYPE	DATE SAMPLED	BATCH ID	DATE ANALYZED	MRL	SAMPLE CONC
SV1-10.0-SHROUD	132330	AIR	04/24/2015	043015A1	04/30/2015	10.0	8800
SV1-5.0-SHROUD	132331	AIR	04/24/2015	043015A1	04/30/2015	10.0	7620
SV2-9.5-SHROUD	132332	AIR	04/24/2015	043015A1	04/30/2015	10.0	17100
SV2-5.0-SHROUD	132333	AIR	04/24/2015	043015A1	04/30/2015	10.0	5500
SV3-9.5-SHROUD	132334	AIR	04/24/2015	043015A1	04/30/2015	10.0	6400
SV3-5.0-SHROUD	132335	AIR	04/24/2015	043015A1	04/30/2015	10.0	2370
SSV1-SHROUD	132336	AIR	04/24/2015	043015A1	04/30/2015	10.0	14600
SSV2-SHROUD	132337	AIR	04/24/2015	043015A1	04/30/2015	10.0	12700
SSV3-SHROUD	132338	AIR	04/24/2015	043015A1	04/30/2015	10.0	14800
SSV4-SHROUD	132339	AIR	04/24/2015	043015A1	04/30/2015	10.0	12900

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE
MRL - METHOD REPORTING LIMIT

APPROVED BY: TG
DATE: 05/08/2015

K PRIME, INC.
LABORATORY QC REPORT

METHOD BLANK ID: B043015A1
LAB CONTROL SAMPLE ID: L043015A1
LAB CONTROL DUPLICATE ID: D043015A1
BATCH ID: 043015A1

METHOD: 1,1-DIFLUOROETHANE
REFERENCE: EPA TO 3

SAMPLE TYPE: AIR
UNITS: PPM -V/V

METHOD BLANK

COMPOUND NAME	REPORTING LIMIT	SAMPLE CONC
1,1-DIFLUOROETHANE	10.0	ND

ACCURACY (LAB CONTROL SAMPLE)

COMPOUND NAME	EXPECTED CONC	MEASURED CONC	PERCENT RECOVERY	LIMITS (PERCENT)
1,1-DIFLUOROETHANE	10000	10500	105	60-140

PRECISION (LAB CONTROL DUPLICATE)

COMPOUND NAME	SAMPLE RESULT	DUPLICATE RESULT	RPD (PERCENT)	LIMITS (PERCENT)
1,1-DIFLUOROETHANE	10500	10000	4.9	±30

NOTES:
ND - NOT DETECTED AT OR ABOVE THE STATED METHOD REPORTING LIMIT
NA - NOT APPLICABLE OR AVAILABLE

9418

PES Environmental, Inc.
Engineering & Environmental Services

CHAIN OF CUSTODY RECORD

1682 NOVATO BOULEVARD, SUITE 100
NOVATO, CALIFORNIA 94947
(415) 899-1600 FAX (415) 899-1601

LABORATORY: K Prime

SAMPLERS: M. Buttress

JOB NUMBER: 1448.001.01

NAME / LOCATION: 6701-6707 shellmound, Emeryville

PROJECT MANAGER: K. Flory

RECORDER: MB

DATE				SAMPLE NUMBER / DESIGNATION	MATRIX					# of Containers & Preservatives						~~DEPTH IN~~ FEET Can ID	ANALYSIS REQUESTED								
YR	MO	DY	TIME		Vapor	Water	Soil	Sedim't	KPI#	Unpres.	EnCore	H_2SO_4	HNO_3	HCl	Summa		EPA 5035/8010	EPA 5035/8021	EPA 5035/8260B	TPHg by 5035/8015M	TPHd by 8015M	TPHmo by 8015M	EPA 8270C	MNA Parameters (see notes)	1,1-DFA (TO-3)
15	04	24	1110	SV1-10.0-shroud	1				132330						1	S-724									X
			1129	SV1-5.0-shroud	1				132331						1	S-727									X
			1157	SV2-9.5-shroud	1				132332						1	S-237									X
			1206	SV2-5.0-shroud	1				132333						1	S-654									X
			1242	SV3-9.5-shroud	1				132334						1	S-361									X
			1250	SV3-5.0-shroud	1				132335						1	S-362									X
			1312	SSV1-shroud	1				132336						1	S-267									X
			1330	SSV2-shroud	1				132337						1	S-235									X
			1346	SSV3-shroud	1				132338						1	S-521									X
			1358	SSV4-shroud	1				132339						1	S-655									X

NOTES

Turn Around Time: Standard

Page 1 of 1

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
	(UTC)	4/24/15	2:35
(UTC)	Rew-Cook KPI	4/24/15	16:57

DISPATCHED BY: (Signature)	DATE	TIME	RECEIVED FOR LAB BY: (Signature)	DATE	TIME

METHOD OF SHIPMENT:

WHITE-Laboratory COPY YELLOW-Project Office Copy PINK-Field or Office Copy

APPENDIX C

HUMAN HEALTH RISK ASSESSMENT

HUMAN HEALTH RISK ASSESSMENT REPORT
6701-6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

MAY, 2015

Prepared by:

SLR International Corporation
110 11th Street, 2nd Floor
Oakland, CA 94607

Prepared for:

PES Environmental, Inc.
1682 Novato Blvd., Suite 100
Novato, CA 94947

Amanda Bailey

Amanda Bailey
Associate Risk Assessment Scientist
SLR International Corporation

Quality Control Review conducted by:

Mark E. Stelljes

Mark E. Stelljes, Ph.D.
Director of Risk Assessment and Toxicology
SLR International Corporation

This document was prepared upon request and on behalf of PES Environmental. No other party should rely on the information contained herein without prior written consent of SLR International Corporation and PES Environmental. The conclusions, recommendations, and interpretations in this report are based in part on information contained in other documents and sources, as cited in the text. Therefore, this report is also subject to the limitations of the cited documents and sources.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PLATES

1.0 INTRODUCTION

This report, prepared by SLR International Corporation (SLR) for PES Environmental, Inc. (PES) on behalf of their client, Anton Emeryville, LLC (Anton), presents a Human Health Risk Assessment (HHRA) for the property located at 6701-6707 Shellmound Street in Emeryville, California (the site). The HHRA specifically evaluates Anton's planned redevelopment of the site for apartments and parking as outlined in PES' Conceptual Site Model (PES, 2015).

The site is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case with Alameda County Environmental Health Services (ACEH) as the lead environmental regulatory agency. According to the SLIC database, soil and groundwater were impacted by releases of solvents and non-petroleum hydrocarbons from Mike Roberts Color Production (6707 Bay Street). The site is also listed in the Leaking Underground Storage Tank (LUST) database due to a reported release from former USTs at this same 6707 Bay Street location. Bay Street is now Shellmound Street.

While the ACEH is the lead environmental regulatory agency for the site, they do not have specific HHRA guidance. Instead, other protocols recommended by the California Environmental Protection Agency (CalEPA) are typically followed. The primary guidance used by ACEH is provided by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), and this HHRA has been conducted generally consistent with their guidance (RWQCB, 2013b).

The objective of the HHRA was to evaluate potential human health risks associated with exposure to chemicals detected in site media during and post-redevelopment. Where applicable, analytical data were compared to risk-based screening levels and evaluated for potential risks as recommended by the RWQCB (2013b).

1.1 OVERVIEW OF APPROACH

The RWQCB provides screening-based guidance for evaluating sites with contaminated soil and groundwater in *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (RWQCB, 2013a,b). In that guidance, the RWQCB provides environmental screening levels (ESLs) for use in a tiered approach similar to the tiered risk-based approach outlined by ASTM International in their *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM, 1995).

In addition to human health risk-based goals, the ESLs also address aesthetic goals (e.g., taste and odor) and environmental protection goals presented in the Water Quality Control Plan for the San Francisco Bay Basin ("Basin Plan"; RWQCB, 2010), including:

Surface Water and Groundwater:

- Protection of drinking water resources;
- Protection of aquatic habitat; and
- Protection against adverse nuisance conditions.

Soil:

- Protection of human health;
- Protection of groundwater;
- Protection of terrestrial biota; and
- Protection against adverse nuisance conditions.

ESLs, which are considered very conservative (i.e., stringent), are not enforceable regulatory cleanup standards. Exceedance of an ESL indicates the potential presence of environmental threats, and suggests but does not require a need for additional evaluation. The presence of a chemical at concentrations below ESLs can be assumed not to pose a significant environmental threat (RWQCB, 2013b).

The RWQCB (2013b) tiered approach consists of the following steps:

- Tier 1 Evaluation – In this conservative screening step, chemical concentrations are directly compared to ESLs selected for the site. Results of this comparison are used to base decisions regarding the need for a more detailed risk assessment (e.g., Tier 2 evaluation), additional site investigation, or remedial action.

- Tier 2 Evaluation – In this step, ESLs are modified with respect to site-specific data or considerations. Examples cited by the RWQCB include modifying an ESL based on site–specific information (e.g., depth to groundwater or soil geophysical properties) or to meet alternative target risk levels.

- Tier 3 Evaluation – In this step, site-specific screening levels or clean-up levels are developed using alternate models and modeling assumptions.

The approach used in this HHRA is consistent with Tier 1 outlined by the RWQCB (2013b). Where relevant, chemicals exceeding the Tier 1 ESLs are then quantitatively evaluated in a baseline risk assessment, which generally corresponds to Tier 3 of the guidance.

Other guidance was also consulted, as necessary and appropriate, in subsequent sections of this HHRA. This report is organized as follows:

- Section 1.0 - Introduction
- Section 2.0 - Site Background
- Section 3.0 - Data Evaluation
- Section 4.0 - Conceptual Site Model
- Section 5.0 - Tier 1 Evaluation
- Section 6.0 – Quantitative Risk Evaluation
- Section 7.0 - Uncertainty Evaluation
- Section 8.0 - Summary and Conclusions
- Section 9.0 - References.

2.0 SITE BACKGROUND

This section describes the site location and use, the adjacent offsite area, and physical characteristics pertinent to the HHRA. Additional information is provided in PES (2015).

2.1 DESCRIPTION OF SITE AND SURROUNDING AREA

The site is located at 6701, 6705, and 6707 Shellmound Street (previously known as Bay Street), in a mixed industrial, commercial, and residential area of Emeryville in Alameda County, California (Plate 1). The site currently contains a two-story office building and a warehouse building connected by a common lobby area and is used for commercial purposes (Plate 2).

Future plans are for a new multi-story, multi-family residential development to be constructed on the site. Existing buildings and related improvements will be demolished and removed followed by grading and excavation for new construction. Planned development includes a seven-story building comprising the majority of the subject property with parking garage, lobby, and amenities spaces occupying the first (on-grade) and second floors of the building. A limited portion of the first and second floors will be developed as residential units. After redevelopment, the entire site will be covered by a combination of the building and associated paved parking and driving areas, with the exception of planter boxes and landscaped areas.

The site is bounded to the west and north by the Ashby Avenue off-ramp from Interstate 80, to the south by a commercial building, and to the east by Shellmound Street and a railroad right-of-way. The site buildings and the adjacent areas are shown on Plates 2 and 3 in PES (2015). The footprints of the office and warehouse buildings occupy approximately 7,470 and 43,850 square feet, respectively, and both buildings have slab-on-grade foundations. The remainder of the site consists of landscaped areas and asphalt paved parking and driving areas.

According to the United States Geological Survey (USGS) *Oakland West, California* Quadrangle 7.5-minute series topographic map dated 1993, the site is situated at an elevation of approximately 18 feet above mean sea level. The site is relatively flat, but the vicinity slopes gently to the west/southwest. The nearest surface water body is San Francisco Bay, located approximately 1,000 feet west of the subject property (PES, 2015).

No potentially sensitive receptors were identified within 0.25 mile of the site.

The highly developed and paved nature of the site area and vicinity make it likely that ecological exposure pathways are incomplete. Wildlife present at the site includes common, non-endangered species such as perching birds, small mammals such as mice, and reptiles such as lizards. However, exposure to chemicals in soil is prevented by paving and ongoing disturbance by human activity makes nesting and breeding at the site unlikely. No aquatic resources are present, which precludes the presence of aquatic receptors. Therefore, this risk assessment does not further consider ecological receptors.

2.2 GEOLOGY AND HYDROGEOLOGY

Based on the results of investigations performed on the subject property and in the vicinity, the site is underlain by imported fill material overlying deposits of native silts and clays known locally as Old Bay Mud. Beneath the Old Bay Mud deposits are deposits of stiffer sand, silts, and clays that likely represent alluvial deposits of the Temescal Formation. The land on which the site is located historically consisted of San Francisco Bay tidal mud flats and was below sea level until the mid- to late-1930s, when a levee was built west of the subject property and a highway (Eastshore Highway, now Interstate 80) was constructed on the levee. From that time until the early to mid-1950s the area between the highway and the former shoreline, including the subject property and vicinity, were filled in by non-native soils to create buildable land. The fill material generally consists of coarse-grained sands and gravels that contain varying amounts of fines, and fine-grained silts and clays.

Previous investigations have shown that the fill materials at the site and other similarly filled properties in the vicinity contain residual contamination with related impacts to shallow groundwater. Contamination found and attributed to the non-native fill materials originally used to create the land along the bay-shore area of Emeryville including the site and immediate vicinity includes impacts related to total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals.

Groundwater was encountered at the site at approximately 11 to 13 feet below ground surface (bgs) in November 2013 (PES, 2015). Groundwater flow to the south/southwest has been measured from monitoring well data collected on the subject property with localized flow toward the west in the vicinity of the former underground storage tanks (see Plate 3 of PES, 2015).

2.3 INSTITUTIONAL AND ENGINEERING CONTROLS

There is an existing deed notice on the subject property. As part of the closure for the former USTs and the related LUST case, a deed notice for the site was provided to the ACEH on February 1, 1995 as a requirement by the ACEH and the RWQCB for closure of the UST case. One requirement under the notice was to conduct an environmental risk assessment if any significant change in land use is proposed. The subject site land use will be changed from commercial to residential under the proposed development plans, triggering the need for an environmental risk assessment. This HHRA fulfills that requirement.

A City of Emeryville Ordinance (No. 07-006) prohibits extraction of groundwater for drinking, industrial or irrigation purposes, and serves as an additional institutional control that reduces the potential for exposure to groundwater.

In conjunction with redevelopment of the site, Anton plans to work with the ACEH to develop a land use covenant (LUC) to replace the existing deed notice. The LUC document will identify the contamination at the site, restrictions on development and use of the site, restrictions on use of underlying groundwater, and requirements for maintenance of the site cover and notification to ACEH. To address contaminated media that may be encountered during construction and redevelopment activities Anton also intends to submit a Site Management and Contingency Plan (SMP) for ACEH approval. The SMP would provide procedures for handling and management of soil, and potentially groundwater, encountered during construction. The SMP will also provide a post-construction operations and management (O&M) plan to describe procedures to be followed to maintain a cap over subsurface materials. Implementation of these institutional and engineering controls will substantially limit or eliminate exposure to chemicals detected in soil at the site during construction activities and site redevelopment, and in the future. More details of the SMP are provided in PES (2015).

3.0 DATA EVALUATION

This section summarizes historical sampling and analysis of soil, groundwater, and soil gas at the site. The site characterization summary in Section 3.1 is based on PES (2015); more detailed information can be found in that report. Analytical results specifically evaluated in the HHRA are also presented.

3.1 SITE CHARACTERIZATION

As discussed in PES (2015), the site has been the subject of several investigations and remediation commencing in 1989. Soil and groundwater sampling began at that time, and some limited soil gas sampling was conducted in April 2013. The most recent activities at the site include soil and groundwater sampling conducted in November 2013. The analyses and results are discussed in this section.

On the basis of the results of the multiple investigations and remediation activities, the UST case was granted conditional closure by the ACEH and RWQCB in a letter dated February 1, 1995. The conditional case closure was granted on the basis of the data provided and the execution of a deed notice, as discussed in Section 2.3.

3.1.1 SOIL CHARACTERIZATION

Soil sampling was conducted at the site in 1989 from 10 soil borings, and TPH was identified in shallow soil at the rear of the site. That same year, soil samples were collected from five additional soil borings, and identified the presence of TPH, PCBs, lead, and MIBK. USTs were removed in October of 1989, but the excavated soil, impacted with MIBK, was placed back into the excavation.

A soil vapor extraction (SVE) system was installed and operated between July and September 1990 to treat MIBK. Soil was sampled by PES in 1991 in the remediated area. The SVE system was decommissioned in May 1993. Nature and extent sampling was conducted in 1994, and nine additional soil borings were installed. MIBK was detected up to 7.8 milligrams per kilogram (mg/kg) in soil downgradient from the former USTs prior to SVE operation. Conditional site closure of the UST portion of the site was granted by the ACEH in December 1996.

In April 2013, five new soil locations were sampled, and PCBs, DDT, and metals were detected in most of the samples. In November 2013, PES drilled and sampled 18 soil borings at both exterior and interior locations across the site. Soil results from the fill material underlying the entire site (identified during the continuous cores collected during this event) indicated SVOCs, PCBs, and metals were present above regulatory screening levels.

3.1.2 GROUNDWATER CHARACTERIZATION

In 1989, four monitoring wells were developed from the soil boreholes and subsequently sampled. Two new monitoring wells were developed in 1990, and all six wells were sampled. Benzene, MIBK, and oil and grease were detected in some of these wells. Groundwater extraction began in October 1990. In 1991, three of the monitoring wells were sampled to evaluate the efficacy of the extraction system, and MIBK was detected in one of these wells. Three additional quarterly monitoring rounds were conducted, after which the treatment system was decommissioned in May 1993 (along with the SVE system).

Nature and extent sampling was conducted for soil in 1994, and two of these borings were developed into monitoring wells and sampled. All other monitoring wells were also sampled at this time. MIBK continued to be detected at concentrations up to 140,000 micrograms per liter (ug/L). Quarterly groundwater monitoring continued through May 1996, at which time conditional soil closure was granted and sampling activities ceased.

In April 2013, five new sampling locations were used to collect grab groundwater samples. TPH as diesel (TPHd), and VOCs including benzene, ethylbenzene, naphthalene, and xylenes were also detected above regulatory screening levels. Analysis of groundwater samples collected during the April 2013 investigation also indicated the presence of elevated concentrations (i.e., exceeding California MCLs and ESLs) of total metals (antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, silver, vanadium and zinc). In November 2013, PES collected groundwater samples from temporary well casings at six exterior locations across the site. Results indicated dissolved arsenic and lead present at concentrations above California Maximum Contaminant Levels (MCLs). As discussed in PES' Conceptual Site Model (PES, 2015), based on a comparison of dissolved lead and other metals results obtained during PES' November 2013 investigation to those obtained during ENVIRON's April 2013 investigation, it appears that the April 2013 metal results were anomalously high and not representative of groundwater conditions beneath the site.

3.1.3 SOIL GAS CHARACTERIZATION

Soil gas samples were collected from five locations in April 2013. Benzene was detected at an elevated concentration at one location, but this sample was compromised with ambient air and is likely not representative of subsurface conditions (PES, 2015). An additional six samples were collected by PES in April 2015, representing two depths (5 and 9.5-10 feet bgs) at each of three locations. At this same time, four subslab samples were collected from beneath the existing building. Four VOCs, but not benzene, were detected in subslab samples.

3.2 RISK ASSESSMENT DATASET

An evaluation of the available soil, groundwater, and soil gas data was conducted to identify data applicable to the HHRA. Some data points may not be applicable according to criteria such as sampling date and medium. Criteria evaluated for identifying the risk assessment dataset were (1) sample location, (2) sample depth, (3) sample date, and (4) type of sample. Results of this evaluation are provided in the following text, followed by summaries of the risk assessment datasets for soil, groundwater, and soil gas. Tables 1 through 5 present a summary of the risk assessment datasets by medium, including the maximum detected concentration, number of analyses and detections, and frequency of detection (FOD). The complete data tables are provided in PES (2015).

Sample location. With two exceptions, soil samples were collected only from onsite locations. The exceptions are two samples from a single location, one at 1 foot bgs and one at 3 feet bgs, which were collected beyond the site boundary in a ditch to the west of the site. This ditch collects runoff from the asphalt (Plate 2), and the area was excavated to approximately 3 feet bgs in 1989. Also, the sump area on the west side of the warehouse building was excavated to 1 foot bgs in 1989. Samples from soil that has been excavated and removed from the site are not representative of current soil conditions, and were not included in the risk assessment dataset. With the exception of the sump area and offsite ditch area, no soil has been removed from the site, but VOC remediation occurred in the excavation area in 1990. Therefore, VOC soil data collected in the vicinity of the former USTs prior to implementation of the remediation systems in 1990 are not representative of current site conditions. These include the six samples collected in October 1989 from beneath the UST excavation, one sample collected from location B-8/MW-8, downgradient of the UST area, from 9 feet bgs in January 1990, and four samples of drain residue collected in 1989. All other soil sample locations are relevant for evaluation in the risk assessment dataset, as are data for non-VOCs Many sample locations will be covered by the building footprint or parking areas post-development; these data are also included in the risk assessment dataset. A separate dataset was also evaluated, to estimate potential risks to future maintenance/utility workers, and this dataset contained only samples from the locations that will remain uncovered except for landscaping (Plate 2).

All groundwater data were collected onsite, and all sample locations were included in the groundwater risk assessment dataset. All soil gas data (including subslab samples) were included in the risk assessment dataset, except for the shroud sample that was collected from SG-2 for quality assurance purposes and is not representative of soil gas conditions.

Sample depth. The soil samples were collected from depths ranging from 0.5 to 30.5 feet bgs (PES 2015 Tables 1-4 of Appendix B, Part 1, and Tables 1 and D4-1 of Appendix B, Part 2). The planned excavation at the site may reach a depth of approximately 12 feet bgs. Therefore, soil samples from 1 to 12 feet bgs were included in the soil risk assessment dataset for potential direct contact. Samples deeper than 12 feet bgs were not quantitatively addressed in the HHRA. A screening evaluation was conducted on samples from these deeper depths as part of Tier 1, but they were not included in the quantitative risk assessment.

Sample date. UST removal and remediation activities occurred at the site between 1989 and 1993. As a result, some of the data represent samples from locations where soil and/or groundwater have been remediated. At these locations (near the former USTs), only soil data collected post-remediation are considered to potentially reflect current conditions for VOCs and were included in the risk assessment dataset for those chemicals. As discussed for sample location, the six soil samples collected in 1989 from beneath the UST excavation and the soil sample collected from 9 feet bgs at location B-8/MW-8 were excluded from the risk assessment dataset for VOCs. Soil gas samples were collected in 2013 and 2015, and were included in the risk assessment dataset as reflecting current conditions. For groundwater, all data included in PES (2015) were conservatively evaluated even though groundwater extraction and treatment occurred in the early 1990s. This is further discussed in the Tier 1 evaluation.

Sample type. Soil samples were collected from soil borings and excavation limits (prior to backfilling), while groundwater samples represent both grab groundwater samples and monitoring well samples. Both types of soil samples were included in the risk assessment dataset, as were all groundwater samples regardless of type or location. Grab groundwater samples are not generally suited for risk assessment purposes because data from grab samples are generally higher than would be anticipated from groundwater wells due to the presence of soil particles from the borehole in the sample, and the lack of equilibrium conditions during sample collection. Therefore, including groundwater data from grab samples in a risk assessment is conservative, particularly for chemicals with low water solubility and high sorption capacity.

The risk assessment datasets for soil, groundwater, and soil gas are summarized below. Only detected chemicals are presented. Data summaries are provided in Tables 1 and 2 for soil, Table 3 for groundwater, Table 4 for soil gas, and Table 5 for subslab soil gas.

3.2.1 SOIL RISK ASSESSMENT DATASET

A summary of detected analytes is provided below for all sampling locations for the datasets described in the previous text.

0 to 12 feet bgs Soil

➢ VOC soil data: A total of 20 to 28 soil samples were included in the risk assessment evaluation for the 0 to 12 feet bgs depth interval, depending on the chemical (Table 1). Two soil samples were collected from the ditch area west of the site. As noted above, soil above one foot in the sump area and above three feet in the ditch area was excavated and disposed offsite. No soil samples included in the risk assessment dataset for VOCs were collected shallower than 3 feet bgs. A total of 13 VOCs were detected in at least one sample (acetone, benzene, chlorobenzene, ethylbenzene, toluene, xylenes, MIBK, methyl

ethyl ketone (MEK), 1,2-dichloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, trichloroethene [TCE], and carbon disulfide). The highest detected soil concentration was 11 mg/kg for total xylenes from IS1 at 10.5 feet bgs collected in 1989, prior to the installation and operation of the SVE system. No VOCs were detected in at least 50 percent of soil samples from this depth interval.

- ➢ SVOC soil data: A total of 20 SVOCs were detected in at least one of the 27 soil samples included in the 0-12 feet bgs dataset; only 2 samples were from the upper 2 feet of the soil column. Most (89%) of the samples were from at least 4 feet bgs. Nine of the polynuclear aromatic hydrocarbons (PAHs) and 4-methylphenol were analyzed in all 27 samples; an additional seven PAHs and N-nitrosodiphenylamine were analyzed in ten samples. The other two detected SVOCs were analyzed in 17 samples. Pyrene was the most frequently detected SVOC (52%), with a maximum concentration of 4.5 mg/kg. The highest SVOC concentration was 28 mg/kg for naphthalene detected at 8 feet bgs from SB7 in November 2013.

- ➢ PCB and DDT soil data: Up to 37 samples were analyzed for PCBs, all within the upper 12 feet of the soil column (Table 1). Aroclor 1260 was analyzed in all samples; Aroclors 1262 and 1268 were analyzed in 17 samples. Aroclor 1260 was the most frequently detected PCB aroclor (43%), with a maximum concentration of 14 mg/kg from 3.5-4 feet bgs at SG-3. Total PCBs were detected in 84% of samples. DDT was the single pesticide detected. It was detected between 3 and 4 feet bgs in 4 of 5 samples at a maximum concentration of 0.42 mg/kg.

- ➢ Metals soil data: Metals were analyzed in up to 87 soil samples from the upper 12 feet of soil at the site. Lead was detected in all but three of 87 samples (97% frequency of detection) at a maximum concentration 10,000 mg/kg at SB4 at a depth of 10 feet bgs (Table 1). Fourteen other metals were detected in at least one of the 52 soil samples analyzed for these constituents. One other detected metal (selenium) was analyzed in 17 samples. Several metals that occur naturally in the environment were detected in all samples. Frequency of detection was generally either very high or very low for individual metals. For example, silver was detected in only 3 samples (6%) while copper was detected in 98% of samples.

- ➢ TPH soil data: TPH and related mixtures (i.e., oil and grease) were analyzed in up to 46 soil samples from the upper 12 feet of soil at the site (Table 1). TPHd and TPH as motor oil (TPHmo) were both detected in at least 50% of samples analyzed for these mixtures; the maximum concentration was 5,050 mg/kg for TPHd at location B-9 from 9 feet bgs collected in 1990 from the sump area. TPH as gasoline (TPHg) was detected in 17% of the 42 samples in which it was analyzed. Oil and grease was detected in 94 percent of the 34 samples in which it was analyzed at a maximum concentration of 45,000 mg/kg at location B-11 at 4 feet bgs.

Deep Soil Data (Below 12 feet bgs)

- VOC soil data: A total of seven soil samples were included in the risk assessment evaluation for this depth interval (Table 2). Seven VOCs were detected in at least one sample (acetone, benzene, total xylenes, MIBK, MEK, methylene chloride, and carbon disulfide). The highest detected soil concentration was 7.8 mg/kg for methyl isobutyl ketone (MIBK). Only two chemicals (acetone and MEK) were detected in at least 50 percent of soil samples from this depth interval. Methylene chloride, carbon disulfide, and total xylenes were each detected in only one sample, and methylene chloride was not detected in any of the shallower soil samples.

- SVOC soil data: A single SVOC, bis(2-ethylhexyl)phthalate, was detected in the single soil sample in this depth interval, at a concentration 0.4 mg/kg (Table 2).

- PCB and DDT soil data: No PCB or DDT samples were collected in this depth interval.

- Metals soil data: Metals were analyzed in 13 soil samples from this depth interval (lead was analyzed in 14 samples). Eight metals were detected in all samples, with a maximum concentration of 6,040 mg/kg for zinc (Table 2). Seven other metals were detected in at least one of the 13 soil samples analyzed for these constituents.

- TPH soil data: TPH was analyzed in 18 samples from deep soil. Both TPHg and TPHd were detected in at least 4 samples. Oil and grease was analyzed in 17 samples, and was detected in 71 percent of these samples at a maximum concentration of 9,400 mg/kg.

3.2.2 GROUNDWATER RISK ASSESSMENT DATASET

All sampling events for VOCs at MW1, MW3, MW5, MW8, MW9, and MW10 were included in the risk assessment dataset. Overall, a total of 50 VOC monitoring well samples were included in the groundwater risk assessment dataset (Table 3). In addition, three grab samples were collected and analyzed for TPH (as diesel fuel and motor oil) and VOCs. The most frequently detected chemical in groundwater (of those chemicals with more than 3 samples) was MIBK (FOD of 33%) with a maximum concentration of 160,000 µg/L in MW8 (from 1990). Benzene was next in detection frequency (FOD of 30%) with a maximum concentration of 2,100 µg/L in the same sample.

Dissolved metals were analyzed in groundwater, but these chemicals are not relevant to the HHRA because only vapor intrusion represents a potentially complete exposure scenario at the site. Due to the combination of the deed restriction on the property, the requirement for a SMP, and the City of Emeryville prohibition on extraction and use of groundwater (Ordinance No. 07-006), use of and contact with groundwater is precluded at the site. Therefore, metals in groundwater are not included in the risk assessment dataset. TPH was detected in groundwater, but it is not evaluated for vapor intrusion by the RWQCB (2013a,b), and no screening levels are available. Additionally, the primary toxic components of these mixtures, PAHs and benzene, toluene, ethylbenzene, and xylenes (BTEX), have been analyzed at the site. Therefore, TPH is also not included in the risk assessment dataset.

3.2.3 SOIL GAS RISK ASSESSMENT DATASET

A total of 5 soil gas samples were collected at the site in 2013, and six soil gas samples were collected at the site in 2015. All 11 samples are included in the risk assessment evaluation. Benzene (73% FOD) and toluene (64% FOD) were most commonly detected among the chemicals that were analyzed in all 11 samples; MEK and xylenes were each detected in 36% of samples. The other eight detected VOCs were present in only 1 or 2 samples (Table 4). Note that the leak check compound (1,1-DFA) shown on Table 5 of Appendix B, Part 2 in PES (2015) was not included in the dataset as it is introduced into the sampling train and is not site-related.

3.2.4 SUBSLAB SOIL GAS RISK ASSESSMENT DATASET

A total of 4 subslab soil gas samples were collected at the site in 2015, and all are included in the risk assessment evaluation. Only one VOC (2-butanone [MEK]) was detected in all samples; styrene was detected in three samples, and two other VOCs (tetrachloroethylene [PCE] and 1,1,1-trichloroethane) were each detected in one sample (Table 5).

4.0 CONCEPTUAL SITE MODEL (CSM)

In this section, potential human receptors and potentially complete exposure pathways are identified at the site. A Conceptual Site Model (CSM) was developed to facilitate this process, and was submitted to ACEH (Plate 9 in PES, 2015). The CSM described in this section presents the relationships between chemical sources and receptors at the site, and identifies potentially complete pathways through which receptors may be exposed to the analytes detected in site media. This is accomplished by considering the site characteristics discussed in Section 2 and summarized below and in PES (2015), as well as the fate and transport characteristics of analytes identified at the site (Section 3). The CSM diagram is presented as Plate 3. The Tier 1 screening analysis that follows then serves to further focus the quantitative risk assessment on chemicals that require further evaluation.

4.1 SUMMARY OF SITE CHARACTERISTICS

- Vadose zone soil is predominantly silts and clays mixed with fill material known to be contaminated with TPH, VOCs, SVOCs, PCBs, and metals. The fill material overlies Old Bay Mud deposits;
- Depth to groundwater is currently between 11 and 13 feet, and groundwater flows to the south/southwest;
- Groundwater cannot be used for domestic or other purposes based on a LUC and City Of Emeryville ordinance;
- The site will be redeveloped in the future as a seven-story apartment building with parking/driving areas, and some planters/landscaping. Most residential areas will be above the second floor. The first two floors will include some office and retail space;
- The maximum planned construction excavation depth is 12 feet bgs for utility trenches;
- Detected analytes include VOCs, SVOCs, TPH, PCBs, DDT, and metals in soil, groundwater, and/or soil gas.

Potential receptors and exposure pathways at the site are identified in the following sections and are presented graphically on Plate 3.

4.2 HYPOTHETICAL HUMAN RECEPTORS

“Receptor” is the term used in risk assessments for people who may be exposed to impacted media at or near an evaluated site. Receptors are not actual people. Rather, they represent groups of people that are associated with various assumed exposure scenarios and are, therefore, termed “hypothetical.” Categories of receptors include: residential, commercial/industrial worker, visitor/trespasser, recreator, and construction/utility worker. When receptors are identified for a risk assessment, these categories are considered in light of current and likely future use of the site and nearby area, and access to the site and impacted media. Only those likely to be the most highly exposed, such as onsite residents and workers, are generally evaluated in a risk assessment. While nearby offsite receptors may be exposed to impacted media (e.g., groundwater), this exposure is generally substantially less than onsite exposures and is not typically quantified. At this site, all receptors are identified as “hypothetical future receptors” because this CSM applies to a future redevelopment scenario. Although the site is currently occupied, site usage will change once redevelopment occurs; in addition, the current site use is commercial, and a future commercial receptor is included in the CSM.

The following hypothetical future onsite receptors were identified as likely present at the site:

- Construction worker receptor
- Maintenance/utility worker receptor
- Commercial worker receptor
- Residential receptor (adult and child)

The construction worker receptor was assumed to work at the site during redevelopment. This receptor would potentially contact soil at depths down to 12 feet bgs.

The maintenance/utility worker receptor was assumed to work at the site following redevelopment for short periods of time, to maintain underground utility lines and/or landscaping. This receptor would potentially contact soil at depths down to 12 feet bgs, the maximum depth of utility lines planned for the redevelopment.

Retail worker receptors were assumed to work at the site following redevelopment in retail space located on the first two floors. Adult and child residential receptors were assumed to live in units on all floors, but primarily on the third floor and above. All of these hypothetical future onsite receptors are shown on Plate 3.

4.3 POTENTIAL EXPOSURE PATHWAYS

Potentially complete exposure pathways for the hypothetical receptors are identified in this section. An exposure pathway is a mechanism by which receptors are assumed to contact chemicals in site media. USEPA (1989) describes a complete exposure pathway in terms of four components:

- A source and mechanism of chemical release (e.g., release of SVOCs);
- A retention or transport medium (e.g., soil above 12 feet bgs);
- A receptor at a point of potential exposure to a contaminated medium (e.g., construction worker in a trench); and
- An exposure route at the exposure point (e.g., inhalation exposure).

If any of these four components is not present, then a potential exposure pathway is considered incomplete and is not evaluated further in a risk assessment. If all four components are present, a pathway is considered complete. Pathways may be potentially complete but insignificant, because the characteristics of the assumed exposure scenario are unlikely to be associated with elevated or unacceptable risks. By contrast, potentially complete and significant pathways represent pathways through which the majority of exposure occurs, and therefore are most likely to be associated with elevated risks. Therefore, these pathways are typically quantified in a risk assessment whereas the former are not.

Exposure to chemicals in soil can occur directly through incidental ingestion and dermal contact and inhalation of dust or indirectly through inhalation of vapors from the subsurface. All receptors were assumed to be exposed to vapors in air originating from the subsurface. The site redevelopment plans call for the site to be fully paved upon completion except for landscaped areas, which will include two feet of clean fill above the site soils (PES, 2015). Therefore, only the construction and maintenance worker receptors can reasonably be assumed to be exposed directly to chemicals in soil. Exposure to chemicals in dust is possible during excavation activities, but monitoring and dust suppression will be conducted as part of planned redevelopment activities. Therefore, dust inhalation is not considered to represent a complete and potentially significant exposure pathway for invasive workers. However, the ESLs used in Tier 1 to evaluate potential direct contact with soil are based on dust and vapor inhalation in outdoor air as well as soil ingestion and dermal exposure (RWQCB, 2013b), so this exposure pathway is included in the evaluation. Because direct contact with soil by future onsite commercial workers and residents following redevelopment is an incomplete exposure scenario, these pathways are considered incomplete as shown on Plate 3. , However, the ESLs used in Tier 1 include direct exposure pathways, so these pathways are included in the initial screening evaluation to provide a conservative evaluation of unrestricted future land uses.

First encountered groundwater at the site is between 11 and 13 feet bgs (PES, 2015), and the maximum depth of the excavation for utility trenches will be approximately 12 feet bgs. The construction of the building foundation system will utilize drilled displacement piers and the building will be constructed with an at grade concrete slab. Deeper excavations will be limited to those conducted for utility trenches. Therefore, direct exposure to groundwater by the construction worker receptor engaged in soil excavation may represent a complete exposure pathway. However, redevelopment activities will require dewatering in the event groundwater is encountered during excavation, and the SMP for the site will also require actions to be taken should groundwater be encountered, so direct contact with groundwater is not anticipated to be a complete exposure pathway. Groundwater at the site cannot be used as a domestic water supply, so exposure through domestic use is an incomplete exposure pathway for all receptors. Only vapor intrusion represents a potentially complete exposure pathway for groundwater; therefore, only VOCs represent relevant chemicals for groundwater.

The new building plans include ground floor residential units on the west and north sides of the building, elevator pits in the center area of the building, and common and amenity areas in the east portion of the building (PES, 2015). To mitigate for potential accumulation and migration of VOCs and methane in soil vapor into these ground floor building areas, a vapor mitigation system will be designed and installed beneath the floor slab underlying these portions of the building. The system will consist of impermeable vapor barriers with passive venting.

Vapor inhalation may occur from chemicals volatilizing from either groundwater or soil. Soil data are typically not evaluated for vapor intrusion; groundwater and soil gas data are considered more appropriate for such evaluations. Vapor inhalation in the indoor environment is typically assumed to be associated with higher exposures than outdoor vapor inhalation. Therefore for the Tier 1 groundwater and soil gas evaluations, all potential vapor inhalation by the commercial and residential receptors was conservatively assumed to occur indoors. Based on the future site configuration discussed above, vapor intrusion should be an incomplete exposure pathway for future onsite receptors. Therefore, this pathway is shown as incomplete on Plate 3.. Vapor inhalation for the construction and maintenance/utility worker receptors was assumed to occur outdoors, since these receptors are not expected to work indoors. Outdoor vapor inhalation is not generally quantified; however, this pathway was addressed in the Tier 1 screening evaluation through the use of soil ESLs.

On the basis of the discussions provided in the preceding text, the following exposure pathways were identified as potentially (or theoretically) complete and were evaluated in Tier 1:

- Future onsite construction worker receptor:
    - Direct contact with soil via ingestion and dermal exposure
    - Inhalation of vapors and dusts in outdoor air
- Future onsite maintenance/utility worker receptor:
    - Direct contact with soil via ingestion and dermal exposure
    - Inhalation of vapors and dusts in outdoor air
- Future onsite commercial (retail) worker receptor:
    - Direct contact with soil via ingestion and dermal exposure
    - Inhalation of vapors in indoor air due to subsurface vapor intrusion
    - Inhalation of dusts and vapors in outdoor air
- Future onsite residential receptor:
    - Direct contact with soil via ingestion and dermal exposure
    - Inhalation of vapors in indoor air due to subsurface vapor intrusion
    - Inhalation of dusts and vapors in outdoor air.

As discussed in the following section, the Tier 1 evaluation utilizes screening levels, some of which are receptor- and pathway-specific. Therefore, in addition to identifying chemicals that should be further evaluated, Tier 1 also serves to distinguish potentially complete but insignificant pathways from those that are potentially complete and significant for the two receptors that are most likely to have complete exposure scenarios at the site, the construction and maintenance/utility worker receptors. The exposure scenarios identified for onsite future commercial and residential receptors assume no mitigation measures will occur to manage potential vapor intrusion. However, a venting system and vapor barrier will be installed beneath the proposed development, eliminating any potential exposure via this pathway. Therefore, only the two invasive receptors are further evaluated beyond Tier 1.

The Tier 1 screening evaluation encompassing the exposure scenarios identified above is provided in the next section.

5.0 TIER 1 EVALUATION

This section describes the Tier 1 human health risk-based screening evaluation for soil, groundwater, and soil gas at the site. The objectives of this evaluation were to identify:

1. Chemicals of potential concern (COPCs), which are the most toxic and prevalent chemicals at a site and therefore those expected to contribute the majority of potential risk; and

2. Potentially complete pathways that are also significant and therefore expected to contribute the majority of potential risk.

To meet these objectives, site chemical concentrations were compared to conservative, generic, risk-based screening levels. These are described in the following section.

5.1 RISK-BASED SCREENING LEVELS

As discussed in Section 1.1, the RWQCB's ESLs (RWQCB, 2013a) address environmental protection goals presented in the Water Quality Control Plan for the San Francisco Bay Basin. In addition to being protective of human health and terrestrial ecological receptors, they are also currently designed to be protective of groundwater and to protect against nuisance conditions. Therefore, not all ESLs are strictly risk-based. Those that are risk-based target a lifetime excess cancer risk of $1x10^{-6}$, which is at the low end of the range of risks considered acceptable by USEPA ($1x10^{-4}$ to $1x10^{-6}$; Federal Register 56(20):3535, 1991) and a noncancer hazard quotient (HQ) of 1. Therefore, use of ESLs is conservative. The following sections identify ESLs for use in screening site soil, groundwater, and soil gas data.

5.1.1 Soil ESLs

Using terms and conventions for ESLs assigned by the RWQCB (2013a,b), ESLs for "direct exposure", were conservatively utilized. The specific ESLs used in this screening analysis were developed by the RWQCB for residential, commercial/industrial, and construction worker exposure scenarios, based on the goal of protection of human health. The ESLs were developed for cumulative exposure across all exposure pathways, including dermal contact, incidental soil ingestion, and inhalation of vapors and particulates in outdoor air (RWQCB, 2013b).

5.1.2 Groundwater ESLs

Groundwater ESLs were developed by the RWQCB (2013a,b) based on several goals including:

- Protection of human health;
    - Emission of subsurface vapors to building interiors
    - Ingestion of groundwater as drinking water

- Protection of aquatic habitat goals; and
- Protection against nuisance concerns (odors, etc.) and general resource degradation.

Based on the goals of the HHRA, only values based on the protection of human health for vapor intrusion concerns were used in the Tier 1 evaluation. Screening levels were compiled on the basis of the CSM described in Section 4.0 and presented as Plate 3.

5.1.3 Soil Gas ESLs

Soil gas ESLs were developed by the RWQCB (2013a,b) protective of vapor intrusion for both residential and commercial exposure scenarios. Soil gas ESLs have not been developed for construction or other outdoor workers. Screening levels were compiled on the basis of the CSM described in Section 4.0 and presented as Plate 3.

5.2 SOIL EVALUATION

As discussed in the CSM, only the construction and maintenance worker receptors were considered relevant for exposure scenarios involving direct soil contact. To ensure that the evaluation fully considers potential future exposures, this Tier 1 evaluation considered soil data down to 12 feet bgs as “shallow soil” for comparison with ESLs (Table 1). Soil data from depths greater than 12 feet bgs were separately evaluated in this step to conservatively evaluate potential exposure scenarios at these deeper depths (Table 2). As is evident from Table 2, a smaller subset of chemicals and samples exceeded potentially relevant ESLs at deeper depths, even assuming direct contact could occur at these depths for all receptors. Therefore, soil from depths deeper than 12 feet bgs are not further evaluated in the HHRA.

For soil depths down to 12 feet bgs, the maximum concentrations of all detected VOCs were below the screening levels for all evaluated receptors except for 1,2-dichloroethane in one sample, which indicates that VOC concentrations are below levels of regulatory concern with regard to human health risks at the site under the conditions evaluated. The one detected concentration of 1,2-dichloroethane of 0.50 mg/kg (Table 1) is very close to the residential ESL of 0.44 mg/kg. Given that the single sample in which 1,2-dichloroethane was detected was collected from a depth of 10.5 feet bgs, this chemical was not detected in shallower soil samples collected from the same location or at any other location, and landscaped areas will include two feet of clean fill above the site soils, direct exposures to residents should be negligible for VOCs. Therefore, VOCs in soil are not further addressed. Results for other chemicals are discussed below by receptor.

5.2.1 CONSTRUCTION AND MAINTENANCE/UTILITY WORKER SCREEN

Since there are no ESLs specific to an invasive maintenance/utility worker, this receptor was included in the screen for the construction worker receptor. Maximum concentrations of one PAH (benzo(a)pyrene), total PCBs, three metals (arsenic, lead, and vanadium), and TPHd exceeded the

ESLs for the construction/maintenance worker receptor (Table 1). Lead exceeded the ESL in 19 of 87 samples, while vanadium and TPHd each exceeded the ESL in only 1 sample (2% of samples). Total PCBs exceeded the ESL in 8 samples, arsenic exceeded the ESL in 6 samples, and benzo(a)pyrene exceeded the ESL in 3 of 27 samples. These six constituents were identified as COPCs for soil exposure pathways and were quantitatively evaluated in Section 6.

5.2.2 COMMERCIAL WORKER SCREEN

This hypothetical exposure scenario is incomplete (Plate 3), but is included for informational purposes. Maximum concentrations of five PAHs (including benzo(a)pyrene), total PCBs and Aroclor 1260, three metals (arsenic, lead, and vanadium), and TPHd exceeded the ESLs for the commercial worker. All detected arsenic concentrations exceeded the ESL, and 22% of the lead concentrations exceeded the ESL. Approximately 48% of total PCB samples exceeded the ESLs, while 30% of Aroclor 1260 samples exceeded the ESL (Table 1). Arsenic concentrations appear consistent with background.

5.2.3 RESIDENTIAL SCREEN

This hypothetical exposure scenario is incomplete (Plate 3), but is included for informational purposes. Maximum concentrations of MIBK, six PAHs (including benzo(a)pyrene), total PCBs and Aroclor 1260, four metals (arsenic, cobalt, lead, and vanadium), and TPHd exceeded the ESLs for the resident receptor. All detected arsenic concentrations exceeded the ESL, and approximately half the lead concentrations exceeded the ESL. The majority of detected Aroclor 1260 and total PCB samples also exceeded their respective ESLs (Table 1). Arsenic concentrations appear consistent with background.

5.3 GROUNDWATER EVALUATION

As discussed in the CSM, the resident and commercial receptors were evaluated for potential contact with groundwater through inhalation of vapors in indoor air. There are no complete exposure scenarios for the construction or maintenance/utility worker receptors (Plate 3). The comparison of maximum detected concentrations with screening levels is provided in Table 3. Only a single chemical, benzene, was detected at concentrations exceeding a vapor intrusion-based ESL for both commercial worker and resident receptors. This occurred in only a single sample (collected in 1990, prior to groundwater extraction) for the commercial worker receptor, and in 6 samples (12% of total samples) for the residential receptor. A second chemical, vinyl chloride, exceeded the residential-based ESL in one of 50 samples (2% FOD). This is one line of evidence used to evaluate if vapor intrusion represents a potential issue at the site (CalEPA, 2011). The evaluation of soil gas is the first line of evidence; this is discussed in the following section.

5.4 SOIL GAS EVALUATION

As discussed in the CSM, the resident and commercial receptors were evaluated for potential contact with soil gas through inhalation of vapors in indoor air. The comparison of maximum detected concentrations with screening levels is provided in Table 4. Only benzene exceeded an ESL in any soil gas sample. This was limited to two samples for the residential receptor. These soil gas benzene concentrations of 76.3 and 73 micrograms per cubic meter (µg/m^3) are less than twice the residential ESL of 42 µg/m^3. All detected concentrations were below the commercial worker indoor air–based ESL of 420 µg/m^3. Soil gas sample SV2, which contained the maximum benzene concentration, is located outside of the footprint of the future building. However, this detection of benzene was conservatively evaluated for potential contact with soil gas through inhalation of vapors in indoor air.

5.5 SUBSLAB SOIL GAS EVALUATION

As discussed above, the resident and commercial receptors were evaluated for potential contact with soil gas through inhalation of vapors in indoor air. Subslab soil gas data were separately compared with indoor air ESLs after incorporating an attenuation factor of 10 to account for the relatively minimal attenuation through the slab assumed by USEPA (2012). These adjusted indoor air ESLs were then compared to the maximum subslab concentrations, as shown in Table 5. Only PCE was detected above the adjusted ESLs, and only in a single sample. This chemical was not detected in soil or groundwater, and was detected in soil vapor in a single sample below ESLs.

Given the combined results of the vapor intrusion evaluation for groundwater and soil gas, only benzene consistently exceeded ESLs, and the two concentrations in soil gas (which is generally given more weight than the groundwater line of evidence) exceeded the residential ESL by less than a factor of two. Additionally, the single groundwater concentration that exceeded the commercial ESL for vapor intrusion, and two of the six concentrations that exceeded the residential ESL, were detected in 1990 before groundwater extraction and treatment occurred at the site. Development plans indicate that only a small fraction of the first floor will be comprised of commercial or residential space, and it is unlikely that vapors from this limited number of locations could affect people in the building in the future. Further, redevelopment plans include a cap on the soil contamination beneath the site prior to construction, which can further mitigate any potential vapor intrusion issues inside the future building. A vapor barrier and passive venting system will also be installed, which should mitigate any potential vapor intrusion from benzene, vinyl chloride, and PCE. Therefore, vapor inhalation exposure pathways were not quantitatively evaluated in the Tier 2 risk assessment.

6.0 QUANTITATIVE RISK EVALUATION

As discussed in Section 5, benzo(a)pyrene, total PCBs, arsenic, lead, vanadium, and TPHd were identified as COPCs in soil, and were therefore retained for further evaluation in the HHRA. In this section, toxicity values are presented for the soil COPCs, followed by exposure assessment and risk characterization for the future construction worker receptor and the future maintenance/utility worker receptor.

6.1 TOXICITY EVALUATION

Potential toxic effects of chemicals are generally classified as carcinogenic (i.e., cancer-causing), or noncarcinogenic (i.e., noncancer health effects). These endpoints are separately quantified in HHRAs as cancer risks and noncancer health effects, respectively. Toxicity values numerically express the magnitude of potential toxic effects of chemicals. Reference doses (RfDs) and reference concentrations (RfCs) are used to quantify noncancer health effects, and cancer slope factors (SFs) and inhalation unit risks (IURs) are used to quantify cancer risks. Both cancer and noncancer endpoints may be evaluated for carcinogenic chemicals depending on the chemicals' toxic effects and availability of RfDs/RfCs.

Toxicity values are pathway-specific and are provided for both ingestion (RfDs and SFs) and inhalation (RfCs and IURs) pathways, as available and applicable. Non-cancer toxicity values are provided by USEPA for chronic and subchronic exposure, which correspond to 7 years or more exposure, and less than 7 years, respectively. Chronic values were conservatively used to evaluate the invasive receptors in the HHRA. In addition, the Office of Environmental Health Hazard Assessment (OEHHA) of CalEPA has developed reference exposure levels (RELs) for a small number of chemicals. RELs correspond to USEPA reference concentrations for the inhalation pathway; these values were preferentially used where available.

Cancer-based toxicity values correspond to lifetime exposure and are provided for both the ingestion (SFs) and inhalation (IURs) pathways, as available and applicable by USEPA. CalEPA also provides cancer SFs and IURs. CalEPA values are based on an independent review by OEHHA of the toxicological literature, and are generally more conservative (i.e., higher) than USEPA values. CalEPA values, where available, were used preferentially.

Toxicity values for chemicals other than TPH were obtained from the following sources, in the order provided below, for the RA:

- Toxicity Criteria Database (TCDB), an online database maintained by the Office Environmental Health Hazard Assessment (OEHHA) of CalEPA (CalEPA, 2015) was used to obtain toxicity criteria as required for California sites.

- Integrated Risk Information System (IRIS), an online database (USEPA, 2015a) was used to obtain toxicity values not available through CalEPA (2015). IRIS is updated monthly.
- Health Effects Assessment Summary Tables (HEAST; USEPA, 1997), Provisional Peer-reviewed Toxicity Values (PPRTV), and other sources as cited by USEPA in the Regional Screening Levels Tables (USEPA, 2015b). This semi-annually updated source was consulted where values were not available in the TCDB or IRIS.

For chemicals with no available toxicity values, values for structurally similar chemicals were used as surrogates. For TPHd, toxicity values from RWQCB (2013a) were used. The non-cancer and cancer toxicity values for the COPCs are presented in Tables 6 and 7, respectively.

6.2 EXPOSURE ASSESSMENT

The first part of the exposure assessment is a CSM, which identifies potential human receptors and exposure pathways at the site primarily on the basis of land and groundwater uses, and was discussed in Section 4 and presented graphically in Plate 3. Inputs to the dose estimation are discussed below. Exposure assumptions used in the HHRA are provided, as well as methods used to develop exposure point concentrations (EPCs).

6.2.1 EXPOSURE ASSUMPTIONS

Exposure assumptions are values used to quantify the assumed exposure to chemicals detected in soil for each receptor. Assumptions are either general and correspond to all the hypothetical receptors evaluated (e.g., averaging time), or receptor- and pathway-specific, such as body weight and exposure duration. Exposure assumptions used in this HHRA represent a conservative, reasonable maximum exposure (RME) scenario. The RME scenario is described by USEPA (1989) as the "highest exposure that can be reasonably anticipated to occur." Risk assessments are intended to be conservative to protect human health. RME scenarios are unlikely to occur in real life and describe only the smallest, most highly exposed portion of the population (i.e., 90th to 95th percentile and above). According to USEPA (1992), RME is not intended to be worst case, which would exceed upper percentile exposure. To this end, exposure assumptions should comprise both upper percentile and average values (USEPA, 1992). The exposure assumptions compiled for the receptors evaluated in the HHRA are considered adequately conservative to represent an RME evaluation, but not worst case.

Exposure assumptions used in the RA were compiled from CalEPA and USEPA guidance documents. The ESL document (RWQCB, 2013b) was used as the primary source for exposure assumptions. Exposure assumption values, sources, and rationale are provided in Table 8.

6.2.2 EXPOSURE POINT CONCENTRATIONS

EPCs are chemical concentrations in the media to which receptors are assumed to be directly exposed at an assumed point of contact. EPCs are combined mathematically in dose equations with exposure assumptions to estimate exposure doses for each exposure pathway. For a baseline RA, USEPA (1989) recommends that EPCs be the lesser of the 95 percent upper confidence limit of the mean (95UCL) and maximum concentration. The 95UCL provides a conservative measure of the average concentration to which receptors are likely exposed as they move around a site over the exposure duration. The methods used to calculate 95UCL concentrations for soil are described below.

USEPA's ProUCL Version 5 (USEPA, 2013a) was used to identify appropriate UCL concentrations for COPCs in soil. This software analyzes the data distribution, and estimates and recommends UCLs on the unknown mean, using both distribution-based (i.e., normal and lognormal parametrics) and distribution-free (i.e., non-parametric) methods. Statistics are calculated using several approaches and the program recommends the statistic that best fits the distribution. Using the most recent version of the software, non-detect values are entered at the MDL or the RL and identified using an indicator variable column, and several different methods are used to handle non-detects in the UCL calculation process. Use of the one-half MDL or RL method, which has historically been used to estimate concentrations for environmental data sets containing non-detects, is no longer recommended and is only included in the ProUCL software for historical and comparison purposes (USEPA, 2013b). Therefore, to calculate soil EPCs using the ProUCL software, non-detect values were entered as the corresponding RLs and the UCLs were selected on a chemical-specific basis as recommended by the program.

To be consistent with EPA guidance, the lesser of the maximum detected concentration and the UCL was used as the EPC for each COPC detected in at least four samples. The ProUCL User's Guide (USEPA, 2013b) does not recommend selecting a UCL as the EPC for data sets with only a few detected values (fewer than 4 to 6 values, or 4 to 5 percent detection frequency). Therefore, for chemicals with fewer than four detected values, the maximum concentration was selected as the EPC. Outputs from the ProUCL software are provided in Appendix A of this report.

For the construction worker receptor exposure scenario, soil EPCs were calculated based on the 0-12 feet bgs soil across the entire site. For the maintenance/utility worker exposure scenario, only 0-12 feet bgs samples projected to be outside of the future building footprint were used to calculate soil EPCs. Only benzo(a)pyrene was detected in four or fewer samples, and this chemical was only detected in fewer than four samples in the subset of data used to calculate soil EPCs for the maintenance/utility worker exposure scenario. Therefore, only the EPC for this chemical and exposure scenario reflects a maximum concentration; all other soil EPCs are based on 95UCL concentrations. Soil EPCs are shown in Table 9.

EPCs were combined with exposure assumptions and toxicity values to estimate risks, as discussed in the following section.

6.3 RISK CHARACTERIZATION

Two steps are conducted to characterize risks: (1) dose estimation and (2) risk estimation. These steps are briefly described in the following sections.

6.3.1 DOSE ESTIMATION

To estimate exposure doses, exposure assumptions and EPCs were combined mathematically in dose equations specific to each exposure pathway. These equations are consistent with those provided in CalEPA and USEPA guidance (CalEPA, 1996; USEPA, 1989). The estimated dose is also referred to as the chronic daily intake (CDI), which corresponds to exposure greater than 7 years (USEPA, 1989). CDIs were conservatively derived for all receptors.

Exposure doses are separately estimated for cancer effects (CDIc) and noncancer effects (CDIn), using the "averaging time" (AT) to differentiate the two endpoints. The averaging time is the time period over which the dose is averaged to yield a "daily intake" in units of milligrams of chemical per kilogram of body weight per day (mg/kg-day). For cancer effects, the carcinogenic averaging time (ATc) equals an assumed lifetime of 70 years. For noncancer effects, the noncarcinogenic averaging time (ATn) equals the receptor's exposure duration.

The general equation to estimate an exposure dose is:

$$\text{Dose} = \frac{\text{EPC} * \text{ED} * \text{EF} * \text{IR}}{\text{BW} * \text{AT}}$$

Where:

Dose = CDI in milligrams per kilogram-day (mg/kg-day)
EPC = medium-specific exposure point concentration (i.e., soil, water, or air)
ED = exposure duration (years)
EF = exposure frequency (days per year)
IR = intake rate (e.g. inhalation rate and dermal surface area)
BW = body weight (kilograms)
AT = averaging time (days; ATn or ATc)

The exposure parameters used to estimate doses were described in Section 6.2.1 and compiled in Table 8. Pathway-specific dose equations are provided in the risk calculation tables (Tables 10 and 11).

6.3.2 RISK ESTIMATION

Potential cancer and noncancer health effects were separately quantified in the RA as discussed in the following text.

Noncancer health effects were quantified to provide Hazard Quotients (HQs) and Hazard Indices (HIs) for each receptor. An HQ is a chemical-specific estimate of adverse noncancer health effects for a particular pathway and receptor. HQs are derived by comparing the noncancer exposure dose to the corresponding noncancer reference dose (i.e., ratio of dose to RfD). An HI is the sum of HQs for one pathway or the sum of HIs for all pathways. HQs and HIs are estimated as described below.

- HQ = CDIn /cRfD
- An HQ is estimated for each COPC for a given pathway and receptor
- HQs are summed across chemicals to provide a Hazard Index (HI) representing the total estimated noncancer hazard for each pathway (pathway-specific HI)
- Pathway-specific HIs are then summed across all pathways quantified for each receptor to provide a multipathway HI
- The resulting HI is compared to the agency-recommended target HI of one (1; CalEPA, 1996; USEPA, 1989). An HI less than or equal to 1 indicates that adverse noncancer health effects are not anticipated for the given receptor under the exposure conditions evaluated.

Cancer risks were estimated for each receptor as described below.

- Theoretical excess risk = CDIc x SF
- An excess risk is estimated for each COPC for a given pathway and receptor
- Chemical-specific risk estimates are summed to provide a pathway-specific total lifetime excess cancer risk (LECR) estimate for each pathway
- Pathway-specific risk estimates are then summed across all pathways quantified for each receptor to provide a multipathway total LECR estimate for each receptor
- Finally, child and adult resident receptor risk estimates are added to provide a total resident receptor LECR estimate corresponding to a 30-year exposure duration (i.e., 6 years for the child plus 24 years for the adult). This same step is not performed for noncarcinogens because duration of exposure is not a variable in the equation (i.e., ATn is equal to exposure duration, thus the terms cancel each other).

Cancer risks are termed “theoretical lifetime excess risks” to distinguish risk results from actual cancer cases such as those recorded for the general population by the Centers for Disease Control. Risk results are entirely theoretical and correspond to the hypothetical exposure scenarios evaluated in the RA. “Excess” means that risk results are additional to the “background” rate of cancer cases in the general population of about 40 percent (one in three persons, according to the American Cancer Society).

USEPA characterizes theoretical LECRs below one in one million (10^{-6}) as not of concern and has stated that estimated risks between 10^{-6} and one in 10,000 (10^{-4}) are “safe and protective of public health” (Federal Register 56(20):3535, 1991). Remedial action is not generally required by

USEPA for sites with a theoretical lifetime excess risk of less than 10^{-4} (USEPA, 1991b). CalEPA (2013) generally adopts the conservative target risk of 10^{-6}, the lower end of the USEPA target risk range, for residents. Consistent with CalEPA policy, a target cancer risk of 10^{-6} was utilized in the HHRA.

Theoretical HIs and LECRs were calculated for the future onsite construction worker receptor in Table 10, and for the future onsite maintenance/utility worker receptor in Table 11.

6.4 RISK CHARACTERIZATION RESULTS

The RME risk characterization results are summarized below.

Hypothetical Future Onsite Construction Worker Receptor:

- Theoretical HI: 3, which is above the target HI of 1. This hazard is mainly due to vanadium at a single location.
    - The maximum vanadium concentration is 11,000 mg/kg from location SB18 at 10 feet bgs; this location will likely be beneath the building following development. Excluding this single sample, the hazard associated with potential vanadium exposure drops to below 0.1.
- Theoretical LECR: 7 x 10^{-6}, which is in the low end of USEPA's target risk range of 10^{-6} to 10^{-4}, but exceeds 1 x 10^{-6}. The LECR is mainly due to arsenic, which has an LECR above 1 x 10^{-6}. LECRs for other chemicals are below 1 x 10^{-6}.
    - The arsenic EPC of 9.33 mg/kg likely is reflective of background conditions. Based on experience at many other locations, background soil concentrations of arsenic in the Bay Area range between 6 and 15 mg/kg. Therefore, risks from potential arsenic exposure are likely related to background and not to releases from the site. Without arsenic, the LECR is 2 x 10^{-6}, and is mainly due to potential total PCB and lead exposure. PCBs and lead are both likely present as a result of the contaminated fill identified at the site (Section 2.2).

Hypothetical Future Onsite Maintenance/Utility Worker Receptor:

- Theoretical HI: 0.01, which is below the target HI of 1. This indicates that adverse noncancer health effects are not anticipated for this receptor under the conservative exposure conditions evaluated.
- Theoretical LECR: 9 x 10^{-6}, which is in the low end of USEPA's target risk range of 10^{-6} to 10^{-4}, but exceeds 1 x 10^{-6}. The LECR is due to benzo(a)pyrene, total PCBs, arsenic, and lead, each of which have LECRs at or above 1 x 10^{-6}. The redevelopment plans for the site include placing a cap over the impacted soil, and an SMP will be prepared that will require appropriate controls to minimize direct contact with contaminated soil during any invasive soil activities that could penetrate beneath the cap. Therefore, actual chemical exposures to this receptor, if any, should be much lower than those assumed herein.

7.0 UNCERTAINTY EVALUATION

Identifying and understanding uncertainty is an essential element of the risk assessment process. Reasonable steps have been taken to limit uncertainties in the risk assessment. However, risk assessment is an inherently uncertain process due to its predictive nature and reliance on assumptions. In general, for this HHRA, these uncertainties are driven by variability in:

- Chemical monitoring data and assumptions used in evaluating these data, and
- Receptor exposure scenarios

Key uncertainties associated with each step of the HHRA are described below.

Data Collection and Evaluation. The techniques used for data sampling and analysis, and the methods used for identifying chemicals for evaluation in this assessment, may result in a number of uncertainties. These uncertainties are itemized below in the form of assumptions:

- It was assumed that the nature and extent of chemical impacts at the site have been adequately characterized.
- It was assumed that sampling and analytical methods were based on agency-approved methods. Systematic or random errors in the chemical analyses may yield erroneous data.
- Maximum concentrations were used as conservative estimates of average site concentrations for the Tier 1 screening analysis. This can compensate for potential deficiencies in sample size, or systematic or random errors in the chemical analyses.

These types of errors may result in a slight over- or under-estimation of risk. Overall, using maximum concentrations, compounded with the deterministic sampling strategy used at the site, is likely to result in an overestimation of exposure. The following site-specific factors also contribute to uncertainty in the risk assessment:

- The use of groundwater data obtained from grab groundwater samples as well as monitoring well data in the analysis is conservative. Concentrations detected in unfiltered, non-well water samples are generally greater than those from well samples, and upwardly skew the dataset.
- All groundwater samples were included in the RA dataset, even though groundwater extraction occurred in the early 1990s. This evaluation also conservatively assumed that VOC concentrations do not decrease over time. This is likely to overestimate potential exposure to vapors from groundwater in indoor air.
- Vapor intrusion from the subsurface was represented by both groundwater and soil gas data.

Exposure Assessment. Key uncertainties associated with this component of the risk assessment are summarized below.

- Exposure Pathways. The exposure pathways evaluated in the CSM are expected to represent the primary pathways of exposure, based on the results of the chemical analyses and the expected fate and transport of these chemicals in the environment. Minor, secondary pathways may exist but often cannot be identified or evaluated using the available data. The contribution of secondary pathways to the overall risk from the site is not likely to be significant.
- A vapor mitigation system will be designed and installed beneath ground floor residential units, elevator pits, common areas, and amenity areas, to mitigate for potential accumulation and migration of VOCs and methane in soil vapor into these spaces. The system will consist of impermeable vapor barriers with passive venting.
- A Site Management and Contingency Plan will provide procedures for handling and management of soil, and potentially groundwater, encountered during construction. The SMP will also provide a post-construction O&M plan to describe procedures to be followed to maintain a cap over subsurface materials. Implementation of these institutional and engineering controls will substantially limit or eliminate exposure to chemicals detected in soil at the site during construction activities and site redevelopment, and in the future. Therefore, actual chemical exposures to receptors, if any, should be much lower than those assumed herein.

Summary of HHRA Uncertainties. The analysis of uncertainties and limitations associated with the risk assessment indicates that the data and exposure pathways used in the risk assessment likely overestimate actual hazards and risks to human health. Although, as outlined above, many factors can contribute to the potential for over- or under-estimating risk, potential exposures were estimated using primarily conservative assumptions. Actual chemical exposures, if any, at the site are most likely less than those estimated for the evaluated receptors.

8.0 SUMMARY AND CONCLUSIONS

A HHRA was conducted for the property at 6701-6707 Shellmound Street, Emeryville, California. The risk assessment was conducted consistent with guidance provided by CalEPA, RWQCB, and USEPA. The objective of the assessment was to evaluate potential human health risks associated with exposure to chemicals detected in soil, groundwater, and soil gas during and following redevelopment of the site. Future plans are for a new multi-story, multi-family residential development to be constructed on the site. Planned development includes a seven-story building comprising the majority of the subject property with parking garage, lobby, and amenities spaces occupying the first (on-grade) and second floors of the building. A limited portion of the first and second floors will be developed as residential units. A vapor mitigation system will be designed and installed beneath ground floor residential units, elevator pits, and common and amenity areas, to mitigate for potential accumulation and migration of VOCs and methane in soil vapor into these spaces. The system will consist of impermeable vapor barriers with passive venting. After redevelopment, the entire site will be covered by a combination of the building and associated paved parking and driving areas, with the exception of planter and landscaped areas.

A City of Emeryville Ordinance (No. 07-006) prohibits extraction of groundwater for drinking, industrial, or irrigation purposes, and therefore provides an institutional control that reduces the potential for exposure to groundwater. Anton plans to work with ACEH to develop a land use covenant (LUC) to replace the existing deed notice. To address contaminated media that may be encountered during construction and redevelopment activities Anton also intends to submit a Site Management and Contingency Plan (SMP) for ACEH approval. The SMP would provide procedures for handling and management of soil, and potentially groundwater, encountered during construction. The SMP will also provide a post-construction operations and management (O&M) plan to describe procedures to be followed to maintain a cap over subsurface materials. Implementation of these institutional and engineering controls will substantially limit or eliminate exposure to chemicals detected at the site during construction activities, site redevelopment, and in the future.

Site data were screened against residential, commercial, and construction worker-based ESLs, and six chemicals in soil exceeding construction worker-based ESLs were quantitatively addressed in the HHRA (benzo(a)pyrene, total PCBs, arsenic, lead, vanadium, and TPHd). Although some chemical concentrations also exceeded residential and commercial ESLs for contact with soil (and three chemicals for vapor intrusion), the LUC and SMP documents described above will preclude exposure by these receptors to chemicals in site soil. Vapor intrusion ESLs for benzene were exceeded at several groundwater sampling locations, but only two values in soil gas exceeded the ESL and only for residential land use. Vinyl chloride exceeded the groundwater ESL, but was only detected in one groundwater sample and was not detected in soil gas. Additionally, PCE was detected in one subslab soil gas sample at a concentration that exceeded the adjusted indoor air ESLs, but was not detected in soil or groundwater, and was detected in soil vapor in a single sample below ESLs. Development plans indicate that only a small fraction of the first floor will be comprised of commercial or residential space, and it is unlikely that vapors from these limited locations could affect people in the building in the future. Additionally, a vapor mitigation system will be installed beneath ground level residential units, elevator pits, and common and amenity areas.

One location with high vanadium concentrations led to an HI above one for the construction worker receptor from dust inhalation, and arsenic exposures resulted in a LECR of 7×10^{-6} for this receptor. Benzo(a)pyrene, PCBs, arsenic, and lead concentrations resulted in a LECR of 9×10^{-6} for the maintenance/utility worker receptor. Arsenic concentrations, which are responsible for the majority of soil LECR estimates for these receptors, are likely consistent with background conditions. The HHRA assumed these workers would ignore the SMP; actual exposures should be well below levels of concern once that document is prepared and followed for redevelopment and post-redevelopment activities.

Overall, based on the specific site redevelopment plans there is a complete lack of future exposure scenarios for residential and commercial/retail worker receptors. Given the lack of exposure scenarios, there is also no unacceptable risk to these receptors from detected chemicals at the site. Risks to future construction and maintenance/utility workers assuming no health and safety requirements are followed will likely be mitigated by the clean fill cap and by the required adherence to the SMP.

9.0 REFERENCES

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USEPA. 2015b. Regional Screening Levels Table. January. http://www.epa.gov/region9/superfund/prg/

TABLES

Table 1
Soil Screening Evaluation, 0-12 feet bgs
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

				Direct-Exposure ESLs (mg/kg) [b,c]			Number of Samples with Concentrations > ESL		
Chemical [a]	**Frequency of Detection**	**Detected (%)**	**Concentration (mg/kg)**	**Residential**	**Commercial**	**Construction**	**Residential**	**Commercial**	**Construction**
VOCs									
Acetone	9 / 23	39%	0.11	60,000	590,000	240,000	--	--	--
Benzene	5 / 28	18%	0.24	0.74	3.7	71	--	--	--
Chlorobenzene	1 / 28	4%	0.11	1,300	12,000	5,000	--	--	--
Ethylbenzene	4 / 28	14%	1.8	4.8	24	490	--	--	--
Toluene	9 / 28	32%	1.3	1,000	4,900	4,300	--	--	--
Total Xylenes	8 / 28	29%	11	600	2,600	2,500	--	--	--
Methyl Isobutyl Ketone (MIBK)	3 / 23	13%	0.01	36,000	240,000	150,000	--	--	--
1,2-Dichloroethane	1 / 28	4%	0.5	**0.44**	2.2	40	**1**	--	--
1,2-Dichlorobenzene	2 / 20	10%	0.004	2,100	11,000	8,700	--	--	--
1,3-Dichlorobenzene	3 / 20	15%	0.004	--	--	--	--	--	--
Methyl Ethyl Ketone (MEK)	6 / 23	26%	0.02	32,000	250,000	130,000	--	--	--
Trichloroethene (TCE)	1 / 28	4%	0.3	1.7	8.3	24	--	--	--
Carbon Disulfide	1 / 23	4%	0.004	770	3,500	--	--	--	--
SVOCs									
Acenaphthene	1 / 10	10%	0.5	3,400	15,000	8,600	--	--	--
Acenaphthylene	1 / 10	10%	0.27	--	--	--	--	--	--
Anthracene	3 / 10	30%	1.2	23,000	170,000	43,000	--	--	--
Benzo(a)anthracene	5 / 27	19%	2.4	**0.38**	**1.3**	8.3	**4**	**2**	--
Benzo(a)pyrene	4 / 27	15%	3	**0.038**	**0.13**	**0.83**	**4**	**4**	**3**
Benzo(b)fluoranthene	4 / 10	40%	3.7	**0.38**	**1.3**	8.3	**4**	**2**	--
Benzo(k)fluoranthene	3 / 27	11%	1.5	**0.38**	**1.3**	8.3	**1**	**1**	--
Benzo(g,h,i)perylene	2 / 10	20%	1.4	--	--	--	--	--	--
Chrysene	9 / 27	33%	2.9	3.8	13	83	--	--	--
Fluoranthene	8 / 27	30%	4.4	2,300	22,000	5,700	--	--	--
Fluorene	3 / 10	30%	0.81	3,100	22,000	5,700	--	--	--
Indeno(1,2,3-cd)pyrene	2 / 10	20%	1.3	**0.38**	1.3	8.3	**1**	--	--
2-Methylnaphthalene	6 / 27	22%	9.2	230	2,200	570	--	--	--
4-Methylphenol	2 / 27	7%	10	6,200	82,000	--	--	--	--
Naphthalene	8 / 27	30%	28	**3.1**	**15**	370	**2**	**1**	--
N-Nitrosodiphenylamine	1 / 10	10%	1.7	110	470	--	--	--	--
Phenanthrene	9 / 27	33%	7.5	--	--	--	--	--	--
Pyrene	14 / 27	52%	4.5	3,400	33,000	8,600	--	--	--
Bis(2-ethylhexyl)phthalate	1 / 17	6%	0.4	160	570	3,300	--	--	--
1,2,4-Trichlorobenzene	1 / 17	6%	0.2	140	700	600	--	--	--
Pesticides									
Aroclor-1260	16 / 37	43%	14	**0.24**	**1.0**	--	**14**	**11**	--
Aroclor-1262	7 / 17	41%	6.5	--	--	--	--	--	--
Aroclor-1268	2 / 17	12%	1.9	--	--	--	--	--	--
DDT	4 / 5	80%	0.42	1.7	7.0	50	--	--	--
Total PCBs	26 / 31	84%	14	**0.22**	**0.74**	**2.7**	**20**	**15**	**8**
Metals									
Antimony	18 / 52	35%	8.9	31	410	120	--	--	--
Arsenic	27 / 52	52%	49	**0.39**	**1.6**	**10**	**27**	**27**	**6**
Barium	52 / 52	100%	810	15,000	190,000	61,000	--	--	--
Beryllium	36 / 52	69%	0.59	160	2,000	180	--	--	--
Cadmium	39 / 52	75%	44	78	1,000	110	--	--	--
Chromium	52 / 52	100%	190	--	--	--	--	--	--
Cobalt	49 / 52	94%	28	**23**	300	49	**2**	--	--
Copper	51 / 52	98%	2,300	3,100	41,000	12,000	--	--	--

Table 1
Soil Screening Evaluation, 0-12 feet bgs
Human Health Risk Assessment Report
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Emeryville, California

Chemical [a]	**Frequency of Detection**	**Detected (%)**	**Concentration (mg/kg)**	**Direct-Exposure ESLs (mg/kg)** [b,c]			**Number of Samples with Concentrations > ESL**		
				Residential	**Commercial**	**Construction**	**Residential**	**Commercial**	**Construction**
Lead	84 / 87	97%	10,000	**80**	**320**	**320**	**47**	**19**	**19**
Mercury	31 / 52	60%	0.66	6.7	88	27	--	--	--
Molybdenum	22 / 52	42%	27	390	5,100	1,500	--	--	--
Nickel	52 / 52	100%	350	1,500	19,000	6,100	--	--	--
Selenium	6 / 17	35%	6	390	5,100	1,500	--	--	--
Silver	3 / 52	6%	15.2	390	5,100	1,500	--	--	--
Vanadium	52 / 52	100%	11,000	**390**	**5,100**	**1,500**	**1**	**1**	**1**
Zinc	52 / 52	100%	6,200	23,000	310,000	93,000	--	--	--
TPH									
Oil & Grease	32 / 34	94%	45,000	--	--	--	--	--	--
TPH - Gasoline	7 / 42	17%	460	770	4,000	2,700	--	--	--
TPH-Diesel	24 / 46	52%	5,050	**240**	**1,100**	**900**	**5**	**1**	**1**
TPH-Motor Oil	5 / 5	100%	1,400	10,000	100,000	28,000	--	--	--

ESLs < Maximum detected concentration are shown in bold font.

Abbreviations:

bgs = below ground surface
mg/kg = milligrams per kilogram
VOCs = volatile organic compounds
SVOCs = semi-volatile organic compounds
DDT = Dichlorodiphenyltrichloroethane
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons
-- = not available

Footnotes:

[a] Only chemicals detected in at least one sample are included in the table.

[b] Environmental screening levels (ESLs) for direct exposure from Tables K-1 (residential), K-2 (commercial/industrial worker), and K-3 (construction/trench worker) of RWQCB (2013a). Regional screening levels (RSLs) from USEPA (2015b) were used, where available, for residential and commercial/industrial worker exposure scenarios in the absence of ESL values.

[c] Chemicals with maximum detected concentrations > ESLs for the construction worker scenario were identified as chemicals of potential concern (COPCs) for quantitative evaluation in the risk assessment. Chemicals without available screening levels are discussed in the Uncertainty Evaluation section of the Risk Assessment Report. Future residential and commercial exposure scenarios do not include any potentially complete and significant exposure pathways. Chemicals with maximum detected concentrations > ESLs for these two exposure scenarios were therefore identified, but were not evaluated beyond the screening step.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.
United States Environmental Protection Agency (USEPA). 2015b. Regional Screening Levels Table. January. <http://www.epa.gov/region9/superfund/prg/>

Table 2
Soil Screening Evaluation, >12 feet bgs
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

	Frequency of	Percent	Maximum Detected	Direct-Exposure ESLs (mg/kg) [b,c]			Number of Samples with Concentrations > ESL		
Chemical [a]	Detection	Detected	Concentration	Residential	Commercial	Construction	Residential	Commercial	Construction
VOCs									
Acetone	4 / 7	57%	0.32	60,000	590,000	240,000	--	--	--
Benzene	3 / 7	43%	0.6	0.74	3.7	71	--	--	--
Total Xylenes	1 / 7	14%	0.5	600	2,600	2,500	--	--	--
Methyl Isobutyl Ketone (MIBK)	2 / 7	29%	7.8	36,000	240,000	150,000	--	--	--
Methyl Ethyl Ketone (MEK)	5 / 7	71%	0.12	32,000	250,000	130,000	--	--	--
Carbon Disulfide	1 / 7	14%	0.02	770	3,500	--	--	--	--
Methylene Chloride	1 / 7	14%	0.04	9.9	49	780	--	--	--
SVOCs									
Bis(2-ethylhexyl)phthalate	1 / 1	100%	0.4	160	570	3,300	--	--	--
Metals									
Antimony	4 / 13	31%	4.4	31	410	120	--	--	--
Arsenic	2 / 13	15%	19	**0.39**	**1.6**	**10**	**2**	**2**	**1**
Barium	13 / 13	100%	1,150	15,000	190,000	61,000	--	--	--
Beryllium	2 / 13	15%	0.43	160	2,000	180	--	--	--
Cadmium	12 / 13	92%	12	78	1,000	110	--	--	--
Chromium	13 / 13	100%	59	--	--	--	--	--	--
Cobalt	13 / 13	100%	40	**23**	300	49	**1**	--	--
Copper	13 / 13	100%	330	3,100	41,000	12,000	--	--	--
Lead	14 / 14	100%	1,270	**80**	**320**	**320**	**3**	**1**	**1**
Mercury	1 / 13	8%	0.77	6.7	88	27	--	--	--
Molybdenum	2 / 13	15%	3.1	390	5,100	1,500	--	--	--
Nickel	13 / 13	100%	151	1,500	19,000	6,100	--	--	--
Silver	1 / 13	8%	1.1	390	5,100	1,500	--	--	--
Vanadium	13 / 13	100%	58.3	390	5,100	1,500	--	--	--
Zinc	13 / 13	100%	6,040	23,000	310,000	93,000	--	--	--
TPH									
Oil & Grease	12 / 17	71%	9,400	--	--	--	--	--	--
TPH - Gasoline	4 / 18	22%	160	770	4,000	2,700	--	--	--
TPH-Diesel	6 / 18	33%	7,300	**240**	**1,100**	**900**	**2**	**1**	**1**

ESLs < Maximum detected concentration are shown in bold font.

Abbreviations:

bgs = below ground surface
mg/kg = milligrams per kilogram
VOCs = volatile organic compounds
SVOCs = semi-volatile organic compounds
DDT = Dichlorodiphenyltrichloroethane
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons
-- = not available

Footnotes:

[a] Only chemicals detected in at least one sample are included in the table.

[b] Environmental screening levels (ESLs) for direct exposure from Tables K-1 (residential), K-2 (commercial/industrial worker), and K-3 (construction/trench worker) of RWQCB (2013a). Regional screening levels (RSLs) from USEPA (2015b) were used, where available, for residential and commercial/industrial worker exposure scenarios in the absence of ESL values.

[c] Soil at depths greater than 12 feet bgs is not associated with any potentially complete and significant exposure pathways, based on planned excavation depths. Chemicals with maximum detected concentrations > ESLs for these two exposure scenarios were therefore identified, but were not evaluated beyond the screening step.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.
United States Environmental Protection Agency (USEPA). 2015b. Regional Screening Levels Table. January. <http://www.epa.gov/region9/superfund/prg/>

Table 3
Groundwater Screening Evaluation
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical [a]	Frequency of Detection	Percent Detected	Maximum Detected Concentration	Vapor Intrusion ESLs (µg/L) [b,c]		Number of Samples with	
				Residential	Commercial	Residential	Commercial
VOCs							
tert-Butyl Alcohol	1 / 3	33%	2.3	--	--		
Methyl Isobutyl Ketone (MIBK)	15 / 46	33%	160,000	11,000,000	SG	--	--
Vinyl Chloride	1 / 50	2%	4	**1.8**	18	**1**	--
Acetone	2 / 45	4%	3,200	130,000,000	SG	--	--
Methyl Ethyl Ketone (MEK)	2 / 45	4%	10,000	23,000,000	200,000,000	--	--
4-Methyl-2-pentanol	1 / 1	100%	130,000	--	--	--	--
Benzene	16 / 53	30%	2,100	**27**	**270**	**6**	**1**
n-Butylbenzene	1 / 3	33%	32	--	--	--	--
sec-Butylbenzene	2 / 3	67%	38	--	--	--	--
Carbon Disulfide	2 / 3	67%	3.9	--	--	--	--
Chlorobenzene	1 / 4	25%	4.4	SG	SG	--	--
cis-1,2-Dichloroethene	1 / 3	33%	0.69	3,100	26,000	--	--
Isopropylbenzene	2 / 3	67%	67	--	--	--	--
4-Isopropyltoluene	1 / 3	33%	13	--	--	--	--
Naphthalene	2 / 4	50%	84	160	1,600	--	--
n-Propylbenzene	1 / 3	33%	87	--	--	--	--
Toluene	2 / 52	4%	8	95,000	SG	--	--
1,2,4-Trimethylbenzene	1 / 3	33%	350	--	--	--	--
1,3,5-Trimethylbenzene	1 / 3	33%	24	--	--	--	--
Ethylbenzene	2 / 53	4%	45	310	3,100	--	--
Total Xylenes	2 / 52	4%	59	37,000	SG	--	--
trans-1,2-Dichloroethene	1 / 50	2%	6	14,000	120,000	--	--

ESLs < Maximum detected concentration are shown in bold font.

Abbreviations:

µg/L = micrograms per liter
VOCs = volatile organic compounds
-- = not available or not applicable
SG = no ESL; soil gas sampling recommended for this chemical

Footnotes:

[a] Only chemicals detected in at least one sample are included in the table.

[b] Groundwater environmental screening levels (ESLs) for evaluation of potential vapor intrusion from Table E-1 of RWQCB (2013a). Values based on a fine-coarse soil mix were used based on information provided in PES (2015).

[c] Future residential and commercial exposure scenarios do not include any potentially complete and significant exposure pathways. Chemicals with maximum detected concentrations > ESLs for these two exposure scenarios were therefore identified, but were not evaluated beyond the screening step.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.
PES Environmental, Inc. (PES). 2015. Conceptual Site Model, 6701-6707 Shellmound Street, Emeryville, California. February 6.

Table 4
Soil Gas Screening Evaluation
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical [a]	Frequency of Detection			Percent Detected (%)	Maximum Detected Concentration ($\mu g/m^3$)	Vapor Intrusion ESLs ($\mu g/m^3$) [b,c]		Number of Samples with Concentrations > ESL	
						Residential	Commercial	Residential	Commercial
VOCs									
Acetone	2	/	5	40%	19	16,000,000	140,000,000	--	--
Benzene	8	/	11	73%	76.3	**42**	420	**2**	--
Chloromethane	1	/	6	17%	2.4	47,000	390,000	--	--
Ethylbenzene	2	/	11	18%	6.2	490	4900	--	--
4-Ethyl-toluene	1	/	5	20%	13	--	--	--	--
2-Butanone (MEK)	4	/	11	36%	37	2,600,000	22,000,000	--	--
Tetrachloroethene (PCE)	1	/	11	9%	30	210	2,100	--	--
Trichloroethene (TCE)	2	/	11	18%	9.6	300	3,000	--	--
Toluene	7	/	11	64%	18	160,000	1,300,000	--	--
1,2,4-Trimethylbenzene	1	/	11	9%	37	--	--	--	--
1,3,5-Trimethylbenzene	1	/	11	9%	16	--	--	--	--
cis-1,2-Dichloroethene	1	/	11	9%	24	3,700	31,000	--	--
Xylenes	4	/	11	36%	38	52,000	440,000	--	--

ESLs < Maximum detected concentration are shown in bold font.

Abbreviations:

$\mu g/m^3$ = micrograms per cubic meter
VOCs = volatile organic compounds
-- = not available

Footnotes:

[a] Only chemicals detected in at least one sample are included in the table.

[b] Soil gas environmental screening levels (ESLs) for evaluation of potential vapor intrusion from Table E-2 of RWQCB (2013a).

[c] Future residential and commercial exposure scenarios do not include any potentially complete and significant exposure pathways. Chemicals with maximum detected concentrations > ESLs for these two exposure scenarios were therefore identified, but were not evaluated beyond the screening step.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.

Table 5
Sub-Slab Soil Gas Screening Evaluation
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical [a]	Frequency of Detection			Percent Detected (%)	Maximum Detected Concentration (µg/m^3)	Modified Indoor Air ESLs (µg/m^3) [b,c]		Number of Samples with Concentrations > ESL	
						Residential	Commercial	Residential	Commercial
VOCs									
2-Butanone (MEK)	4	/	4	100%	15.8	52,000	220,000	--	--
Styrene	3		4	75%	9.16	9,400	39,000	--	--
Tetrachloroethene (PCE)	1	/	4	25%	43.8	**4.1**	**21**	**1**	**1**
1,1,1-Trichloroethane	1		4	25%	6.66	52,000	220,000	--	--

ESLs < Maximum detected concentration are shown in bold font.

Abbreviations:
µg/m^3 = micrograms per cubic meter
VOCs = volatile organic compounds
-- = not available

Footnotes:

[a] Only chemicals detected in at least one sample are included in the table.

[b] Ambient and indoor air environmental screening levels (ESLs) from Table E-3 of RWQCB (2013a), divided by a conservative attenuation factor of 0.1.

[c] Future residential and commercial exposure scenarios do not include any potentially complete and significant exposure pathways. Chemicals with maximum detected concentrations > ESLs for these two exposure scenarios were therefore identified, but were not evaluated beyond the screening step.

References:

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.

Table 6
Toxicity Values - Reference Doses and Reference Concentrations
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical Of Potential Concern (COPC)	Chronic Oral Reference Dose (RfDo) [a] (mg/kg-day)		Gastrointestinal Absorption Factor (GIABS) [b] (unitless)	Chronic Dermal Reference Dose (RfDo) [b] (mg/kg-day)	Chronic Inhalation Reference Concentration (RfCi) [a] ($\mu g/m^3$)	
	Value	Source		Value	Value	Source
SVOCs						
Benzo(a)pyrene	--	--	1	--	--	--
Pesticides						
Total PCBs	--	--	1	--	--	--
Metals						
Arsenic	3.0E-04	USEPA 2015a	1	3.0E-04	1.5E-02	CalEPA 2015
Lead	--	--	1	--	--	--
Vanadium	5.0E-03	USEPA 2015b	0.026	1.3E-04	1.0E-01	USEPA 2015b
TPH						
TPH-Diesel	2.0E-02	RWQCB 2013a	1	2.0E-02	1.3E+02	RWQCB 2013a

Abbreviations:
mg/kg-day = milligrams per kilogram body weight per day
$\mu g/m^3$ = micrograms per cubic meter
-- = not available or applicable
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons

Footnotes:

[a] Toxicity values (for chemicals other than TPH) were obtained from the following sources of information in order of priority: CalEPA (2015), USEPA (2015a), USEPA (2015b). Values for TPH-diesel are from RWQCB (2013a).

[b] Dermal RfD = Oral RfD * GIABS. Gastrointestinal absorption factors from USEPA (2004).

References:

California Environmental Protection Agency (CalEPA). 2015. Office of Environmental Health Hazard Assessment (OEHHA). Toxicity Criteria Database. Online database, accessed April 2015. http://oehha.ca.gov/risk/chemicaldb/index.asp

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2013a. 2013 Update to Environmental Screening Levels. December.

United States Environmental Protection Agency (USEPA). 2015a. Integrated Risk Information System (IRIS). Online database, accessed April 2015. http://www.epa.gov/iris/

USEPA. 2015b. Regional Screening Levels Table. January. http://www.epa.gov/region9/superfund/prg/

Table 7
Toxicity Values - Cancer Slope Factors and Inhalation Unit Risks
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical Of Potential Concern (COPC)	Oral Slope Factor (SFo) [a] (mg/kg-day)$^{-1}$		Gastrointestinal Absorption Factor (GIABS) [b] (unitless)	Dermal Slope Factor (SFd) [b] (mg/kg-day)$^{-1}$	Inhalation Unit Risk (IUR) [a] (µg/m^3)$^{-1}$	
	Value	Source			Value	Source
SVOCs						
Benzo(a)pyrene	2.9E+00	CalEPA 2015	1	2.9E+00	1.1E-03	CalEPA 2015
Pesticides						
Total PCBs	2.0E+00	CalEPA 2015	1	2.0E+00	5.7E-04	CalEPA 2015
Metals						
Arsenic	9.5E+00	CalEPA 2015	1	9.5E+00	3.3E-03	CalEPA 2015
Lead	8.5E-03	CalEPA 2015	1	8.5E-03	1.2E-05	CalEPA 2015
Vanadium	--	--	0.026	--	--	--
TPH						
TPH-Diesel	--	--	1	--	--	--

Abbreviations:

mg/kg-day = milligrams per kilogram body weight per day
µg/m^3 = micrograms per cubic meter
-- = not available or applicable
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons

Footnotes:

[a] Toxicity values were obtained from the following sources of information in order of priority: CalEPA (2015), USEPA (2015a), USEPA (2015b).

[b] Dermal SF = Oral SF * GIABS. Gastrointestinal absorption factors from USEPA (2004).

References:

California Environmental Protection Agency (CalEPA). 2015. Office of Environmental Health Hazard Assessment (OEHHA). Toxicity Criteria Database. Online database, accessed April 2015. http://oehha.ca.gov/risk/chemicaldb/index.asp

United States Environmental Protection Agency (USEPA). 2015a. Integrated Risk Information System (IRIS). Online database, accessed April 2015. http://www.epa.gov/iris/

USEPA. 2015b. Regional Screening Levels Table. January. http://www.epa.gov/region9/superfund/prg/

Table 8
Exposure Intake Assumptions
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Hypothetical Receptor/Parameter	Acronym	Value	Unit	Rationale	Reference
Future Construction Worker Receptor					
Averaging Time - Noncarcinogens	ATnc	365	days	ATn = ED x 365 days ATc = Lifetime x 365 days.	RWQCB, 2013b
Averaging Time - Carcinogens	ATc	25,550	days	ATc = Lifetime x 365 days.	RWQCB, 2013b
Lifetime	--	70	years	Default value.	RWQCB, 2013b
Body Weight	BW	70	kg	Default value.	RWQCB, 2013b
Exposure Duration	ED	1	year	Default value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Exposure Frequency	EF	250	days/year	Default value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Exposure Time	ET	8	hours/day	Standard work day.	RWQCB, 2013b
Soil Ingestion Rate	IRs	330	mg/day	Default value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Particulate Emission Factor	PEF	1.4E+06	m^3/kg	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Skin Surface Area	SA	5,800	cm^2/day	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Soil Adherence Factor	AF	0.51	mg/cm^2	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Dermal Absorption Fraction	ABS	-	-	Chemical-specific (USEPA, 2004, Exhibit 3-4).	USEPA, 2004
	B(a)P	0.13	--	Benzo(a)pyrene	USEPA, 2004
	PCBs	0.14	--	Total Polychlorinated Biphenyls (PCBs)	USEPA, 2004
	As	0.03	--	Arsenic	USEPA, 2004
	Pb	0	--	Lead	USEPA, 2004
	V	0	--	Vanadium	USEPA, 2004
	TPH-d	0.1		Total petroleum hydrocarbons as diesel	USEPA, 2004
Conversion Factor	CF1	1E-06	kg/mg		--
Conversion Factor	CF2	1/24	days/hour		--
Conversion Factor	CF3	1.0E+03	µg/mg		--
Future Utility/Maintenance Worker Receptor					
Averaging Time - Noncarcinogens	ATnc	9,125	days	ATn = ED x 365 days ATc = Lifetime x 365 days.	RWQCB, 2013b
Averaging Time - Carcinogens	ATc	25,550	days	ATc = Lifetime x 365 days.	RWQCB, 2013b
Lifetime	--	70	years	Default value.	RWQCB, 2013b
Body Weight	BW	70	kg	Default value.	RWQCB, 2013b
Exposure Duration	ED	25	year	Default value for commercial/industrial worker.	RWQCB, 2013b
Exposure Frequency	EF	12	days/year	Best professional judgement in the absence of a recommended value. Assumes worker visits the site once per month to perform maintenance activities.	--
Exposure Time	ET	8	hours/day	Standard work day.	RWQCB, 2013b
Soil Ingestion Rate	IRs	330	mg/day	Default value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Particulate Emission Factor	PEF	1.4E+06	m^3/kg	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Skin Surface Area	SA	5,800	cm^2/day	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Soil Adherence Factor	AF	0.51	mg/cm^2	Value used to calculate direct-exposure ESLs for construction worker.	RWQCB, 2013b
Dermal Absorption Fraction	ABS	-	-	Chemical-specific (USEPA, 2004, Exhibit 3-4).	USEPA, 2004
	B(a)P	0.13	--	Benzo(a)pyrene	USEPA, 2004
	PCBs	0.14	--	Total Polychlorinated Biphenyls (PCBs)	USEPA, 2004
	As	0.03	--	Arsenic	USEPA, 2004
	Pb	0	--	Lead	USEPA, 2004
	V	0	--	Vanadium	USEPA, 2004
	TPH-d	0.1		Total petroleum hydrocarbons as diesel	USEPA, 2004
Conversion Factor	CF1	1E-06	kg/mg		--
Conversion Factor	CF2	1/24	days/hour		--
Conversion Factor	CF3	1.0E+03	µg/mg		--

Abbreviations:

cm^2 = centimeters squared; kg = kilograms; mg = milligrams ; m^3 = cubic meters; µg = micrograms

- = Chemical-specific

-- = Not applicable

References:

California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region. 2013b. User's Guide: Derivation and Application of Environmental Screening Levels. Interim Final 2013. December.

United States Environmental Protection Agency (USEPA). 2004. Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP. July 2004.

Table 9
Soil Exposure Point Concentrations
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical of Potential Concern (COPC)	Construction Worker (EPCc) [a,b]	Maintenance/Utility Worker (EPCm) [a,c]
	(mg/kg)	(mg/kg)
SVOCs		
Benzo(a)pyrene	0.465	3
Pesticides		
Total PCBs	3.983	4.206
Metals		
Arsenic	9.33	6.991
Lead	1,313	3,362
Vanadium	1,159	34.36
TPH		
TPH-Diesel	670.1	1,024

Abbreviations:

mg/kg = milligrams per kilogram
EPC = exposure point concentration
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons

Footnotes:

[a] Lesser of the maximum and the upper confidence limit on the unknown mean recommended from ProUCL software (USEPA, 2013a). See Appendix A for ProUCL outputs. Maximum concentrations were used as the EPCs for chemicals with fewer than four detected values.

[b] Construction workers were assumed to have potential exposure to soil across the site to an excavation depth of 12 feet. All soil samples collected from 0-12 feet bgs were therefore included in the construction worker soil EPC calculations.

[c] Maintenance/utility workers were assumed to have potential exposure to soil to an excavation depth of 12 feet in areas outside of the future building footprint. Maintenance/utility worker soil EPC calculations therefore include soil samples collected from 0-12 feet bgs from locations outside of the future building footprint.

References:

United States Environmental Protection Agency (USEPA). 2013a. ProUCL Version 5.0, A Statistical Software. National Exposure Research Lab, EPA, Las Vegas, Nevada. Available for download at: http://www2.epa.gov/land-research/proucl-software

Table 10
Risk Characterization for the Future Construction Worker Receptor
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical of Potential Concern (COPC)	Noncancer Hazard Quotient (HQ) [a,d]				Lifetime Excess Cancer Risk (LECR) [b,d]			
	Soil Ingestion	Dermal Soil Contact	Dust Inhalation	Multi-Pathway	Soil Ingestion	Dermal Soil Contact	Dust Inhalation	Multi-Pathway
SVOCs								
Benzo(a)Pyrene	--	--	--	--	6.2E-08	7.2E-08	1.2E-09	1.4E-07
Pesticides								
Total PCBs	--	--	--	--	3.7E-07	4.6E-07	5.3E-09	8.3E-07
Metals								
Arsenic	0.10	0.027	0.10	0.23	4.1E-06	1.1E-06	7.2E-08	5.3E-06
Lead	--	--	--	--	5.1E-07	0.0E+00	3.7E-08	5.5E-07
Vanadium	0.75	0	1.9	2.6	--	--	--	--
TPH								
TPH-Diesel	0.11	0.097	0.00084	0.21	--	--	--	--
Total HI or LECR [c]	0.8	0.03	2	3	5E-06	2E-06	1E-07	7E-06

Abbreviations:

-- = not applicable; toxicity or pathway-specific value not available
HI = hazard index
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons

Footnotes:

[a] HQ soil ingestion= [(EPCc x IRs x EF x ED x CF1) / (BW x ATnc)] / RfDo
HQ dermal soil contact = [(EPCc x SA x AF x ABS x EF x ED x CF1) / (BW x ATnc)] / RfDd
HQ dust inhalation = [(EPCc x 1/PEF x ET x EF x ED x CF2 x CF3) / ATnc] / RfCi
HQ multi-pathway = sum of HQs for soil ingestion, dermal soil contact, and dust inhalation

[b] LECR soil ingestion= [(EPCc x IRs x EF x ED x CF1) / (BW x ATc)] x SFo
LECR dermal soil contact = [(EPCc x SA x AF x ABS x EF x ED x CF1) / (BW x ATc)] x SFd
LECR dust inhalation = [(EPCc x 1/PEF x ET x EF x ED x CF2 x CF3) / ATc] * IUR
LECR multi-pathway = sum of LECRs for soil ingestion, dermal soil contact, and dust inhalation

[c] Total HI or LECR = sum of chemical-specific HQs or LECRs, respectively, for each pathway or for all pathways combined (i.e., multi-pathway)

[d] Refer to Tables 8 and 9 for explanation of acronyms used in equations.
Refer to Tables 6 and 7 for toxicity values and sources.

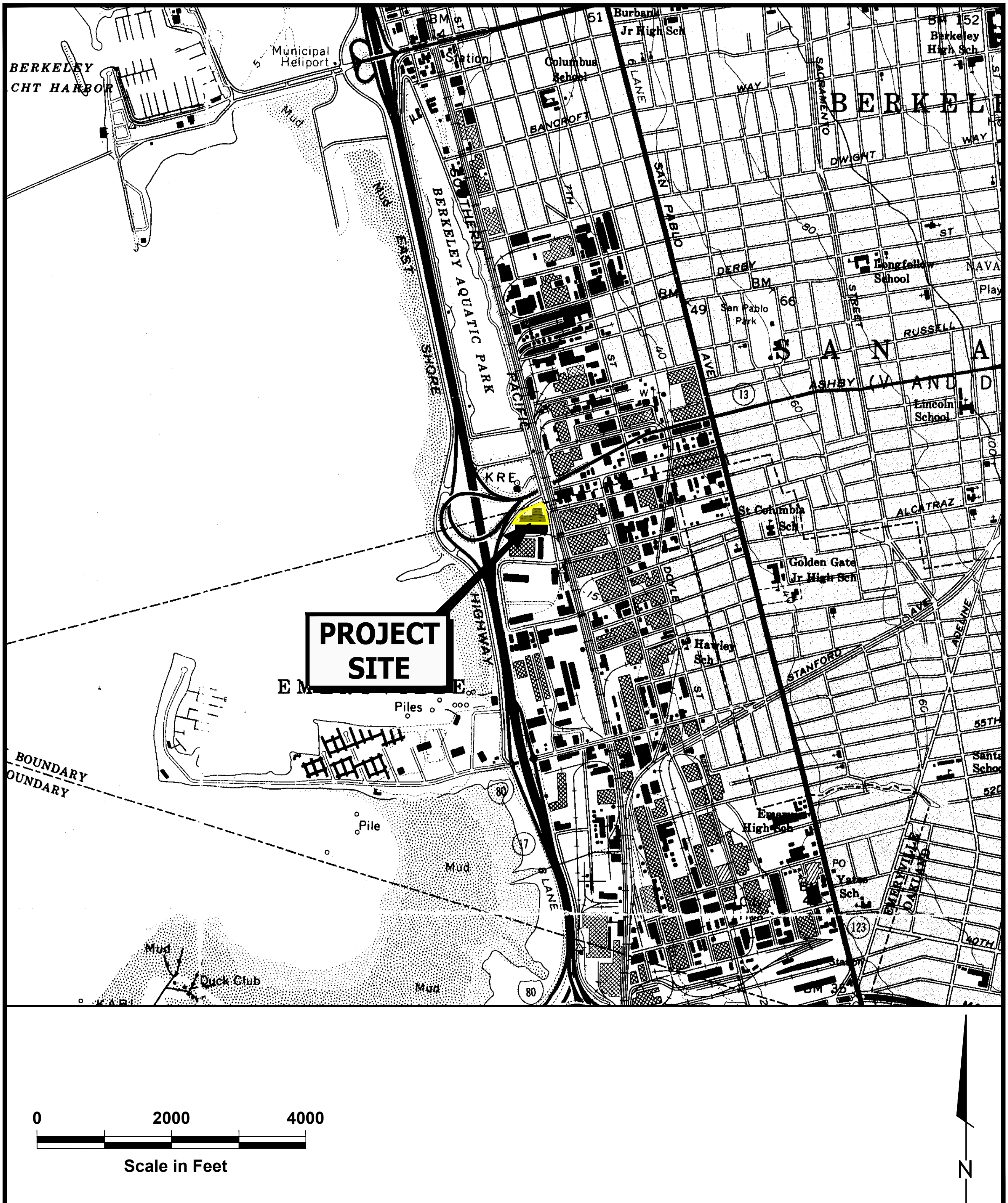
Table 11
Risk Characterization for the Future Maintenance/Utility Worker Receptor
Human Health Risk Assessment Report
6701-6707 Shellmound Street
Emeryville, California

Chemical of Potential Concern (COPC)	Noncancer Hazard Quotient (HQ) [a,d]				Lifetime Excess Cancer Risk (LECR) [b,d]			
	Soil Ingestion	**Dermal Soil Contact**	**Dust Inhalation**	**Multi-Pathway**	**Soil Ingestion**	**Dermal Soil Contact**	**Dust Inhalation**	**Multi-Pathway**
SVOCs								
Benzo(a)Pyrene	--	--	--	--	4.8E-07	5.6E-07	9.2E-09	1.1E-06
Pesticides								
Total PCBs	--	--	--	--	4.7E-07	5.8E-07	6.7E-09	1.1E-06
Metals								
Arsenic	0.0036	0.00097	0.0036	0.0082	3.7E-06	9.9E-07	6.4E-08	4.7E-06
Lead	--	--	--	--	1.6E-06	0.0E+00	1.1E-07	1.7E-06
Vanadium	0.0011	0	0.0027	0.0038	--	--	--	--
TPH								
TPH-Diesel	0.0079	0.0071	0.000062	0.015	--	--	--	--
Total HI or LECR [c]	0.005	0.001	0.006	0.01	6E-06	2E-06	2E-07	9E-06

Abbreviations:
-- = not applicable; toxicity or pathway-specific value not available
HI = hazard index
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons

Footnotes:
[a] HQ soil ingestion= [(EPCm x IRs x EF x ED x CF1) / (BW x ATnc)] / RfDo
HQ dermal soil contact = [(EPCm x SA x AF x ABS x EF x ED x CF1) / (BW x ATnc)] / RfDd
HQ dust inhalation = [(EPCm x 1/PEF x ET x EF x ED x CF2 x CF3) / ATnc] / RfCi
HQ multi-pathway = sum of HQs for soil ingestion, dermal soil contact, and dust inhalation
[b] LECR soil ingestion= [(EPCm x IRs x EF x ED x CF1) / (BW x ATc)] x SFo
LECR dermal soil contact = [(EPCm x SA x AF x ABS x EF x ED x CF1) / (BW x ATc)] x SFd
LECR dust inhalation = [(EPCm x 1/PEF x ET x EF x ED x CF2 x CF3) / ATc] * IUR
LECR multi-pathway = sum of LECRs for soil ingestion, dermal soil contact, and dust inhalation
[c] Total HI or LECR = sum of chemical-specific HQs or LECRs, respectively, for each pathway or for all pathways combined (i.e., multi-pathway)
[d] Refer to Tables 8 and 9 for explanation of acronyms used in equations.
Refer to Tables 6 and 7 for toxicity values and sources.

PLATES



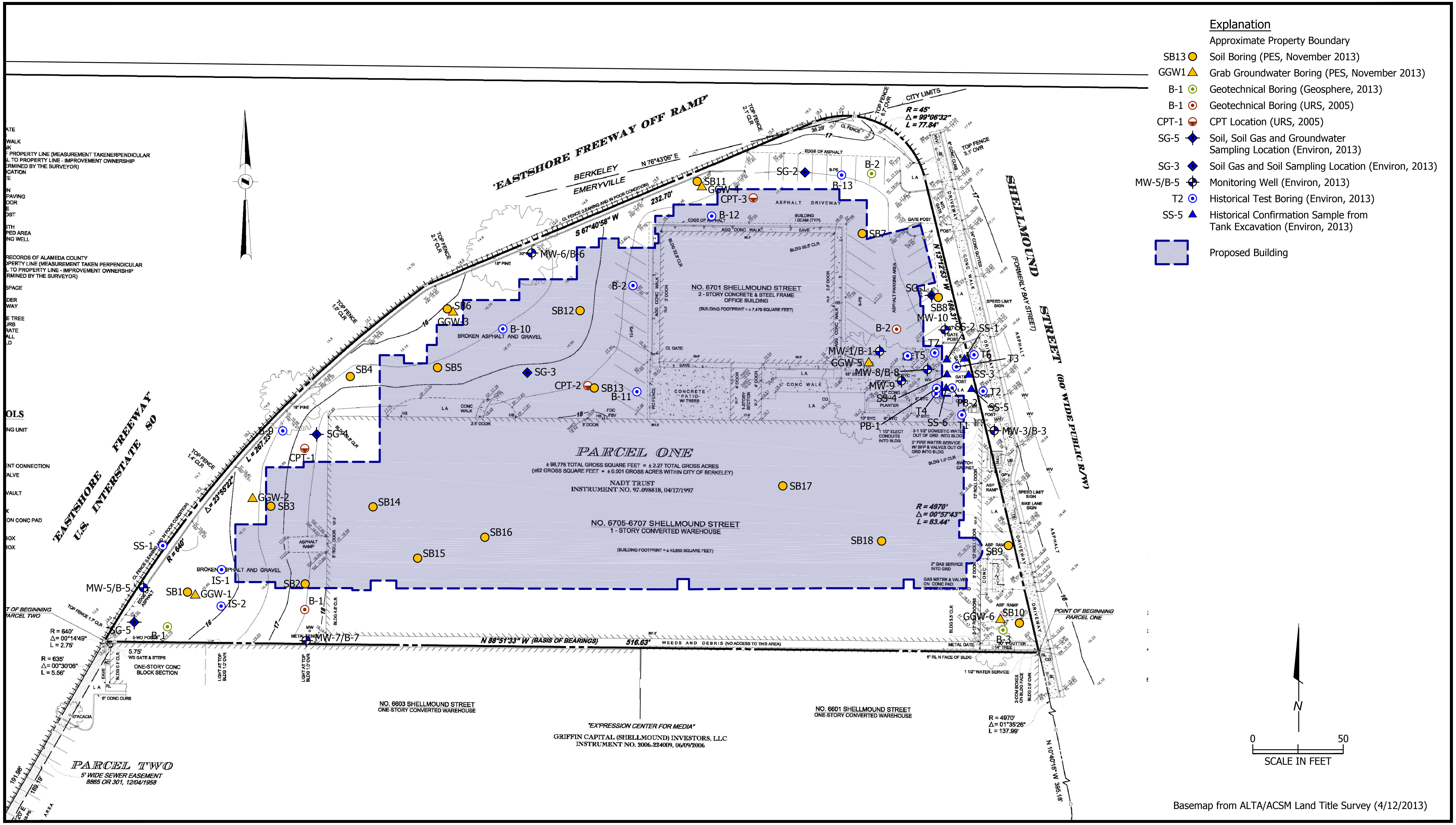
U.S.G.S. Topo Map - Oakland West, California, 7.5-minute quadrangle.1997

PES Environmental, Inc.
Engineering & Environmental Services

Site Location Map
Human Health Risk Assessment
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
1

1448.001.01.004	1448-00101004_HHRA_1	MS	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



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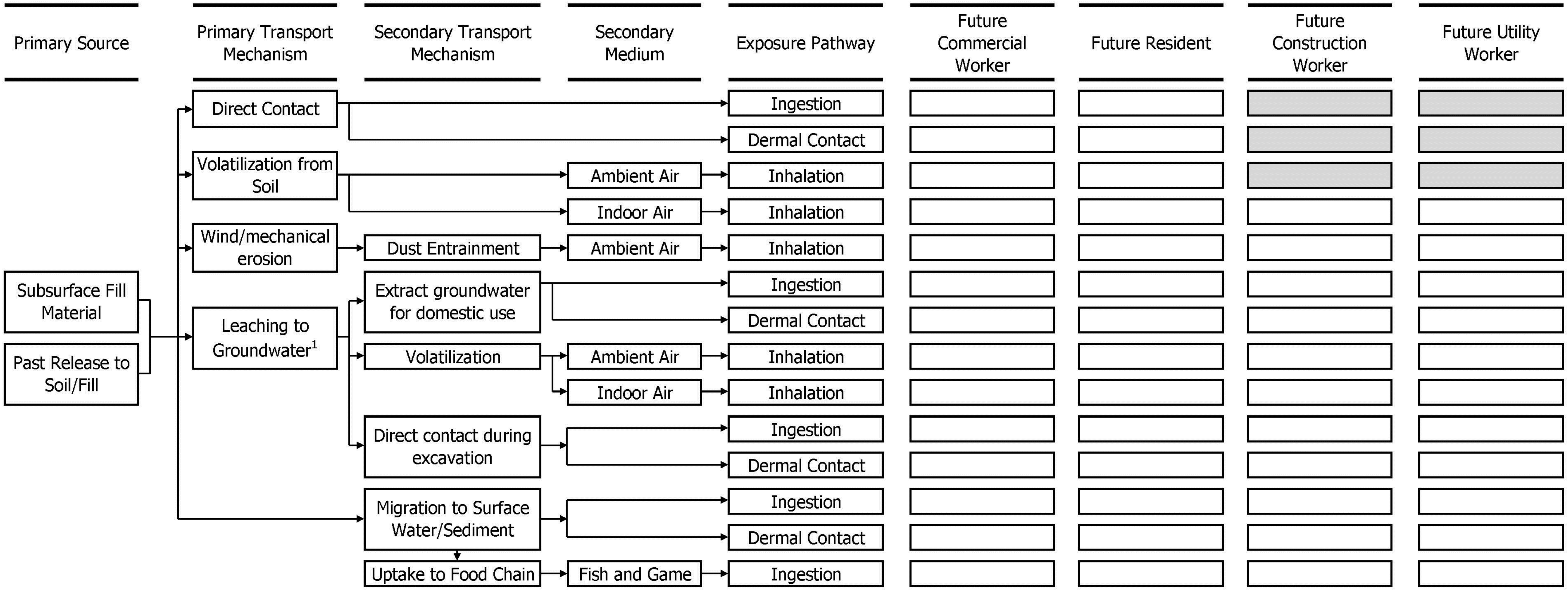
Site Plan and Proposed Building
Human Health Risk Assessment
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
2

1448.001.01.004	1448-00101004_HHRA_2	MS	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

Conceptual Site Model



Primary Source	Primary Transport Mechanism	Secondary Transport Mechanism	Secondary Medium	Exposure Pathway	Future Commercial Worker	Future Resident	Future Construction Worker	Future Utility Worker
Subsurface Fill Material Past Release to Soil/Fill	Direct Contact			Ingestion	□	□	▨	▨
				Dermal Contact	□	□	▨	▨
	Volatilization from Soil		Ambient Air	Inhalation	□	□	▨	▨
			Indoor Air	Inhalation	□	□	□	□
	Wind/mechanical erosion	Dust Entrainment	Ambient Air	Inhalation	□	□	□	□
	Leaching to Groundwater[1]	Extract groundwater for domestic use		Ingestion	□	□	□	□
				Dermal Contact	□	□	□	□
		Volatilization	Ambient Air	Inhalation	□	□	□	□
			Indoor Air	Inhalation	□	□	□	□
		Direct contact during excavation		Ingestion	□	□	□	□
				Dermal Contact	□	□	□	□
		Migration to Surface Water/Sediment		Ingestion	□	□	□	□
				Dermal Contact	□	□	□	□
		Uptake to Food Chain	Fish and Game	Ingestion	□	□	□	□

■ Receptor likely to be exposed via this route, so exposure pathways are considered potentially complete and significant.

▨ Receptor may be exposed via this route; however, exposure is likely insignificant based on engineering and institutional controls. [2]

□ Pathway to receptor is not complete and/or significant.

Footnotes:

[1] Groundwater ranges from approximately 11 to 13 feet below ground surface.

[2] Refer to Section 4.3 of report text.

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Engineering & Environmental Services

Conceptual Site Model Diagram
HHRA
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
3

1448.001.01.004 JOB NUMBER
1448-00101004_SMP_C-3 DRAWING NUMBER
DRAFT REVIEWED BY
5/15 DATE

APPENDIX A

PROUCL DATA

INPUT DATA

CONSTRUCTION WORKER

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SS-3-E	-	Benzo(a)pyrene	0.03	0
SS-5-E	-	Benzo(a)pyrene	0.20	0
B-7/M-7	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-8/MW-8	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-9	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-11	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-12	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-13	4	Benzo(a)pyrene	0.47	1
	9	Benzo(a)pyrene	0.30	0
T-2	6	Benzo(a)pyrene	0.30	0
T-5	5	Benzo(a)pyrene	3.00	0
	9.0	Benzo(a)pyrene	0.30	0
SB2	4	Benzo(a)pyrene	0.067	0
	7.5	Benzo(a)pyrene	0.97	1
SB6	4	Benzo(a)pyrene	3.00	1
	10	Benzo(a)pyrene	0.067	0
SB7	2.5	Benzo(a)pyrene	0.33	0
	8	Benzo(a)pyrene	0.33	0
SB11	2	Benzo(a)pyrene	1.30	0
	5.5	Benzo(a)pyrene	0.90	1
SB13	1.5	Benzo(a)pyrene	0.066	0
	10	Benzo(a)pyrene	1.70	0
IS-1	3.5	Arsenic	2.2	0
	7	Arsenic	2.2	0
	10	Arsenic	2.2	0
IS-2	3	Arsenic	2.2	0
	8.5	Arsenic	2.2	0
B-1/MW-1	5.5	Arsenic	2.2	0
	10.5	Arsenic	2.2	0
B-2	6	Arsenic	2.2	0
	10	Arsenic	2.2	0
B-5/MW-5	6	Arsenic	2.2	0
	11	Arsenic	2.2	0
B-7/MW-7	4	Arsenic	16	0
	9	Arsenic	16	0
B-8/MW-8	4	Arsenic	16	0
	9	Arsenic	16	0
B-9	4	Arsenic	16	0
	9	Arsenic	16	0
B-10	4	Arsenic	16	0
	9	Arsenic	21	1
B-11	4	Arsenic	16	0
	9	Arsenic	16	0
B-12	4	Arsenic	16	0
	9	Arsenic	38	1
B-13	4	Arsenic	16	0
	9	Arsenic	16	0
Sump	Confirmation	Arsenic	16	0
T-2	6	Arsenic	9.3	1

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
T-5	5	Arsenic	6	1
	9	Arsenic	2.5	0
T-7	7.5	Arsenic	4.2	1
SG-1	3.5-4.0	Arsenic	11	1
SG-2	3.0-3.5	Arsenic	12	1
SG-3	3.5-4.0	Arsenic	7.3	1
SG-4	3.5-4.0	Arsenic	6.9	1
SG-5	4.5-5.0	Arsenic	9.9	1
SB1	1	Arsenic	5.9	1
SB3	1.5	Arsenic	3.4	1
SB3	11	Arsenic	7.5	1
SB5	8	Arsenic	6.7	1
SB6	10	Arsenic	5.6	1
SB7	2.5	Arsenic	5.0	1
SB8	8	Arsenic	2.3	1
SB9	4.5	Arsenic	5.4	1
SB10	2	Arsenic	6.9	1
SB11	5.5	Arsenic	9.2	1
SB12	10	Arsenic	5.9	1
SB13	5	Arsenic	8.4	1
SB14	3.5	Arsenic	7.7	1
SB15	7.5	Arsenic	4.6	1
SB16	10.5	Arsenic	11	1
SB17	2	Arsenic	7.8	1
SB18	10	Arsenic	49	1
IS-1	3.5	Lead	100	1
	7	Lead	130	1
	10	Lead	4,300	1
IS-2	3	Lead	90	1
	8.5	Lead	5.3	1
B-1/MW-1	5.5	Lead	61	1
	10.5	Lead	3	1
B-2	6	Lead	167	1
	10	Lead	1,360	1
B-5/MW-5	6	Lead	9.7	1
	11	Lead	164	1
B-7/MW-7	4	Lead	12	0
	9	Lead	12	0
B-8/MW-8	4	Lead	12	0
	9	Lead	24	1
B-9	4	Lead	41	1
	9	Lead	980	1
B-10	4	Lead	42	1
	9	Lead	1,500	1
B-11	4	Lead	72	1
	9	Lead	55	1
B-12	4	Lead	120	1
	9	Lead	3,000	1
B-13	4	Lead	520	1
	9	Lead	12	1
Sump	Confirmation	Lead	62	1
T-2	6	Lead	330	1
T-5	5	Lead	61	1
	9	Lead	1.5	1

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
T-7	7.5	Lead	6.1	1
SG-1	3.5-4.0	Lead	990	1
SG-2	3.0-3.5	Lead	120	1
SG-3	3.5-4.0	Lead	830	1
SG-4	3.5-4.0	Lead	130	1
SG-5	4.5-5.0	Lead	75	1
SB1	1	Lead	81	1
SB1	5.5	Lead	1,300	1
SB1	11.75	Lead	2,400	1
SB2	4	Lead	20	1
SB2	7.5	Lead	120	1
SB2	10.75	Lead	240	1
SB3	1.5	Lead	14	1
SB3	7.5	Lead	340	1
SB3	11	Lead	460	1
SB4	1.5	Lead	18	1
SB4	5	Lead	110	1
SB4	10	Lead	10,000	1
SB5	3	Lead	430	1
SB5	8	Lead	100	1
SB5	11.5	Lead	1,100	1
SB6	4	Lead	140	1
SB6	8	Lead	58	1
SB6	10	Lead	160	1
SB7	2.5	Lead	120	1
SB7	8	Lead	250	1
SB8	3.5	Lead	200	1
SB8	8	Lead	3.1	1
SB8	12	Lead	3.0	1
SB9	4.5	Lead	41	1
SB9	10	Lead	50	1
SB10	2	Lead	45	1
SB10	5	Lead	49	1
SB10	10	Lead	21	1
SB11	2	Lead	28	1
SB11	5.5	Lead	170	1
SB11	11.5	Lead	1.7	1
SB12	2	Lead	130	1
SB12	5	Lead	320	1
SB12	10	Lead	290	1
SB13	1.5	Lead	68	1
SB13	5	Lead	54	1
SB13	10	Lead	3,300	1
SB14	3.5	Lead	11	1
SB14	8.5	Lead	100	1
SB14	11.5	Lead	250	1
SB15	2.5	Lead	8.2	1
SB15	7.5	Lead	870	1
SB15	11.5	Lead	130	1
SB16	2.5	Lead	19	1
SB16	7.5	Lead	280	1
SB16	10.5	Lead	210	1
SB17	2	Lead	54	1
SB17	5	Lead	27	1

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SB17	9.5	Lead	150	1
SB18	2	Lead	30	1
SB18	5	Lead	34	1
SB18	10	Lead	650	1
IS-1	3.5	Vanadium	15.4	1
	7	Vanadium	17.3	1
	10	Vanadium	17.3	1
IS-2	3	Vanadium	15.6	1
	8.5	Vanadium	6.7	1
B-1/MW-1	5.5	Vanadium	15	1
	10.5	Vanadium	7	1
B-2	6	Vanadium	9.7	1
	10	Vanadium	13	1
B-5/MW-5	6	Vanadium	12	1
	11	Vanadium	23.4	1
B-7/MW-7	4	Vanadium	36	1
	9	Vanadium	12	1
B-8/MW-8	4	Vanadium	15	1
	9	Vanadium	8.5	1
B-9	4	Vanadium	31	1
	9	Vanadium	26	1
B-10	4	Vanadium	5	1
	9	Vanadium	28	1
B-11	4	Vanadium	21	1
	9	Vanadium	17	1
B-12	4	Vanadium	21	1
	9	Vanadium	23	1
B-13	4	Vanadium	27	1
	9	Vanadium	15	1
Sump	Confirmation	Vanadium	39	1
T-2	6	Vanadium	26	1
T-5	5	Vanadium	26	1
	9	Vanadium	15	1
T-7	7.5	Vanadium	27	1
SG-1	3.5-4.0	Vanadium	60	1
SG-2	3.0-3.5	Vanadium	50	1
SG-3	3.5-4.0	Vanadium	49	1
SG-4	3.5-4.0	Vanadium	45	1
SG-5	4.5-5.0	Vanadium	41	1
SB1	1	Vanadium	51	1
SB3	1.5	Vanadium	26	1
SB3	11	Vanadium	42	1
SB5	8	Vanadium	29	1
SB6	10	Vanadium	41	1
SB7	2.5	Vanadium	35	1
SB8	8	Vanadium	26	1
SB9	4.5	Vanadium	36	1
SB10	2	Vanadium	34	1
SB11	5.5	Vanadium	36	1
SB12	10	Vanadium	30	1
SB13	5	Vanadium	45	1
SB14	3.5	Vanadium	53	1
SB15	7.5	Vanadium	40	1
SB16	10.5	Vanadium	41	1

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SB17	2	Vanadium	53	1
SB18	10	Vanadium	11,000	1
IS-1	3.5	TPH-Diesel	46	1
	7.0	TPH-Diesel	200	1
	10.5	TPH-Diesel	10	1
IS-2	3.0	TPH-Diesel	50	1
	8.5	TPH-Diesel	10	1
B-1/MW-1	5.5	TPH-Diesel	12	1
	10.5	TPH-Diesel	10	1
B-2	6.0	TPH-Diesel	19	1
	10	TPH-Diesel	172	1
B-3/MW-3	5.0	TPH-Diesel	30	1
	12.0	TPH-Diesel	20	1
B-4	4.5	TPH-Diesel	10	1
	10.0	TPH-Diesel	170	1
B-5/MW-5	6.0	TPH-Diesel	10	1
	11.0	TPH-Diesel	15	1
SS-1-E	2' Beneath UST	TPH-Diesel	12	1
SS-2-W	2' Beneath UST	TPH-Diesel	11	1
SS-3-E	2' Beneath UST	TPH-Diesel	10	1
SS-4-W	2' Beneath UST	TPH-Diesel	60	1
SS-5-E	2' Beneath UST	TPH-Diesel	35	1
SS-6-W	2' Beneath UST	TPH-Diesel	700	1
B-7/MW-7	4	TPH-Diesel	10	1
	9	TPH-Diesel	788	1
B-8/MW-8	4	TPH-Diesel	10	1
	9	TPH-Diesel	10	1
B-9	4	TPH-Diesel	10	1
	9	TPH-Diesel	5,050	1
B-10	4	TPH-Diesel	380	1
	9	TPH-Diesel	10	1
B-11	4	TPH-Diesel	10	1
	9	TPH-Diesel	10	1
B-12	4	TPH-Diesel	10	1
	9	TPH-Diesel	10	1
B-13	4	TPH-Diesel	10	1
	9	TPH-Diesel	10	1
Sump	Confirmation	TPH-Diesel	10	1
MW-9	8.5	TPH-Diesel	1	1
T-2	6	TPH-Diesel	40	1
T-5	5	TPH-Diesel	10	1
	9	TPH-Diesel	1	1
T-7	7.5	TPH-Diesel	10	1
SG-1	3.5 - 4.0	TPH-Diesel	43	1
SG-2	3.0 - 3.5	TPH-Diesel	43	1
SG-3	3.5 - 4.0	TPH-Diesel	290	1
SG-4	3.5 - 4.0	TPH-Diesel	200	1
SG-5	4.5 - 5.0	TPH-Diesel	33	1

Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SB5	3	Total PCBs	10	1
	8	Total PCBs	0.018	1
	11.5	Total PCBs	0.014	1
SB6	4	Total PCBs	0.57	1
	8	Total PCBs	0.16	1
	10	Total PCBs	4.8	1
SB7	2.5	Total PCBs	1.9	1
	8	Total PCBs	1.5	1
SB11	2	Total PCBs	0.38	1
	5.5	Total PCBs	2.60	1
SB12	2	Total PCBs	2	1
	5	Total PCBs	1.2	1
	10	Total PCBs	6.5	1
SB13	1.5	Total PCBs	0.27	1
	5	Total PCBs	0.018	1
	10	Total PCBs	5.2	1
SB14	3.5	Total PCBs	0.013	1
SG-1	3.5 - 4.0	Total PCBs	1	1
SG-2	3.0 - 3.5	Total PCBs	1	1
SG-3	3.5 - 4.0	Total PCBs	14	1
SG-4	3.5 - 4.0	Total PCBs	8	1
SG-5	4.5 - 5.0	Total PCBs	1	1
IS1	3.5	Total PCBs	0.4	1
	7.0	Total PCBs	0.7	1
	10.5	Total PCBs	1	1
IS2	3.0	Total PCBs	0.2	1
	8.5	Total PCBs	1	1
B-8/MW-8	4	Total PCBs	2.3	1
B-11	4	Total PCBs	2.2	1
B-13	4	Total PCBs	3.1	1
Sump	Confirmation	Total PCBs	4.2	1

INPUT DATA

MAINTENANCE/UTILITY WORKER

Boring Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SS-3-E	-	Benzo(a)pyrene	0.03	0
SS-5-E	-	Benzo(a)pyrene	0.20	0
B-7/M-7	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-9	4	Benzo(a)pyrene	0.30	0
	9	Benzo(a)pyrene	0.30	0
B-13	4	Benzo(a)pyrene	0.47	1
	9	Benzo(a)pyrene	0.30	0
T-2	6	Benzo(a)pyrene	0.30	0
SB6	4	Benzo(a)pyrene	3.00	1
	10	Benzo(a)pyrene	0.067	0
SB11	2	Benzo(a)pyrene	1.30	0
	5.5	Benzo(a)pyrene	0.90	1
IS-1	3.5	Arsenic	2.2	0
	7	Arsenic	2.2	0
	10	Arsenic	2.2	0
IS-2	3	Arsenic	2.2	0
	8.5	Arsenic	2.2	0
B-5/MW-5	6	Arsenic	2.2	0
	11	Arsenic	2.2	0
B-7/MW-7	4	Arsenic	16	0
	9	Arsenic	16	0
B-9	4	Arsenic	16	0
	9	Arsenic	16	0
B-13	4	Arsenic	16	0
	9	Arsenic	16	0
Sump	Confirmation	Arsenic	16	0
T-2	6	Arsenic	9.3	1
SG-1	3.5-4.0	Arsenic	11	1
SG-2	3.0-3.5	Arsenic	12	1
SG-4	3.5-4.0	Arsenic	6.9	1
SG-5	4.5-5.0	Arsenic	9.9	1
SB1	1	Arsenic	5.9	1
SB6	10	Arsenic	5.6	1
SB8	8	Arsenic	2.3	1
SB9	4.5	Arsenic	5.4	1
SB10	2	Arsenic	6.9	1
SB11	5.5	Arsenic	9.2	1
IS-1	3.5	Lead	100	1
	7	Lead	130	1
	10	Lead	4,300	1
IS-2	3	Lead	90	1
	8.5	Lead	5.3	1
B-5/MW-5	6	Lead	9.7	1
	11	Lead	164	1

Boring Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
B-7/MW-7	4	Lead	12	0
	9	Lead	12	0
B-9	4	Lead	41	1
	9	Lead	980	1
B-13	4	Lead	520	1
	9	Lead	12	1
Sump	Confirmation	Lead	62	1
T-2	6	Lead	330	1
SG-1	3.5-4.0	Lead	990	1
SG-2	3.0-3.5	Lead	120	1
SG-4	3.5-4.0	Lead	130	1
SG-5	4.5-5.0	Lead	75	1
SB1	1	Lead	81	1
SB1	5.5	Lead	1,300	1
SB1	11.75	Lead	2,400	1
SB4	1.5	Lead	18	1
SB4	5	Lead	110	1
SB4	10	Lead	10,000	1
SB6	4	Lead	140	1
SB6	8	Lead	58	1
SB6	10	Lead	160	1
SB8	3.5	Lead	200	1
SB8	8	Lead	3.1	1
SB8	12	Lead	3.0	1
SB9	4.5	Lead	41	1
SB9	10	Lead	50	1
SB10	2	Lead	45	1
SB10	5	Lead	49	1
SB10	10	Lead	21	1
SB11	2	Lead	28	1
SB11	5.5	Lead	170	1
SB11	11.5	Lead	1.7	1
IS-1	3.5	Vanadium	15.4	1
	7	Vanadium	17.3	1
	10	Vanadium	17.3	1
IS-2	3	Vanadium	15.6	1
	8.5	Vanadium	6.7	1
B-5/MW-5	6	Vanadium	12	1
	11	Vanadium	23.4	1
B-7/MW-7	4	Vanadium	36	1
	9	Vanadium	12	1
B-9	4	Vanadium	31	1
	9	Vanadium	26	1
B-13	4	Vanadium	27	1
	9	Vanadium	15	1

Boring Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
Sump	Confirmation	Vanadium	39	1
T-2	6	Vanadium	26	1
SG-1	3.5-4.0	Vanadium	60	1
SG-2	3.0-3.5	Vanadium	50	1
SG-4	3.5-4.0	Vanadium	45	1
SG-5	4.5-5.0	Vanadium	41	1
SB1	1	Vanadium	51	1
SB6	10	Vanadium	41	1
SB8	8	Vanadium	26	1
SB9	4.5	Vanadium	36	1
SB10	2	Vanadium	34	1
SB11	5.5	Vanadium	36	1
IS-1	3.5	TPH-Diesel	46	1
	7.0	TPH-Diesel	200	1
	10.5	TPH-Diesel	10	1
IS-2	3.0	TPH-Diesel	50	1
	8.5	TPH-Diesel	10	1
B-3/MW-3	5.0	TPH-Diesel	30	1
	12.0	TPH-Diesel	20	1
B-4	4.5	TPH-Diesel	10	1
	10.0	TPH-Diesel	170	1
B-5/MW-5	6.0	TPH-Diesel	10	1
	11.0	TPH-Diesel	15	1
SS-1-E	2' Beneath UST	TPH-Diesel	12	1
SS-2-W	2' Beneath UST	TPH-Diesel	11	1
SS-3-E	2' Beneath UST	TPH-Diesel	10	1
SS-4-W	2' Beneath UST	TPH-Diesel	60	1
SS-5-E	2' Beneath UST	TPH-Diesel	35	1
SS-6-W	2' Beneath UST	TPH-Diesel	700	1
B-7/MW-7	4	TPH-Diesel	10	1
	9	TPH-Diesel	788	1
B-9	4	TPH-Diesel	10	1
	9	TPH-Diesel	5,050	1
B-13	4	TPH-Diesel	10	1
	9	TPH-Diesel	10	1
Sump	Confirmation	TPH-Diesel	10	1
T-2	6	TPH-Diesel	40	1
SG-1	3.5 - 4.0	TPH-Diesel	43	1
SG-2	3.0 - 3.5	TPH-Diesel	43	1
SG-4	3.5 - 4.0	TPH-Diesel	200	1
SG-5	4.5 - 5.0	TPH-Diesel	33	1

Boring Location	Sample Depth	Chemical	Result (mg/kg)	d_Result (mg/kg)
SB6	4	Total PCBs	0.57	1
	8	Total PCBs	0.16	1
	10	Total PCBs	4.8	1
SB11	2	Total PCBs	0.38	1
	5.5	Total PCBs	2.60	1
SG-1	3.5 - 4.0	Total PCBs	1	1
SG-2	3.0 - 3.5	Total PCBs	1	1
SG-4	3.5 - 4.0	Total PCBs	8	1
SG-5	4.5 - 5.0	Total PCBs	1	1
IS1	3.5	Total PCBs	0.4	1
	7.0	Total PCBs	0.7	1
	10.5	Total PCBs	1	1
IS2	3.0	Total PCBs	0.2	1
	8.5	Total PCBs	1	1
B-13	4	Total PCBs	3.1	1
Sump	Confirmation	Total PCBs	4.2	1

PROUCL OUTPUT

CONSTRUCTION WORKER

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	4/29/2015 11:28:16 AM
From File	ProUCL_Construction_worker.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Result (mg/kg) (arsenic)

General Statistics

Total Number of Observations	52	Number of Distinct Observations	27
Number of Detects	27	Number of Non-Detects	25
Number of Distinct Detects	24	Number of Distinct Non-Detects	3
Minimum Detect	2.3	Minimum Non-Detect	2.2
Maximum Detect	49	Maximum Non-Detect	16
Variance Detects	106.5	Percent Non-Detects	48.08%
Mean Detects	10.29	SD Detects	10.32
Median Detects	7.3	CV Detects	1.002
Skewness Detects	2.965	Kurtosis Detects	8.848
Mean of Logged Detects	2.073	SD of Logged Detects	0.649

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.584	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	7.215	Standard Error of Mean	1.183
SD	8.186	95% KM (BCA) UCL	9.199
95% KM (t) UCL	9.198	95% KM (Percentile Bootstrap) UCL	9.33
95% KM (z) UCL	9.162	95% KM Bootstrap t UCL	10.75
90% KM Chebyshev UCL	10.77	95% KM Chebyshev UCL	12.37
97.5% KM Chebyshev UCL	14.61	99% KM Chebyshev UCL	18.99

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.001	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.223	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.17	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.085	k star (bias corrected MLE)	1.878
Theta hat (MLE)	4.937	Theta star (bias corrected MLE)	5.481
nu hat (MLE)	112.6	nu star (bias corrected)	101.4
MLE Mean (bias corrected)	10.29	MLE Sd (bias corrected)	7.511

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.777	nu hat (KM)	80.79
Approximate Chi Square Value (80.79, α)	61.08	Adjusted Chi Square Value (80.79, β)	60.59
95% Gamma Approximate KM-UCL (use when n>=50)	9.544	95% Gamma Adjusted KM-UCL (use when n<50)	9.621

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6.558
Maximum	49	Median	5.5
SD	8.951	CV	1.365
k hat (MLE)	0.338	k star (bias corrected MLE)	0.331
Theta hat (MLE)	19.41	Theta star (bias corrected MLE)	19.81
nu hat (MLE)	35.13	nu star (bias corrected)	34.43
MLE Mean (bias corrected)	6.558	MLE Sd (bias corrected)	11.4
		Adjusted Level of Significance (β)	0.0454
Approximate Chi Square Value (34.43, α)	22.01	Adjusted Chi Square Value (34.43, β)	21.73
95% Gamma Approximate UCL (use when n>=50)	10.26	95% Gamma Adjusted UCL (use when n<50)	10.39

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	7.184	Mean in Log Scale	1.597
SD in Original Scale	8.347	SD in Log Scale	0.837
95% t UCL (assumes normality of ROS data)	9.123	95% Percentile Bootstrap UCL	9.127
95% BCA Bootstrap UCL	9.908	95% Bootstrap t UCL	10.61
95% H-UCL (Log ROS)	9.01		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.639	95% H-UCL (KM -Log)	8.532
KM SD (logged)	0.755	95% Critical H Value (KM-Log)	2.074
KM Standard Error of Mean (logged)	0.118		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7.601	Mean in Log Scale	1.621
SD in Original Scale	8.25	SD in Log Scale	0.958
95% t UCL (Assumes normality)	9.518	95% H-Stat UCL	10.84

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	9.198	95% KM (% Bootstrap) UCL	9.33

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mg/kg) (benzo(a)pyrene)

General Statistics

Total Number of Observations	27	Number of Distinct Observations	12
Number of Detects	4	Number of Non-Detects	23
Number of Distinct Detects	4	Number of Distinct Non-Detects	9
Minimum Detect	0.47	Minimum Non-Detect	0.03
Maximum Detect	3	Maximum Non-Detect	3
Variance Detects	1.281	Percent Non-Detects	85.19%
Mean Detects	1.335	SD Detects	1.132
Median Detects	0.935	CV Detects	0.848
Skewness Detects	1.765	Kurtosis Detects	3.358
Mean of Logged Detects	0.0519	SD of Logged Detects	0.77

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.234	Standard Error of Mean	0.135
SD	0.601	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.465	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.457	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.64	95% KM Chebyshev UCL	0.824
97.5% KM Chebyshev UCL	1.079	99% KM Chebyshev UCL	1.58

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.417	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.34	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.398	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.262	k star (bias corrected MLE)	0.732
Theta hat (MLE)	0.59	Theta star (bias corrected MLE)	1.823
nu hat (MLE)	18.1	nu star (bias corrected)	5.858
MLE Mean (bias corrected)	1.335	MLE Sd (bias corrected)	1.56

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.152	nu hat (KM)	8.187
Approximate Chi Square Value (8.19, α)	2.844	Adjusted Chi Square Value (8.19, β)	2.646
95% Gamma Approximate KM-UCL (use when n>=50)	0.674	95% Gamma Adjusted KM-UCL (use when n<50)	0.725

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.206
Maximum	3	Median	0.01
SD	0.615	CV	2.98

k hat (MLE)	0.296	k star (bias corrected MLE)	0.288
Theta hat (MLE)	0.697	Theta star (bias corrected MLE)	0.717
nu hat (MLE)	15.97	nu star (bias corrected)	15.53
MLE Mean (bias corrected)	0.206	MLE Sd (bias corrected)	0.385
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (15.53, α)	7.632	Adjusted Chi Square Value (15.53, β)	7.279
95% Gamma Approximate UCL (use when n>=50)	0.42	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.26	Mean in Log Scale	-2.556
SD in Original Scale	0.6	SD in Log Scale	1.448
95% t UCL (assumes normality of ROS data)	0.457	95% Percentile Bootstrap UCL	0.464
95% BCA Bootstrap UCL	0.591	95% Bootstrap t UCL	0.808
95% H-UCL (Log ROS)	0.543		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.933	95% H-UCL (KM -Log)	0.279
KM SD (logged)	1.328	95% Critical H Value (KM-Log)	2.977
KM Standard Error of Mean (logged)	0.307		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.401	Mean in Log Scale	-1.665
SD in Original Scale	0.632	SD in Log Scale	1.213
95% t UCL (Assumes normality)	0.609	95% H-Stat UCL	0.771

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.465	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mg/kg) (lead)

General Statistics

Total Number of Observations	87	Number of Distinct Observations	71
Number of Detects	84	Number of Non-Detects	3
Number of Distinct Detects	71	Number of Distinct Non-Detects	1
Minimum Detect	1.5	Minimum Non-Detect	12
Maximum Detect	10000	Maximum Non-Detect	12
Variance Detects	1654371	Percent Non-Detects	3.448%
Mean Detects	481.2	SD Detects	1286
Median Detects	105	CV Detects	2.673
Skewness Detects	5.58	Kurtosis Detects	37.32
Mean of Logged Detects	4.606	SD of Logged Detects	1.821

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.404	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.355	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0967	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	464.8	Standard Error of Mean	135.8
SD	1259	95% KM (BCA) UCL	727.6
95% KM (t) UCL	690.6	95% KM (Percentile Bootstrap) UCL	705.1
95% KM (z) UCL	688.2	95% KM Bootstrap t UCL	918.1
90% KM Chebyshev UCL	872.2	95% KM Chebyshev UCL	1057
97.5% KM Chebyshev UCL	1313	99% KM Chebyshev UCL	1816

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.707	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.104	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.416	k star (bias corrected MLE)	0.409
Theta hat (MLE)	1156	Theta star (bias corrected MLE)	1175
nu hat (MLE)	69.94	nu star (bias corrected)	68.78
MLE Mean (bias corrected)	481.2	MLE Sd (bias corrected)	752.1

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.136	nu hat (KM)	23.7
Approximate Chi Square Value (23.70, α)	13.62	Adjusted Chi Square Value (23.70, β)	13.49
95% Gamma Approximate KM-UCL (use when n>=50)	808.7	95% Gamma Adjusted KM-UCL (use when n<50)	816.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

```
                                Minimum    0.01                                             Mean   464.6
                                Maximum  10000                                            Median   100
                                     SD   1267                                                CV     2.726
                            k hat (MLE)    0.361                         k star (bias corrected MLE)     0.356
                        Theta hat (MLE)   1287                       Theta star (bias corrected MLE)  1304
                           nu hat (MLE)   62.82                             nu star (bias corrected)    61.99
               MLE Mean (bias corrected)  464.6                               MLE Sd (bias corrected)   778.4
                                                                      Adjusted Level of Significance (β)    0.0472
       Approximate Chi Square Value (61.99, α)   44.88                Adjusted Chi Square Value (61.99, β)    44.64
  95% Gamma Approximate UCL (use when n>=50)   641.7           95% Gamma Adjusted UCL (use when n<50)   645.2

                              Lognormal GOF Test on Detected Observations Only
                Lilliefors Test Statistic    0.0641                            Lilliefors GOF Test
           5% Lilliefors Critical Value    0.0967           Detected Data appear Lognormal at 5% Significance Level
                             Detected Data appear Lognormal at 5% Significance Level

                             Lognormal ROS Statistics Using Imputed Non-Detects
                   Mean in Original Scale   464.8                                Mean in Log Scale    4.503
                     SD in Original Scale   1267                                   SD in Log Scale    1.872
     95% t UCL (assumes normality of ROS data)   690.6                   95% Percentile Bootstrap UCL   715.6
                   95% BCA Bootstrap UCL   837.4                             95% Bootstrap t UCL   905.7
                      95% H-UCL (Log ROS)   996.5

          UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed
                       KM Mean (logged)    4.497                               95% H-UCL (KM -Log)   994.4
                         KM SD (logged)    1.873                         95% Critical H Value (KM-Log)    3.22
       KM Standard Error of Mean (logged)    0.203

                                              DL/2 Statistics
        DL/2 Normal                                                  DL/2 Log-Transformed
                   Mean in Original Scale   464.8                                Mean in Log Scale    4.509
                     SD in Original Scale   1267                                   SD in Log Scale    1.862
             95% t UCL (Assumes normality)   690.6                                   95% H-Stat UCL   977.9
                    DL/2 is not a recommended method, provided for comparisons and historical reasons

                                Nonparametric Distribution Free UCL Statistics
                          Detected Data appear Lognormal Distributed at 5% Significance Level

                                             Suggested UCL to Use
                97.5% KM (Chebyshev) UCL   1313

         Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
                               Recommendations are based upon data size, data distribution, and skewness.
          These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
      However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.
```

Result (mg/kg) (vanadium)

General Statistics

Total Number of Observations	52	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	5	Mean	239.1
Maximum	11000	Median	26.5
SD	1522	Std. Error of Mean	211
Coefficient of Variation	6.363	Skewness	7.21

Normal GOF Test

Shapiro Wilk Test Statistic	0.147	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.528	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.123	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	592.6	95% Adjusted-CLT UCL (Chen-1995)	811.6
		95% Modified-t UCL (Johnson-1978)	627.8

Gamma GOF Test

A-D Test Statistic	14.63	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.859	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.488	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.133	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.315	k star (bias corrected MLE)	0.309
Theta hat (MLE)	759.5	Theta star (bias corrected MLE)	772.6
nu hat (MLE)	32.74	nu star (bias corrected)	32.19
MLE Mean (bias corrected)	239.1	MLE Sd (bias corrected)	429.8
		Approximate Chi Square Value (0.05)	20.22
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	19.95

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	380.6	95% Adjusted Gamma UCL (use when n<50)	385.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.686	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.110E-13	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.221	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.123	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.609	Mean of logged Data	3.304
Maximum of Logged Data	9.306	SD of logged Data	1.032

```
                                  Assuming Lognormal Distribution
                         95% H-UCL     65.11                                 90% Chebyshev (MVUE) UCL     68.98
          95% Chebyshev (MVUE) UCL     79.53                               97.5% Chebyshev (MVUE) UCL     94.18
          99% Chebyshev (MVUE) UCL    123

                              Nonparametric Distribution Free UCL Statistics
                             Data do not follow a Discernible Distribution (0.05)

                                 Nonparametric Distribution Free UCLs
                        95% CLT UCL    586.2                                        95% Jackknife UCL    592.6
           95% Standard Bootstrap UCL    577.5                                    95% Bootstrap-t UCL  25514
              95% Hall's Bootstrap UCL  3979                                 95% Percentile Bootstrap UCL    661.4
                95% BCA Bootstrap UCL    874.4
          90% Chebyshev(Mean, Sd) UCL    872.1                             95% Chebyshev(Mean, Sd) UCL   1159
        97.5% Chebyshev(Mean, Sd) UCL   1557                               99% Chebyshev(Mean, Sd) UCL   2339

                                          Suggested UCL to Use
          95% Chebyshev (Mean, Sd) UCL   1159

     Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
       These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
             and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
                            For additional insight the user may want to consult a statistician.

Result (mg/kg) (total pcbs)

                                             General Statistics
          Total Number of Observations     31                              Number of Distinct Observations     27
                                                                            Number of Missing Observations      0
                               Minimum      0.013                                                      Mean      2.443
                               Maximum     14                                                        Median      1
                                    SD      3.3                                          Std. Error of Mean      0.593
              Coefficient of Variation      1.351                                                  Skewness      2.084

                                              Normal GOF Test
          Shapiro Wilk Test Statistic      0.733                              Shapiro Wilk GOF Test
        5% Shapiro Wilk Critical Value      0.929                 Data Not Normal at 5% Significance Level
             Lilliefors Test Statistic      0.231                               Lilliefors GOF Test
          5% Lilliefors Critical Value      0.159                 Data Not Normal at 5% Significance Level
                              Data Not Normal at 5% Significance Level

                                       Assuming Normal Distribution
        95% Normal UCL                                                  95% UCLs (Adjusted for Skewness)
                 95% Student's-t UCL      3.449                          95% Adjusted-CLT UCL (Chen-1995)      3.655
                                                                        95% Modified-t UCL (Johnson-1978)      3.486

                                             Gamma GOF Test
                    A-D Test Statistic      0.227                       Anderson-Darling Gamma GOF Test
                   5% A-D Critical Value      0.805        Detected data appear Gamma Distributed at 5% Significance Level
                    K-S Test Statistic      0.0764                   Kolmogrov-Smirnoff Gamma GOF Test
                   5% K-S Critical Value      0.166        Detected data appear Gamma Distributed at 5% Significance Level
                        Detected data appear Gamma Distributed at 5% Significance Level
```

Gamma Statistics

k hat (MLE)	0.557	k star (bias corrected MLE)	0.524
Theta hat (MLE)	4.389	Theta star (bias corrected MLE)	4.66
nu hat (MLE)	34.51	nu star (bias corrected)	32.51
MLE Mean (bias corrected)	2.443	MLE Sd (bias corrected)	3.374
		Approximate Chi Square Value (0.05)	20.47
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	19.94

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	3.879	95% Adjusted Gamma UCL (use when n<50)	3.983

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.159	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.343	Mean of logged Data	-0.229
Maximum of Logged Data	2.639	SD of logged Data	1.923

Assuming Lognormal Distribution

95% H-UCL	18.51	90% Chebyshev (MVUE) UCL	10.42
95% Chebyshev (MVUE) UCL	13.17	97.5% Chebyshev (MVUE) UCL	16.98
99% Chebyshev (MVUE) UCL	24.47		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.418	95% Jackknife UCL	3.449
95% Standard Bootstrap UCL	3.409	95% Bootstrap-t UCL	3.803
95% Hall's Bootstrap UCL	4.03	95% Percentile Bootstrap UCL	3.479
95% BCA Bootstrap UCL	3.656		
90% Chebyshev(Mean, Sd) UCL	4.221	95% Chebyshev(Mean, Sd) UCL	5.027
97.5% Chebyshev(Mean, Sd) UCL	6.145	99% Chebyshev(Mean, Sd) UCL	8.341

Suggested UCL to Use

95% Adjusted Gamma UCL	3.983

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Result (mg/kg) (tph-diesel)

General Statistics

Total Number of Observations	46	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	1	Mean	187.4
Maximum	5050	Median	11.5
SD	751.1	Std. Error of Mean	110.7
Coefficient of Variation	4.008	Skewness	6.314

Normal GOF Test

Shapiro Wilk Test Statistic	0.258	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.402	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	373.4	95% Adjusted-CLT UCL (Chen-1995)	479.7
		95% Modified-t UCL (Johnson-1978)	390.6

Gamma GOF Test

A-D Test Statistic	6.449	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.852	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.299	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.141	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.342	k star (bias corrected MLE)	0.334
Theta hat (MLE)	548.7	Theta star (bias corrected MLE)	561.5
nu hat (MLE)	31.42	nu star (bias corrected)	30.71
MLE Mean (bias corrected)	187.4	MLE Sd (bias corrected)	324.4
		Approximate Chi Square Value (0.05)	19.05
Adjusted Level of Significance	0.0448	Adjusted Chi Square Value	18.75

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	302.1	95% Adjusted Gamma UCL (use when n<50)	306.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.131	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0	Mean of logged Data	3.257
Maximum of Logged Data	8.527	SD of logged Data	1.652

Assuming Lognormal Distribution

95% H-UCL	218.9	90% Chebyshev (MVUE) UCL	190
95% Chebyshev (MVUE) UCL	232.9	97.5% Chebyshev (MVUE) UCL	292.4
99% Chebyshev (MVUE) UCL	409.4		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	369.6	95% Jackknife UCL	373.4
95% Standard Bootstrap UCL	366.8	95% Bootstrap-t UCL	1070
95% Hall's Bootstrap UCL	971.8	95% Percentile Bootstrap UCL	399.9
95% BCA Bootstrap UCL	535.4		
90% Chebyshev(Mean, Sd) UCL	519.6	95% Chebyshev(Mean, Sd) UCL	670.1
97.5% Chebyshev(Mean, Sd) UCL	879	99% Chebyshev(Mean, Sd) UCL	1289

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	670.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

PROUCL OUTPUT

MAINTENANCE/UTILITY WORKER

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	4/29/2015 11:36:59 AM
From File	ProUCL_Maintenance_worker.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Result (mg/kg) (arsenic)

General Statistics

Total Number of Observations	25	Number of Distinct Observations	12
Number of Detects	11	Number of Non-Detects	14
Number of Distinct Detects	10	Number of Distinct Non-Detects	2
Minimum Detect	2.3	Minimum Non-Detect	2.2
Maximum Detect	12	Maximum Non-Detect	16
Variance Detects	8.24	Percent Non-Detects	56%
Mean Detects	7.673	SD Detects	2.871
Median Detects	6.9	CV Detects	0.374
Skewness Detects	-0.235	Kurtosis Detects	-0.389
Mean of Logged Detects	1.955	SD of Logged Detects	0.464

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.544	Standard Error of Mean	0.845
SD	3.42	95% KM (BCA) UCL	6.916
95% KM (t) UCL	6.991	95% KM (Percentile Bootstrap) UCL	6.879
95% KM (z) UCL	6.935	95% KM Bootstrap t UCL	7.102
90% KM Chebyshev UCL	8.081	95% KM Chebyshev UCL	9.23
97.5% KM Chebyshev UCL	10.82	99% KM Chebyshev UCL	13.96

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.375	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.256	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	6.207	k star (bias corrected MLE)	4.575
Theta hat (MLE)	1.236	Theta star (bias corrected MLE)	1.677
nu hat (MLE)	136.6	nu star (bias corrected)	100.7
MLE Mean (bias corrected)	7.673	MLE Sd (bias corrected)	3.587

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.628	nu hat (KM)	131.4
Approximate Chi Square Value (131.42, α)	105.9	Adjusted Chi Square Value (131.42, β)	104.4
95% Gamma Approximate KM-UCL (use when n>=50)	6.878	95% Gamma Adjusted KM-UCL (use when n<50)	6.981

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.346
Maximum	12	Median	5.4
SD	3.544	CV	0.663
k hat (MLE)	1.244	k star (bias corrected MLE)	1.121
Theta hat (MLE)	4.298	Theta star (bias corrected MLE)	4.768
nu hat (MLE)	62.19	nu star (bias corrected)	56.06
MLE Mean (bias corrected)	5.346	MLE Sd (bias corrected)	5.049
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (56.06, α)	39.85	Adjusted Chi Square Value (56.06, β)	38.92
95% Gamma Approximate UCL (use when n>=50)	7.52	95% Gamma Adjusted UCL (use when n<50)	7.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.877	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.551	Mean in Log Scale	1.531
SD in Original Scale	3.26	SD in Log Scale	0.639
95% t UCL (assumes normality of ROS data)	6.667	95% Percentile Bootstrap UCL	6.621
95% BCA Bootstrap UCL	6.726	95% Bootstrap t UCL	6.891
95% H-UCL (Log ROS)	7.441		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.501	95% H-UCL (KM -Log)	7.461
KM SD (logged)	0.666	95% Critical H Value (KM-Log)	2.111
KM Standard Error of Mean (logged)	0.165		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.924	Mean in Log Scale	1.469
SD in Original Scale	3.589	SD in Log Scale	0.926
95% t UCL (Assumes normality)	7.152	95% H-Stat UCL	10.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	6.991	95% KM (Percentile Bootstrap) UCL	6.879

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mg/kg) (benzo(a)pyrene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	8
Number of Detects	3	Number of Non-Detects	10
Number of Distinct Detects	3	Number of Distinct Non-Detects	5
Minimum Detect	0.47	Minimum Non-Detect	0.03
Maximum Detect	3	Maximum Non-Detect	1.3
Variance Detects	1.833	Percent Non-Detects	76.92%
Mean Detects	1.457	SD Detects	1.354
Median Detects	0.9	CV Detects	0.929
Skewness Detects	1.538	Kurtosis Detects	N/A
Mean of Logged Detects	0.0794	SD of Logged Detects	0.941

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.368	Standard Error of Mean	0.274
SD	0.802	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.856	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.819	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.19	95% KM Chebyshev UCL	1.562
97.5% KM Chebyshev UCL	2.078	99% KM Chebyshev UCL	3.093

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.834	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.794	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	11	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.211	nu hat (KM)	5.481
		Adjusted Level of Significance (β)	0.0301
Approximate Chi Square Value (5.48, α)	1.381	Adjusted Chi Square Value (5.48, β)	1.111
95% Gamma Approximate KM-UCL (use when n>=50)	1.462	95% Gamma Adjusted KM-UCL (use when n<50)	1.817

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.383	Mean in Log Scale	-2.387
SD in Original Scale	0.826	SD in Log Scale	1.658
95% t UCL (assumes normality of ROS data)	0.791	95% Percentile Bootstrap UCL	0.807
95% BCA Bootstrap UCL	1.032	95% Bootstrap t UCL	2.275
95% H-UCL (Log ROS)	2.551		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.636	95% H-UCL (KM -Log)	1.471
KM SD (logged)	1.575	95% Critical H Value (KM-Log)	3.921
KM Standard Error of Mean (logged)	0.548		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.467	Mean in Log Scale	-1.652
SD in Original Scale	0.805	SD in Log Scale	1.371
95% t UCL (Assumes normality)	0.864	95% H-Stat UCL	1.987

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.856	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mg/kg) (lead)

General Statistics

Total Number of Observations	39	Number of Distinct Observations	35
Number of Detects	37	Number of Non-Detects	2
Number of Distinct Detects	35	Number of Distinct Non-Detects	1
Minimum Detect	1.7	Minimum Non-Detect	12
Maximum Detect	10000	Maximum Non-Detect	12
Variance Detects	3174740	Percent Non-Detects	5.128%
Mean Detects	619.9	SD Detects	1782
Median Detects	90	CV Detects	2.874
Skewness Detects	4.549	Kurtosis Detects	22.58
Mean of Logged Detects	4.504	SD of Logged Detects	1.959

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.384	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.377	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	588.4	Standard Error of Mean	278.8
SD	1717	95% KM (BCA) UCL	1114
95% KM (t) UCL	1058	95% KM (Percentile Bootstrap) UCL	1097
95% KM (z) UCL	1047	95% KM Bootstrap t UCL	2263
90% KM Chebyshev UCL	1425	95% KM Chebyshev UCL	1804
97.5% KM Chebyshev UCL	2329	99% KM Chebyshev UCL	3362

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.665	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.846	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.275	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.156	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.349	k star (bias corrected MLE)	0.339
Theta hat (MLE)	1775	Theta star (bias corrected MLE)	1829
nu hat (MLE)	25.85	nu star (bias corrected)	25.08
MLE Mean (bias corrected)	619.9	MLE Sd (bias corrected)	1065

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.117	nu hat (KM)	9.157
Approximate Chi Square Value (9.16, α)	3.422	Adjusted Chi Square Value (9.16, β)	3.284
95% Gamma Approximate KM-UCL (use when n>=50)	1574	95% Gamma Adjusted KM-UCL (use when n<50)	1640

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	588.1
Maximum	10000	Median	81
SD	1740	CV	2.958
k hat (MLE)	0.295	k star (bias corrected MLE)	0.29
Theta hat (MLE)	1991	Theta star (bias corrected MLE)	2030
nu hat (MLE)	23.04	nu star (bias corrected)	22.6
MLE Mean (bias corrected)	588.1	MLE Sd (bias corrected)	1093
		Adjusted Level of Significance (β)	0.0437
Approximate Chi Square Value (22.60, α)	12.79	Adjusted Chi Square Value (22.60, β)	12.5
95% Gamma Approximate UCL (use when n>=50)	1039	95% Gamma Adjusted UCL (use when n<50)	1064

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	588.4	Mean in Log Scale	4.346
SD in Original Scale	1740	SD in Log Scale	2.029
95% t UCL (assumes normality of ROS data)	1058	95% Percentile Bootstrap UCL	1099
95% BCA Bootstrap UCL	1300	95% Bootstrap t UCL	2237
95% H-UCL (Log ROS)	2116		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.341	95% H-UCL (KM -Log)	1995
KM SD (logged)	2.012	95% Critical H Value (KM-Log)	3.778
KM Standard Error of Mean (logged)	0.328		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	588.5	Mean in Log Scale	4.365
SD in Original Scale	1740	SD in Log Scale	2.001
95% t UCL (Assumes normality)	1058	95% H-Stat UCL	1973

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL	3362

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mg/kg) (vanadium)

General Statistics

Total Number of Observations	25	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	6.7	Mean	29.59
Maximum	60	Median	27
SD	13.95	Std. Error of Mean	2.79
Coefficient of Variation	0.471	Skewness	0.319

Normal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	34.36	95% Adjusted-CLT UCL (Chen-1995)	34.37
		95% Modified-t UCL (Johnson-1978)	34.39

Gamma GOF Test

A-D Test Statistic	0.347	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.117	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.175	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.125	k star (bias corrected MLE)	3.657
Theta hat (MLE)	7.172	Theta star (bias corrected MLE)	8.091
nu hat (MLE)	206.3	nu star (bias corrected)	182.8
MLE Mean (bias corrected)	29.59	MLE Sd (bias corrected)	15.47
		Approximate Chi Square Value (0.05)	152.6
Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	150.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	35.46	95% Adjusted Gamma UCL (use when n<50)	35.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.902	Mean of logged Data	3.261
Maximum of Logged Data	4.094	SD of logged Data	0.544

Assuming Lognormal Distribution

95% H-UCL	37.74	90% Chebyshev (MVUE) UCL	40.31
95% Chebyshev (MVUE) UCL	44.96	97.5% Chebyshev (MVUE) UCL	51.42
99% Chebyshev (MVUE) UCL	64.11		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	34.18	95% Jackknife UCL	34.36
95% Standard Bootstrap UCL	33.97	95% Bootstrap-t UCL	34.55
95% Hall's Bootstrap UCL	34.45	95% Percentile Bootstrap UCL	34.36
95% BCA Bootstrap UCL	34.08		
90% Chebyshev(Mean, Sd) UCL	37.96	95% Chebyshev(Mean, Sd) UCL	41.75
97.5% Chebyshev(Mean, Sd) UCL	47.01	99% Chebyshev(Mean, Sd) UCL	57.34

Suggested UCL to Use

95% Student's-t UCL	34.36

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Result (mg/kg) (total pcbs)

General Statistics

Total Number of Observations	16	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	0.16	Mean	1.788
Maximum	8	Median	0.635
SD	2.219	Std. Error of Mean	0.555
Coefficient of Variation	1.241	Skewness	1.811

Normal GOF Test

Shapiro Wilk Test Statistic	0.732	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.222	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.76	95% Adjusted-CLT UCL (Chen-1995)	2.969
		95% Modified-t UCL (Johnson-1978)	2.802

Gamma GOF Test

A-D Test Statistic	0.885	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.24	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.222	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.895	k star (bias corrected MLE)	0.769
Theta hat (MLE)	1.997	Theta star (bias corrected MLE)	2.325
nu hat (MLE)	28.65	nu star (bias corrected)	24.61
MLE Mean (bias corrected)	1.788	MLE Sd (bias corrected)	2.039
		Approximate Chi Square Value (0.05)	14.32
Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	13.43

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.074	95% Adjusted Gamma UCL (use when n<50)	3.278

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.222	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.833	Mean of logged Data	-0.0721
Maximum of Logged Data	2.079	SD of logged Data	1.171

Assuming Lognormal Distribution

95% H-UCL	4.54	90% Chebyshev (MVUE) UCL	3.433
95% Chebyshev (MVUE) UCL	4.205	97.5% Chebyshev (MVUE) UCL	5.275
99% Chebyshev (MVUE) UCL	7.378		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.7	95% Jackknife UCL	2.76
95% Standard Bootstrap UCL	2.679	95% Bootstrap-t UCL	3.368
95% Hall's Bootstrap UCL	2.981	95% Percentile Bootstrap UCL	2.757
95% BCA Bootstrap UCL	3.058		
90% Chebyshev(Mean, Sd) UCL	3.452	95% Chebyshev(Mean, Sd) UCL	4.206
97.5% Chebyshev(Mean, Sd) UCL	5.252	99% Chebyshev(Mean, Sd) UCL	7.307

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	4.206

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Result (mg/kg) (tph-diesel)

General Statistics

Total Number of Observations	29	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	10	Mean	263.7
Maximum	5050	Median	30
SD	939.7	Std. Error of Mean	174.5
Coefficient of Variation	3.564	Skewness	5.064

Normal GOF Test

Shapiro Wilk Test Statistic	0.293	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.165	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	560.5	95% Adjusted-CLT UCL (Chen-1995)	726
		95% Modified-t UCL (Johnson-1978)	587.9

Gamma GOF Test

A-D Test Statistic	4.331	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.847	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.335	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.176	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.343	k star (bias corrected MLE)	0.33
Theta hat (MLE)	769	Theta star (bias corrected MLE)	798.1
nu hat (MLE)	19.88	nu star (bias corrected)	19.16
MLE Mean (bias corrected)	263.7	MLE Sd (bias corrected)	458.7
		Approximate Chi Square Value (0.05)	10.23
Adjusted Level of Significance	0.0407	Adjusted Chi Square Value	9.845

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	493.6	95% Adjusted Gamma UCL (use when n<50)	513.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.802	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.926	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.208	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.165	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.303	Mean of logged Data	3.607
Maximum of Logged Data	8.527	SD of logged Data	1.6

Assuming Lognormal Distribution

95% H-UCL	359.3	90% Chebyshev (MVUE) UCL	258.9
95% Chebyshev (MVUE) UCL	321.4	97.5% Chebyshev (MVUE) UCL	408
99% Chebyshev (MVUE) UCL	578.2		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	550.7	95% Jackknife UCL	560.5
95% Standard Bootstrap UCL	550.6	95% Bootstrap-t UCL	1789
95% Hall's Bootstrap UCL	1619	95% Percentile Bootstrap UCL	598
95% BCA Bootstrap UCL	806.2		
90% Chebyshev(Mean, Sd) UCL	787.1	95% Chebyshev(Mean, Sd) UCL	1024
97.5% Chebyshev(Mean, Sd) UCL	1353	99% Chebyshev(Mean, Sd) UCL	2000

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	1024

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

APPENDIX D

SITE SPECIFIC HEALTH AND SAFETY PLAN

PES Environmental, Inc.
Engineering & Environmental Services

Prepared for:

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HEALTH AND SAFETY PLAN
6701 – 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

MAY 19, 2015

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THE AMERICAN BOARD OF INDUSTRIAL HYGIENE
CERTIFICATION NUMBER
8978 CP
EXPIRES
12-1-2015
JEREMY L. MOTT, CIH

1448.001.01.004

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1.0 INTRODUCTION

1.1 Introduction

This site-specific earthwork Health and Safety Plan (HASP) has been prepared by PES Environmental, Inc. (PES) and Sterling & Associates (Sterling) for the use of contractors performing earthwork and/or underground utility installation activities associated with redevelopment and construction activities at the property located at 6701-6707 Shellmound Street (previously known as Bay Street) in Emeryville, California (the site or subject property).

This HASP has been developed to provide: (1) health and safety guidelines for those who may potentially encounter subsurface chemical residuals during site grading excavation for construction of subgrade portions of the building, and in areas where earthwork will be performed outside of the building footprints (e.g., underground utility work, monitoring well decommissioning, etc.); (2) provide protection to the public and surrounding community during construction; and (3) contingency procedures to be implemented by contractors to protect worker health and safety should hazardous materials be encountered.

1.2 Background Information

The site is located in a former industrial area of Emeryville, which has been undergoing redevelopment for residential and commercial purposes since the mid-1980s. The land was historically tidal mud flats, and was reclaimed from the bay with imported soils sometime between the late 1930s and early 1950s. Currently, the subject property consists of two commercial buildings (a two-story office building and a warehouse building), surface-level parking, and landscaped areas on approximately 2.27 acres. Construction activities associated with the site redevelopment will include: removal of existing building foundations/slabs, surface parking, curbs, sidewalks, trees, planting areas, and pole lights; decommissioning of existing groundwater monitoring wells and soil vapor probes; grading; excavation and installation of building foundations; trench excavation and underground utility installation; and installation of new curbs, sidewalks, landscape/planting areas, trees, and new pole lights.

Previous environmental investigations of soil and groundwater at the site indicate the presence of petroleum hydrocarbons (diesel, gasoline, oils) and related volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes (BTEX). Relatively low levels of semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs) have also been detected in soil and groundwater at the site. In addition, the shallow soils and fill at the site are affected by metals (including lead) typical of the greater Emeryville bay-front area.

2.0 HEALTH AND SAFETY PLAN

In addition to the procedures and requirements described in this HASP, all on-site personnel shall follow applicable procedures and requirements specified by applicable Federal, State, and local authorities. As specified in Title 29 CFR 1910.120, this HASP has been prepared to address the basic requirements of the overall safety and health program, with attention to those characteristics of site-specific activities. Any modifications made to this HASP because of encountered field conditions must be approved by the site-safety officer (SSO) and/or project manager (PM).

A copy of this HASP will be available at the site during all construction activities where the environmental conditions described herein might be encountered. At this time, it is expected these activities consist of: grading, soil excavation (for the building foundation and utilities), subsurface drilling, soil handling, and possible soil/groundwater characterization, handling and disposal.

This plan addresses the hazardous constituents identified at the site in accordance with the hazardous material regulations found in California Occupational Health and Safety Administration (Cal/OSHA) Construction Safety Orders within Title 8 of the California Code of Regulations (CCR *General Industry Safety Orders* §*5192*). Additional work tasks and/or activities performed at other locations of the site may involve compliance with other hazardous materials/safety regulations and thus, this plan may not include appropriate information or protective measures for those activities.

This plan is not intended to meet or satisfy applicable regulatory standards associated with construction safety (i.e., trenching/shoring, electrical safety, welding/cutting, etc.). According to the Cal/OSHA Consultation Group, the construction activities to be conducted at the site are not applicable to those requirements outlined in the HAZWOPER standard.

This plan is not intended to cover demolition of existing site buildings and related hazards potentially associated with the demolition materials.

Compliance with this plan is required of all personnel, contractors, subcontractors, etc. associated with the earthwork activities mentioned above. Other construction activities not currently expected nor specifically identified herein, but where contact with potential chemical of concern (COC)-affected soil and/or groundwater may occur, shall also comply with this plan.

2.1 Purpose

The primary purpose of this plan is to provide appropriate personnel with an understanding of the potential chemical and general physical hazards that exist or may arise while the applicable tasks of this project are being performed. Additionally, the information contained herein will define the safety precautions necessary to respond to such hazards should they occur.

2.2 Objective

The primary objective is to ensure the well being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this plan and sign the Agreement and Acknowledgment Statement (Appendix A) to certify that they have read, understood, and agreed to abide by its provisions.

2.3 Amendments

Any changes in the scope of this project and/or site conditions must be amended in writing on the plan Amendment Sheet (Appendix B) and approved by the Health and Safety Representative or applicable individual.

2.4 Medical Monitoring Program

All construction personnel engaged in subsurface work for this project will be required to be medically qualified, trained in the use of respiratory protection, and fit-tested (within the last year) prior to donning a respirator should respiratory protection become necessary. If site conditions vary drastically from those anticipated in the plan, other medical surveillance procedures may become necessary, as appropriate or required.

2.5 Safety Training

The environmental conditions of the property shall be disclosed to all construction workers and subcontractors who will be engaged in earthwork activities including soil excavation, dewatering (if any), and other subsurface activities where contact with potentially contaminated soil and/or groundwater is possible. It is the individual contractor's/subcontractor's responsibility to provide additional site-specific construction safety training. For construction activities, additional safety meetings must be held at least once every 10 working days and may include a discussion of site work plans, personal protective equipment, site rules, site hazards, trenching/shoring, and the requirements of this HASP. Meetings should be held more frequently as site conditions and work activities change.

The contractor should also be aware that the possibility exists that hazardous materials and/or conditions may differ from those expected and described herein. These conditions could necessitate compliance with additional regulatory requirements and should be brought to the attention of the SSO or Health and Safety Consultant (HSC) immediately.

3.0 PROJECT PERSONNEL

3.1 Background Information

All contractors and subcontractors will act in accordance with applicable Federal, State, regional, and local regulations during all phases of the project. The following management structure will be instituted for the purpose of successfully and safely completing this project.

3.2 Contact Summary

The primary contact for this project will be Ms. Rachel Green of Anton Emeryville, LLC (property owner). Contact information for Ms. Green and other parties involved in the project are provided below:

Project Responsibility	Company Name	Name	Phone #
Owner/ Developer	Anton Emeryville, LLC	Rachel Green	Off: (916) 400-2080
Construction Project Manager	TBD	TBD	Off: _________ Cell: _________
Environmental Project Manager	PES Environmental	Kyle Flory	Off: (415) 899-1600 Cell: (415) 497-2729
Health and Safety Consultant	TBD	TBD	Off: ________ Cell: ________

3.3 Construction Project Manager

The Construction Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project. Specific duties of the Construction Project Manager with regard to health and safety issues will include:

- Coordinating the activities of employees and subcontractors, including their acknowledgement of this plan, and ensuring that all employees and subcontractors have signed the plan Acknowledgment Statement (see Appendix A);

- Selecting field personnel for the work that is to be undertaken on-site;

- Ensuring that the tasks assigned are being completed as planned and are kept on schedule;

- Providing authority and resources to ensure that the Health & Safety representative is able to implement and manage safety procedures; and

- Ensuring that all persons allowed to enter the site (i.e., employees, subcontractors, client, client representatives, regulators, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on-site, and are knowledgeable as to the location of the on-site copy of this HASP.

In addition, the Construction Project Manager, or its designee, has responsibilities for the overall coordination and oversight of the plan. Specific duties will include:

- Being aware of all of the provisions of this plan and instructing personnel about the safety practices and emergency procedures defined in the plan;

- Monitoring site safety, and designating a Field Team Leader to assist with the responsibility when necessary;
- Providing the various types of personal protective equipment (PPE) to be used on-site for specific tasks and monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task;
- Ensuring compliance with Cal/OSHA Construction Safety Orders in Title 8 CCR;
- Approving all field personnel conducting earthwork activities, taking into consideration their level of safety training, their physical capacity, and their eligibility to wear the protective equipment necessary for their assigned tasks;
- Stopping work or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;
- Stopping work on the site or changing work assignments or procedures if unidentified hazards are encountered and reporting those hazards immediately to the Environmental Project Manager and/or Site Health & Safety Representative/Consultant;
- Dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public;
- Reporting any signs of fatigue, work-related stress, or chemical exposures immediately or as soon as possible;
- Reporting any accidents or violations of the plan immediately or as soon as possible;
- Knowing emergency procedures, evacuation routes and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;
- Ensuring that all project-related earthwork personnel have signed the personnel agreement and acknowledgment form contained in this plan; and
- Ensuring that air monitoring will be conducted in accordance with Section 7.0 of this plan.

3.4 Environmental Project Manager

The Environmental Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project. Specific duties of the Environmental Project Manager with regard to health and safety issues will include:

- Coordinating the activities of employees and subcontractors, including their acknowledgement of this plan, and ensuring that all employees and subcontractors have signed the plan Acknowledgment Statement (see Appendix A);

- Selecting field personnel for the work that is to be undertaken on-site;

- Ensuring that the tasks assigned are being completed as planned and are kept on schedule;

- Performing air monitoring in accordance with Section 7.0 of this plan, as appropriate;

- Providing authority and resources to ensure that the Health & Safety representative is able to implement and manage safety procedures; and

- Ensuring that all persons allowed to enter the site (i.e., employees, subcontractors, client, client representatives, regulators, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on-site, and are knowledgeable as to the location of the on-site copy of this plans.

3.5 Site Health & Safety Representative/Consultant – To Be Determined

The Health & Safety Representative will also be involved in the coordination and implementation of this plan. The duties described below may be conducted by representatives of the Health & Safety Consultant, PES, the Construction General Manager, or a designee. Examples of specific duties may include:

- Development of the Health and Safety and Contingency Plans;

- Being aware of the provisions of this plan and instructing personnel about the safety practices and emergency procedures defined in the plan and monitoring site safety;

- Advising on the selection of the types of PPE to be used on-site for specific tasks and monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task;

- Coordinating upgrading or downgrading PPE, as necessary, due to changes in exposure levels, monitoring results, weather, and other site conditions;

- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;

- Stopping work on the site or changing work assignments or procedures if unidentified hazards are encountered and reporting those hazards immediately to the Construction Project Manager and/or Environmental Project Manager;

- Reporting any signs of fatigue, work-related stress, or chemical exposures to the Construction Project Manager immediately or as soon as possible;
- Reporting any field personnel if their actions or negligence endangers themselves, co-workers, or the public, and reporting the same to the Construction Project Manager immediately or as soon as possible;
- Reporting any accidents or violations of the plan to the Construction Project Manager immediately or as soon as possible;
- Knowing emergency procedures, evacuation routes and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;
- Performing air monitoring in accordance with Section 7.0 of this plan, as appropriate; and
- If necessary, recommending a suitable medical monitoring program for the site workers.

3.6 Other Field Personnel

All field personnel shall be responsible for acting in compliance with all safety procedures outlined in this plan. Any hazardous work situations or procedures should be reported to the Construction Project Manager and the designated Site Safety Representative or SSO so that corrective steps can be taken. The Site Safety Representative and/or Construction Project Manager have the authority to halt any operation that does not follow the provisions of this plan.

4.0 SITE CHARACTERIZATION & ANALYSIS

4.1 Site Description

Owner/Developer: Anton Emeryville, LLC (Anton)

Location of site: 6701 – 6707 Shellmound Street, Emeryville, California

Topography of area surrounding the site:

Hilly ____________ Flat **X** Hummocky ______
Marshy ____________ Mountainous __ Other ________

Area affected:

Urban ________________ Rural ________ Residential ___X___
Industrial ______________ Commercial _X_ Other __________

Types of bodies of water bordering the site, if any:

Stream ________ River _________ Pond ________ Lake ___________
Bay __X – (~ ¼ mile west of site)____ Ocean _______ Other __________

Properties bordering the site:

North: Ashby Avenue off-ramp from Interstate Highway 80
South: Commercial Building
East: Shellmound Street, and Railroad right-of-way
West: Ashby Avenue off-ramp from Interstate Highway 80

4.2 Project Tasks

Based on the description of site work contained in a Site Management and Contingency Plan (SMP) prepared for the site and discussions between Anton and PES, construction tasks that may encounter subgrade soil and potential hazardous materials are presented in the following sections.

It should be noted that elevated levels of methane gas have been observed in other, similar properties in the greater Emeryville area and the potential for flammable atmospheres must be evaluated prior to the use of potential ignition sources such as concrete saw-cutting, pile driving, welding, etc. Appropriate safety precautions should be made during these activities, including monitoring for potential methane release and prevention of ignition sources. Additional information regarding methane is provided in Sections 4.3 and 7.0.

4.2.1 Foundation Installation

The preliminary foundation design for the new building consists of drilled displacement piers and associated pier caps. Auger pressure-grouted displacement (APGD) piers will be installed with a specialized auger that laterally displaces soil by means of mechanical compaction as the auger is advanced and withdrawn from the borehole. Little to no cuttings are generated during installation. Soil surrounding the piers will be excavated to approximately 3 to 4 feet bgs so that pier caps and other structural foundation elements (e.g., grade beams) can be constructed. As such, there is a potential for dermal contact with soil. Based on the depth to groundwater at the site (approximately 8 to 12 feet bgs) and construction plans, it is not expected that dewatering activities will be necessary in excavations for foundations. In the event that dewatering becomes necessary (e.g., localized deep excavations for elevator pits or deeper subsurface utilities), dermal contact with COC-affected groundwater is possible. Proper precautions and personal protective equipment (Sections 4.6 and 4.7) should be utilized during foundation construction and excavation to reduce the potential for contact with affected materials.

4.2.2 Drilling and Monitoring Well Decommissioning

Five existing monitoring wells and five existing soil vapor probes will be decommissioned by over-drilling using a hollow-stem auger drill rig or equivalent and each borehole will be tremie-grouted from the bottom of the borehole to the ground surface. This will require drilling to depths of up to approximately 30 feet bgs. During over-drilling and decommissioning of the wells and probes, there is the potential for contractors to have dermal contact with subsurface soil and groundwater in drill cuttings. Proper precautions and personal protective equipment (Sections 4.6 and 4.7) should be utilized during drilling and well construction to reduce the potential for contact with affected materials.

4.2.3 Grading, Excavation and Soil Handling Activities

Of primary concern will be dermal contact with soils at the hands and feet in addition to whole body contact to sidewalls when/if personnel enter an excavation or trench. Grading and excavation (including utility trenches for electrical conduit and/or plumbing runs) may involve contact with soil potentially containing chemical residuals. As such, the potential for volatilization of hazardous vapors from excavations and stockpile soil exists. Additionally, exposure to volatile and non-volatile hazardous materials in soil may be present during all soil handling (e.g., excavation, loading, and stockpiling) activities. The potential for exposure to volatile vapors will be evaluated using direct-reading air monitoring equipment (refer to Section 7.0). Appropriate measures will be implemented for potential nuisance dust conditions, emissions, and monitoring (refer to Sections 6.1 and 7.0).

The contractor will also need to make provisions to appropriately stockpile excavated materials (refer to Section 11.1). In addition, while dewatering is not anticipated to be necessary, the contractor must make provisions for the collection and management of groundwater and/or rainwater during this phase of the project (Section 11.2).

4.3 Hazardous Chemicals

Potential effects of any exposure are dependent on several factors such as: toxicity of substance, time frame of exposure, concentration of substance producing the exposure, general health of person exposed, and individual use of hazard reduction methods. Based on previous soil sampling results, the primary classification of contaminants include: petroleum hydrocarbons such as diesel, gasoline, BTEX, and oil and other chemicals typically observed in the surrounding Emeryville Brownfield area such as heavy metals (including arsenic, lead, cadmium, and zinc) and methane. Other chemicals detected at the site include VOCs, SVOCs and PCBs. Additionally, asbestos has been identified in association with roofing materials and other debris buried at nearby properties.

For construction and trench worker direct contact criteria, concentrations exceed the risk-based, direct exposure Environmental Screening Levels (ESLs) for total petroleum hydrocarbons (TPH), arsenic, lead, vanadium, benzo (a) pyrene, and PCBs. The potential for direct exposures to soil for construction and trench workers will be addressed by implementing procedures and controls included in this HASP and associated SMP. This plan concentrates on hazards and measures necessary to prevent unnecessary exposure to these potential contaminants, as summarized in Table 1.

Table 1. Hazardous Chemicals Detected On-Site

Chemical Name	**Gasoline**	**Diesel/Kerosene**	**Benzene**	**Ethyl Benzene**	**Toluene**	**Xylenes**
Physical Description	Highly flammable, mobile liquid with a characteristic odor.	Combustible, brown, slightly viscous liquid with a characteristic odor.	A clear, volatile colorless, highly flammable liquid with a sweet aromatic odor.	A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.	A clear, colorless liquid with a characteristic aromatic odor.	A clear liquid with an aromatic hydrocarbon odor.
Chemical/Physical Properties						
flash point	-45ºF	100ºF (varies)	12ºF	64ºF	40ºF	81-90ºF
vapor density	3-4	not available	2.7	3.7	3.1	3.7
Relative dens.	0.72-0.76	0.87	0.88	0.86	0.87	0.86
LEL-UEL	1.4-7.6%	0.6-7.5%	1.3-7.1%	1-6.7%	1.3-7.1%	1-7%
vapor pressure	not available	not available	100mm Hg @ 79ºF	7.1 torr @ 68ºF	22mm Hg @ 68ºF	7-9 torr @ 68ºF
Toxicological Effects	Gasoline is a complex mixture of hydrocarbons and additives. Chronic exposures or exposures to a high concentration of gasoline vapor may cause unconsciousness, coma, and possibly death from respiratory failure. Exposure to low concentrations of gasoline vapor may produce flushing of the face, slurred speech, and mental confusion.	Diesel is available in a variety of differing grades. Its toxicity is thought to be similar to that of kerosene, although somewhat more toxic because of the addition of additives. Diesel is an eye, skin, and respiratory irritant, and is a Central Nervous System (CNS) depressant. It is not as acutely hazardous as many other petroleum products such as gasoline.	Chronic exposure to benzene vapor can produce neurotoxic blood system effects. Other effects can include headache, dizziness, nausea, convulsions, coma, & possible death if exposure isn't reversed. The most significant chronic effect is bone marrow toxicity. It is believed that there might be a strong association between chronic exposures to benzene & the development of leukemia.	Ethyl benzene is an eye, mucous membrane, respiratory tract, and skin irritant. High air levels can cause central nervous system depression, sense of chest constriction, headache, and dizziness. Skin contact may cause irritation, inflammation and first or second degree burns.	Inhalation of toluene vapors can produce effects such as central nervous system depression. Signs and symptoms can include headache, dizziness, fatigue, muscular weakness, lack of coordination, drowsiness, collapse, and possible coma. Toluene can be a skin and mucous membrane irritant and has been shown to cause liver and kidney damage when over-exposure is significant.	Inhalation of xylene vapor may produce central nervous system excitation followed by depression. Exposure to xylene vapor can produce dizziness, staggering, drowsiness, and unconsciousness. At very high concentrations, xylene vapor may produce lung irritation, nausea, vomiting, & abdominal pain. Xylene is not known to possess the chronic bone marrow toxicity of benzene, but liver enlargement and nerve cell damage have been noted from chronic overexposure.
Exposure Limits						
Cal/OSHA (PEL)	300 ppm	not established	1 ppm	100 ppm	50 ppm (skin)	100 ppm
ACGIH (TLV)	300 ppm	not established	10 ppm	100 ppm	50 ppm (skin)	100 ppm
NIOSH (REL)	not established	Kerosene - 100 mg/m^3	0.1 ppm	100 ppm	100 ppm	100 ppm

Table 1. Hazardous Chemicals Detected On-Site

Chemical Name	**Arsenic**	**Cadmium**	**Lead**	**Vanadium**
Physical Description	A brittle, crystalline, silvery to black metal. Arsenic has no odor	A soft, blue white, malleable, lustrous metal that can be easily cut with a knife	Bluish-white, silvery, gray, very soft metal.	Yellow-orange powder or dark gray, odorless flakes dispersed in air.
Chemical/Physical Properties				
flash point	none	none	none	none
vapor density	none	none	none	none
Relative dens.	5.7	8.6	11.34	3.4
LEL-UEL	none	none	none	none
vapor pressure	1 mm Hg @ 702ºF	0.095 Torr @ 610ºF	1.77mm Hg @ 1832 ºF	0.1 mmHg @ 3470°F
Toxicological Effects	Ingestion of arsenic can cause severe gastrointestinal damage, including vomiting, diarrhea, and shock. Inhalation of arsenic can cause damage to mucous membranes and skin, and is a severe nose, eye, and respiratory irritant. Cough, breathing difficulty, chest pain, and severe damage to the respiratory system can occur from acute inhalation exposures. Severe respiratory effects can occur from chronic inhalation exposure.	Cadmium has no known biological function. Cadmium oxide is formed whenever cadmium is burned or heated, producing fumes which can cause a "metal fume fever" similar to that of zinc oxide. Cadmium is relatively efficiently The inhalation of cadmium may have the following symptoms: tracheobronchitis, and pulmonary edema The kidney cortex is the critical organ for long-term cadmium exposure.	Lead is normally absorbed through inhalation. Inorganic lead is not commonly absorbed through skin contact. Symptoms of lead intoxication are commonly gastro-intestinal disorders. However, the early symptoms of lead poisoning are non-specific and, except by laboratory testing, are difficult to distinguish from the symptoms of minor seasonal illness. These include: aching muscles and joints, headache, constipation, & abdominal pain. These symptoms are reversible and complete recovery is probable.	Vanadium compounds are poorly absorbed through the gastrointestinal system. Inhalation exposures to vanadium and vanadium compounds result primarily in adverse effects on the respiratory system. Quantitative data are, however, insufficient to derive a subchronic or chronic inhalation reference dose. Other effects have been reported after oral or inhalation exposures on blood parameters, on liver, on neurological development in rats, and other organs.
Exposure Limits				
Cal/OSHA (PEL)	0.01 mg/m^3	0.005 mg/m^3	0.05 mg/m^3	0.05 mg/m^3
ACGIH (TLV)	0.01 mg/m^3	0.01 mg/m^3	0.05 mg/m^3	0.05 mg/m^3
NIOSH (REL)	C - 0.002 mg/m^3	Ca-as low as feasible	<0.1 mg/m^3	C – 0.05 mg/m^3

Table 1. Hazardous Chemicals Detected On-Site

Chemical Name	**Methane**	**Asbestos**	**PCBs**	**Benzo(a)pyrene**
Physical Description	A colorless, odorless, tasteless, extremely flammable gas.	Fibrous substance, found as composite in building materials	Colorless to pale yellow, viscous liquid or solid with a mild hydrocarbon odor.	Black or dark-colored amorphous residue or yellow to yellow-brown powder. Aromatic odor.
Chemical/Physical Properties				
flash point	-213 °F	none	none	not available
vapor density	0.54	none	none	not available
Relative dens.	NA	2.45	not available	not available
LEL-UEL	5-15%	none	none	not available
vapor pressure	NA	not applicable	not available	not available
Toxicological Effects	Methane is a simple asphyxiant and does not cause physiological responses, but it can displace oxygen.	Intact asbestos containing materials (ACM) are not hazardous unless the material is disturbed or deteriorates, causing loose fibers to become airborne and respirable. Inhalation of asbestos fibers may increase the risk of developing lung cancer or mesothelioma. Inhalation of ACMs may also cause asbestosis, a scarring of the lungs. Concurrent exposure to asbestos and cigarette smoke may greatly increase the risk of lung cancer because the two substances act synergistic.	PCBs (Polychlorinated Biphenyls) are a mixture of chemicals that are clear to yellow oily liquids or solids, used in hydraulic systems and closed electrical systems, capacitors, transformers, insulating fluids, or sealants. PCBs are probable cancer causing agents and teratogens PCBs are readily absorbed through the skin, eyes, and mucous membranes. Exposure to the vapor can irritate the eyes, nose, and throat; high exposures can damage the liver and chloracne, severe acne-like rash.	Often associated with coal tar, coal tar pitch, and creosote. Exposure by inhalation, skin and/or eye contact may cause dermatitis and bronchitis and damage to skin, bladder, kidneys and respiratory system. May cause cancer. May cause heritable genetic damage and impair fertility. May cause harm to the unborn child. Very toxic to aquatic organisms, May cause long-term adverse effects in the aquatic environment.
Exposure Limits				
Cal/OSHA (PEL)	none established	0.1 f/cc (OSHA TWA) 1 f/cc (OSHA Excursion Limit)	0.5mg/M3 (as 1254)	0.2 mg/m^3
ACGIH (TLV)	none established		0.5mg/M3 (as 1254)	0.2 mg/m^3
NIOSH (REL)	none established		Ca-0.001 mg/m^3	Ca-0.1 mg/m^3

4.4 Hazard Determination

Serious______ Moderate______ Low___X___ Unknown______

- Non-chemical hazards:

confined space____________	drill rig_____X________	traffic_____X_______
underground utilities____X____	overhead lines_______	backhoe_____X______
poisonous animals_________	dangerous animals______	ticks______________
high crime area___________	slip/fall hazards____X___	welding____X_______
heat/cold stress_______X____	excavation >5 ft_______	trench >4 ft___X____
leaking containers_________	electrical______X______	hot surface_________
low light conditions________	lifting hazard **X-possible**	noise________X_____
heavy construction equipment_____X_______	poisonous insects____________	

other____

____

If confined space entry was checked above, of what type is the confined space?

shed__________ subsurface vault_______ manhole_____ basement_______

trench______ excavated pit_____________ other_________________________

- Chemicals utilized to perform on-site tasks (include chemicals used to maintain equipment):

____gasoline, diesel, lubricating oils and greases (expected)______________________

____

As indicated above, the potential hazards to personnel working at the site have been principally identified as: chemical exposures and physical hazards. Physical hazards include those associated with working in the vicinity of: (1) excavators; (2) other heavy equipment (such as trucks); and (3) open excavations of varying sizes. **Entry into excavations defined as a confined space under OSHA guidelines is not permitted under this HASP.** According to

OSHA, *"Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines. OSHA uses the term "permit-required confined space" (permit space) to describe a confined space that has one or more of the following characteristics: contains or has the potential to contain a hazardous atmosphere; contains a material that has the potential to engulf an entrant; has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress."*

All excavations and trenches shall be constructed such that they do not qualify under OSHA guidelines as confined spaces. **If entry into a confined space is required for any reason and at any time during the course of the remediation activities, work will be discontinued at that location, the PM and SSO will be contacted, and a confined space entry plan/permit will be prepared.**

4.5 Other Hazards/Procedures for Reducing Hazards

The potential for unknown hazards cannot be eliminated. Hazards can exist for all exposure routes such as inhalation, dermal contact, ingestion, and eye contact.

The following are potential site hazards and the corresponding procedures for hazard reduction:

POTENTIAL HAZARDS	PROCEDURES FOR HAZARD REDUCTION
1. **Ingestion of hazardous materials** can occur by accidental swallowing of contaminated soils, liquids and/or transfer of the contaminated particles onto ingestible substances (such as food).	**1.** Eating, smoking, drinking and application of cosmetics is prohibited on-site. This minimizes the possibility of exposure to hazardous materials potentially encountered on-site via ingestion.
2. Physical hazards in general such as:	
a) **Slippery surfaces.**	**a)** Use of approved skid-proof boots shall be required.
b) **Noise.**	**b)** Approved ear plugs/muffs shall be made available for noisy work operations such as pounding.
c) **Contaminated surfaces.**	**c)** Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling or placing equipment in puddles, mud, or discolored surfaces.

POTENTIAL HAZARDS	PROCEDURES FOR HAZARD REDUCTION
d) Exposure.	**d)** ***Heat stress:*** Provide plenty of liquids to replace loss of body fluids. Appropriate liquids should consist of juices, juice products, and water. Establish a work schedule that will provide sufficient rest periods for cooling down. As the temperature increases, more frequent and longer rest periods are required. Refer to Sections 10.7 and 10.9 for detailed procedures. ***Cold Stress:*** Establish a work schedule that will provide sufficient rest periods for warming-up. As the temperature drops, more frequent and longer rest periods are required. Provide adequate thermal protective clothing. Refer to Section 10.8 for detailed procedures.
e) Head/eye protection	**e) ANSI** approved hard hats and safety glasses and will be worn at all times while on-site, and/or when head or eye hazards are present.
f) Other hazards.	**f)** Avoid standing near the edge of excavations. -Look for falling objects, slipping and tripping hazards (i.e. plastic sheeting used to hold excavated soil can be slippery). -Secure the site with fences and post warning signs to prevent the exposure of unauthorized, unprotected people to site hazards. -Do not park or leave equipment near the edge of an excavation.

4.6 Required Personal Protective Equipment

Modified Level D is the minimum acceptable level for this site. Modified Level D provides minimal dermal protection. Respiratory protection is optional unless air-monitoring data indicates otherwise. Consult the Site Action Level chart located in Section 4.8 of this plan.

Modified Level D includes:

- Normal work uniform;
- Tyvek suit (if working within an electrical/plumbing trench or interceptor/vault excavation, or if handling/working with potentially contaminated soils and/or groundwater is necessary);
- Nitrile gloves (when handling potentially contaminated soil/water);
- Boots/shoes with steel shank and approved toe protection. Chemical resistant (PVC or neoprene) boots or overboots are necessary when working in exposed soils (i.e., within trench or interceptor excavation) or when handling potentially contaminated soil; and
- ANSI approved industrial safety glasses and hardhat.

Additional equipment upgrade:

1. Protocols for upgrading:

   Once air monitoring data are complete and results are tabulated on the initial site entry, the Health & Safety representative will determine if changes in PPE are needed.

2. Upgraded equipment:

   Respirators
   If respirators become necessary, potentially affected personnel will be required to be current with medical clearance, fit-testing and training under the Respiratory Protection Standard found in Title 8 CCR 5144.

   Half mask air purifying respirators equipped with high efficiency particulate air (HEPA) cartridges shall be worn by all potentially affected personnel if monitoring results exceed the applicable action levels (see Section 4.8 for information).

   If significant levels of airborne VOCs and/or hydrocarbons are detected (refer to Section 4.8), respiratory protection including organic vapor/carbon cartridges may become necessary. Alternatively, an organic vapor/HEPA cartridge maybe utilized.

   Note: Respirator cartridges shall be replaced at least daily. If cartridges begin to restrict breathing or if breakthrough (ability to smell, taste, or be physically affected by the contaminant) occurs, replace cartridges immediately.

   Other
   Appropriate dermal protection (i.e., gloves, coveralls, etc.) shall be worn if the potential for exposure exists while performing job tasks.

4.7 Levels of Protection

LEVEL A (*not anticipated*)

Level A personal protection is required in the area where the highest levels of contamination exist and is designated as the area where maximum respiratory, skin, and eye protection are required.

LEVEL B (*not anticipated*)

Level B personal protection is required in the area where maximum respiratory protection is required; however, there is a low probability of dermal toxicity.

LEVEL C (*not anticipated*)

Level C personal protection is required in the area where respiratory protection of a lesser degree than the criteria established for Levels A or B is required, and the probability of skin contamination by dermal toxic materials is unlikely. An area may be designated as Level C when:

- Monitored levels of air contamination do not exceed the protection factors afforded by Air-Purifying Respirators (APR);
- Air contaminants have good warning properties;
- Contaminants are not known to be absorbed through, or toxic to, skin surface; and
- A reliable history of prior site entries exists without indications of acute or chronic health effects.

LEVEL D

Level D personal protection is required in the area where respiratory protection is not a requirement. An area may be designated as Level D when:

- No hazardous airborne contaminants are known to be present, and the potential for a release of such hazards is low;
- Work operations preclude the splashing of hazardous/toxic materials on body surfaces; and
- There are no Level A zones within the same exclusion area.

4.8 Action Levels

Because VOCs could potentially become airborne and be a risk to construction workers, periodic air monitoring of the breathing zone for Total Organic Vapors (TOV) with a PID or equivalent (e.g. organic vapor analyzer [OVA] or flame-ionization detector [FID]) will be conducted. Prior to the onset of intrusive activities, the PID/OVA will be calibrated following instructions provided by the manufacturer. Background readings will be recorded in the field for documentation purposes (Appendix D). Background monitoring will commence under Level D PPE. The criteria listed below for dust monitoring relate only to PPE selection. Additional information regarding dust monitoring and suppression related to air emission limitations is provided in Sections 6.1 and 7.0. As discussed in Section 7.0, a combustible gas and oxygen meter may be used for air monitoring to measure the lower explosive limit (LEL) and oxygen levels (% O_2).

SITE ACTION LEVELS* = (see table below)
SITE SHALL BE EVACUATED IF <19.5% or > 23.5% O_2
SITE SHALL BE EVACUATED IF LEL > 10%

Air Monitoring Equipment and Levels of Protection

Air Monitoring Instruments	Level D	Level C	Level B	Level A
PID, OVA or FID	0-1 ppm TOV over background (sustained); or 1 ppm benzene	1 - 10 ppm	Not Anticipated	Not Anticipated
Dust Monitoring [1]	<1.0 mg/m^3	1.0-10 mg/m^3	Not Anticipated	Not Anticipated
Lead Air Monitoring [2]	<0.03 mg/m^3	0.03 – 0.5 mg/m^3 (½ face respirator) 0.5 – 2.5 mg/m^3 (full-face respirator)	Not Anticipated	Not Anticipated
O_2	19.5 - 23.5%	19.5 - 23.5%	<19.5%	Not Anticipated
LEL	Stop all operations, evacuate immediate area when >10% LEL encountered			

1 - Site action level is based on sustained airborne concentrations above background, detected in the breathing zone of the worker (refer to Section 7.0 “Air Monitoring”).

2 - Lead monitoring requires the collection of air samples and laboratory analysis; direct-reading instrumentation is not available.

If the PID (or OVA, FID) detects TOV at sustained concentrations greater than 1 part per million (ppm) over background concentrations, air-purifying respirators will be worn and a colorimetric benzene detector tube will be used to measure benzene concentration. If the PID readings exceed 5 ppm sustained for one minute over background or 1 ppm benzene, all work will stop and the source of the contaminants will be assessed by site personnel wearing Level C protection. Full face air purifying respirators (Protection Factor = 100 with OVA/HEPA cartridges) will be worn if workers are exposed to greater than 10 ppm over background, and work may not resume until airborne TOV readings are below 5 ppm. Should detector tube readings for benzene exceed 1 ppm in the breathing zone, industrial hygiene sampling will be conducted to determine employee's 8 hour exposure and appropriate control measures implemented thru cooperation of the Site Safety Representative and a Project Certified Industrial Hygienist (CIH).

If conditions require Level B personal protective measures and the appropriate Level B equipment is unavailable, site personnel shall evacuate immediately. See Section 4.7 for personal protective equipment (PPE) level guidance.

If LEL measurements are greater than 10 % LEL or O_2 is less than 19.5 %, related work activities will stop immediately and the area will be evacuated.

5.0 SITE ACCESS

Site access shall be controlled and secured by a fence or similar site control device during construction activities and associated stockpile areas during construction or maintenance work. Breaches to the fence or locked gates/doors, should they occur, shall be repaired as soon as possible. In addition, signs should be posted indicating the presence of hazards on-site and that unauthorized individuals should keep out.

6.0 ENGINEERING CONTROLS AND SAFE WORK PRACTICES

6.1 Engineering Controls

Depending on soil conditions, during earthwork activities there is a potential to generate a nuisance dust condition. The best (most reasonable) available control measures will be used to minimize dust emissions. These control measures will include, but are not limited to, the following:

- Dust monitoring (refer to Section 7.0);
- Watering of active construction areas to prevent visible dust plumes from migrating outside of the site limits, as applicable;

- Misting or spraying while loading transportation vehicles, as applicable;

- Minimizing drop heights while loading transportation vehicles;

- Using tarpaulins or other effective covers for soil stockpiles and trucks carrying soils that travel on public roads; and

- Using sufficient water during slab coring/cutting operations. If flammable atmospheres are detected below the slab, ventilating or inerting that area may be necessary prior to cutting or using other potential ignition sources.

Earthwork activities shall immediately cease should airborne dust exceed the PM10 criteria specified by the California Air Resources Board (CARB) and shall not recommence until the area is adequately moistened such that no visible dust will be generated. Additional information regarding dust management is provided in Section 7.0 below, and in the Dust and Odor Management Plan included in the SMP.

6.2 Work Practices

Workers are expected to adhere to established safe work practices for their respective specialties (i.e., piping, trenching, construction, etc.). A general Code of Safe Practices is presented in Appendix E. The need to exercise caution in the performance of specific work tasks while wearing PPE is made more acute due to: (1) weather conditions; (2) restricted mobility and reduced peripheral vision caused by the protective gear itself; (3) the need to maintain the integrity of the protective gear; and (4) the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved.

Among the most important of these principles for working at a site where hazardous materials are present are the following:

- In any unknown situation, always assume the worst conditions and plan responses accordingly;

- Because no PPE is 100 percent effective at all times, personnel should minimize contact with excavated or potentially contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment on drums or the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground. Avoid standing in or walking through puddles or stained soils;

- **Smoking, eating, or drinking in potentially contaminated work areas will not be allowed**. Prior to doing such activities (outside of potentially contaminated areas), individual shall wash his/her hands and face prior to such. Oral ingestion of contaminants is a major route of entry for introducing toxic substances into the body;

- Avoid heat and other work stresses related to wearing protective gear. Work breaks should be planned to prevent stress-related accidents and fatigue;
- Personnel must be observant of not only their own immediate surroundings, but also those of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while utilizing PPE because vision, hearing, and communication may be impaired;
- Personnel with any facial hair that interferes with the proper fit of the respirator will not be allowed to work on-sites requiring Levels C, B, or A;
- Rigorous contingency planning and dissemination of plans to all personnel reduces the impact of rapidly changing safety protocols in response to changing site conditions; and
- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Drinking of alcohol while working on the site is prohibited during field investigation assignments.

6.3 Work Zones

Field project managers working under health and safety plans for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to non-contaminated areas on or off site. The work zones (exclusion zone, contaminant reduction zone (CRZ), support zone, and mobile work zone) are described in more detail in the following subsections. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points.

The actual locations of the zones will be determined prior to set up. The staging area will be used for communications and will be a contaminant-free zone. The CRZ will lie between the staging area and the exclusion zone and will be determined by the SSO. The exclusion zone may be delineated with red tape and cones or barricades. Personnel not immediately involved in the field activity at hand will not be allowed within the exclusion zone.

6.3.1 Exclusion Zone

The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as “A 20-foot radius around the drill rig.” On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with red tape, traffic cones or in some instances, fencing and barriers. The need will be job specific and the method should be identified by the site HSO. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in this site health and safety plan for tasks executed within the zone;
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellant is allowed in the exclusion zone;
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided;
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone;
- The use of illegal drugs or consumption of alcohol is prohibited on all projects; and
- When leaving the exclusion zone, employees should exit via the designated access/egress point(s) and follow decontamination procedures as described by the HSO and this HASP.

6.3.2 Contaminant Reduction Zone (CRZ)

A CRZ is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined by the HSO. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

6.3.3 Support Zone

The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses, and safety work boots is expected except for areas such as office trailers, break and lunch areas, or other designated areas. Operational support activities and equipment storage and maintenance areas are located in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the requirement set forth by the SSO.

6.3.4 Mobile Work Zone

For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during drilling and well decommissioning, the exclusion zone can be defined as, "1.5 times the mast height" of the drill rig, or a 20-foot radius, whichever is greater. Once the drilling and well decommissioning is complete, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next work location.

6.3.5 Considerations When Establishing Work Zones

Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site;
- Dimensions of the contaminated area;
- Weather;
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone;
- Potential for exposure to site contaminants;
- Known and estimated concentrations of contaminants;
- Air dispersion of contaminants;
- Fire and explosion potential;
- Planned operations and space needed to perform the work safely;
- Surrounding areas;
- Decontamination procedures; and
- History of job site.

7.0 AIR MONITORING

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of sampling equipment. Information gathered will be used to ensure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of Personal Protection, at the discretion of the Health & Safety Representative and/or Construction Project Manager.

The following air sampling equipment may be utilized for site monitoring:

- Photo-Ionization Detector (PID) or flame-ionization detector (FID) – organic vapors;
- Colorimetric detector tubes – benzene or other specific chemicals;
- LEL/O_2 Meter;
- MiniRAM dust monitor (PDM-3 or equivalent); and
- Integrated air sampling for airborne lead (during soil excavation and loading operations).

The PID or FID will serve as the primary instrument for personal exposure monitoring for organic vapors. If sustained PID or FID readings exceed 1 ppm, colorimetric detector tubes will be utilized to characterize airborne benzene or other chemical levels. These instruments will be utilized to characterize potential employee exposure and the need for PPE and equipment upgrades/downgrades.

During initial excavation and slab opening/cutting activities monitoring should be conducted for explosive atmospheres using an LEL/O_2 monitor. In addition to the petroleum hydrocarbons, fill materials of the site could present a methane or other flammable vapor issue.

During activities covered by the SMP and this HASP, the dust standard will be based on the PM10 ambient air quality standards adopted by CARB, which specifies a ceiling level of no more than 50 micrograms per cubic meter ($\mu g/m^3$) difference between upwind and downwind sampling locations. If this level is exceeded, additional dust suppression activities such as water application for dust suppression will be conducted during work activities. The ceiling level of 50 $\mu g/m^3$ represents the Bay Area 24-hour time-weighted average standard for 10 micron diameter particulate matter (the PM10 24-hour standard). Note that dust monitoring criteria related to PPE selection are provided in Section 4.8.

Monitoring will be conducted to properly characterize the potential for exposure to site personnel during initial operations. Continuous monitoring should be performed during operations that have not been characterized. After initial site screening, monitoring shall be conducted periodically and when site conditions might be altered (i.e., weather, drilling, new area of excavation, etc.).

Results of Monitoring information shall be recorded including time, date, location, operations, and any other conditions that may contribute to potential airborne organic vapors and lead. All maintenance and calibration information shall be maintained on-site. The monitoring equipment will be calibrated in accordance with the manufacturer's specifications and the records of such maintained with this plan and/or project file.

8.0 DECONTAMINATION

All personnel and/or equipment leaving a potentially contaminated area are subject to decontamination procedures. If applicable, general decontamination procedures for personnel and equipment are outlined below. All contaminated articles and waste decontamination materials shall be containerized, labeled, and properly disposed.

8.1 Personal Decontamination

All personnel leaving areas where existing soil (below the existing slab and associated base rock) has been exposed must follow decontamination procedures.

At a minimum, individuals involved in this project should wash their face and hands prior to eating, smoking, and/or applying cosmetics. If water is not readily available on-site, the use of sanitary wipes or similar materials may be used. If gloves and boot covers are worn, they should be properly disposed.

Although not anticipated, if a level of protection greater than Level D is necessary, no personnel will be allowed to leave an earthwork area prior to decontamination. Generalized procedures for removal of protective clothing are as follows:

1) Drop tools, equipment, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).

2) Wash down boots with clear water in the designated wash pit area. If non-disposable clothing is utilized, wash down outer protective garments.

3) Remove tape from boots and gloves.

4) Remove boots or boot covers and discard in container.

5) Remove gloves and place in container.

6) Remove outer garment and discard in container.

7) Remove respiratory equipment, place in designated area.

8) If the site requires use of a decontamination trailer, all personnel must shower prior to leaving the site.

9) Wash face and hands prior to eating, smoking, and/or applying cosmetics.

NOTE: Disposable items (i.e., Tyvek coveralls, respirator cartridges, gloves, and latex overboots) will be changed daily unless there is reason to change sooner.

Pressurized sprayers or other designated equipment may be available in the decontamination area for wash down and cleaning of personnel and equipment.

Respirators will be decontaminated daily. The masks will be disassembled, the cartridges replaced, and all other parts placed in a cleaning solution (typically warm soapy water). Prior to re-use of the respirator, employees will inspect their mask to ensure there are no apparent defects, tears, etc.

8.2 Equipment Decontamination

Equipment utilized in the areas of exposed soil (instruments, samples, tools, backhoes, other construction equipment) will be decontaminated prior to leaving the earthwork areas. Smaller equipment can be protected from contamination by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible) without hindering operation of the unit.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in appropriate containers. Any dirt or obvious contamination will be brushed or wiped off with a disposable paper wipe. The units can then be placed inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

9.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

This contingency plan applies to "on-site emergency responses" only. Much of the information for this section is covered elsewhere within this plan, therefore, only the items not previously addressed will be included.

9.1 Lines of Authority/Communication

The Health & Safety Representative is the primary authority for directing site operations under emergency conditions. All emergency communications both on and off-site will be directed through the Construction Project Manager.

9.2 Emergency Telephone Numbers

In the event of an accident or emergency situation, immediate action must be taken by the first person to recognize the event. First aid equipment is typically located with the construction field office. Notify: (1) the Construction Project Manager, and (2) the Health and Safety representative about the situation immediately after emergency procedures are implemented.

Contact information for the Construction Project Manager and Health & Safety Representative is presented in Section 3.2.

Emergency Telephone Numbers:

Immediate Emergencies:

Local Police: 911
State Police: 911
Fire: 911
Ambulance: 911

Medical:

Nearest Hospital: Alta Bates Medical Center
Telephone #: (510) 204-4444
Directions: (see Appendix F)
Poison Control Center: 911

Environmental Emergency:

Regional EPA Office: (415) 744-2000

9.3 Usual Procedure for Injury

1. Call for ambulance/medical assistance, if necessary. Notify the receiving hospital of the nature of physical injury or chemical overexposure.

2. If time allows, send/take pertinent information (i.e., Table 1) to medical facility.

3. If the injury is minor, proceed to administer first aid and then immediately notify the Construction Project Manager.

4. Construction Project Manager and Health & Safety Representative must be notified of situation.

9.4 Emergency Treatment

When transporting an injured person to a hospital, bring this plan to assist medical personnel with diagnosis and treatment. In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Four different routes of exposure and their respective first aid/poison management procedures are outlined below:

1. Ingestion:
   Refer to Table 1 or the applicable MSDS (if available) for specific recommendation and/or CALL THE POISON CONTROL CENTER AT: 1-800-222-1222 FOR INSTRUCTIONS.

2. Inhalation:
   DO NOT ENTER CONFINED SPACE UNLESS PROPERLY EQUIPPED AND HAVE A STANDBY PERSON.

   Move the person from the contaminated environment. Initiate CPR if necessary. Call, or have someone call, for medical assistance. Refer to Table 1 for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.

3. Skin Contact:
   Wash off skin with a large amount of water immediately. Remove any contaminated clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.

4. Eyes:
   Hold eyelids open and rinse the eyes immediately with copious amounts of water for 15 minutes. If possible, have the person remove his/her contact lenses (if worn). Never permit the eyes to be rubbed. Transport person to a hospital as soon as possible.

9.5 Evacuation Procedures

Various emergencies may warrant a site evacuation. These may include: fire, explosion, chemical release, or personal injury.

Personnel encountering a hazardous situation shall instruct others on-site to evacuate the vicinity IMMEDIATELY and call: (1) Health & Safety Representative and, (2) Construction Project Manager for instructions.

The site must not be re-entered until the situation has been corrected.

In the event of an evacuation, the work party will move upwind. Wind direction can be noted by the use of a windsock located on the site or other indicators (i.e., flags, trees, waves, etc.).

When conditions warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or further, as indicated by the site monitoring instruments. If the decontamination area is upwind and far enough from the event, the work crew will quickly pass through the decontamination area to remove contaminated clothing.

When the Health & Safety Representative determines that conditions warrant evacuation of downwind residences and commercial operations, local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

The following signals will be utilized for site evacuation/emergencies (i.e. truck/car horn):

1 long blast	Evacuate
1 short blast	Attention
2 blasts	Fire

9.6 First Aid Equipment

Vehicles used for site work will be equipped with a first aid kit and safety equipment including:

fluorescent vests	traffic cones
barricades	fire extinguisher
flashlight	water, suitable for drinking
portable eyewash	emergency bandage material

10.0 OTHER

10.1 Confined Space Entry

Confined space entry is not anticipated for this project.

10.2 Sanitation

Provisions must be made for sanitation facilities (i.e., bathrooms and hand washing) for the earthwork work force. If it is a mobile crew and they have transport readily available, the requirements do not apply. At a minimum, the provision of toilet facilities must meet the requirements of 29 CFR 1910.141 that specify one facility for less than 20 employees; or one toilet and one urinal for every 40 employees, up to 200; then one of each for every 50 employees thereafter.

In addition, an adequate supply of potable water must be available at each jobsite for drinking and decontamination for earthwork operations involving potentially hazardous materials.

10.3 Illumination

Earthwork operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light, downrange operations must halt in time to permit personnel and equipment to exit the site and proceed through decontamination before dusk. Conversely, earthwork operations will not be permitted to begin until lighting is adequate.

10.4 Electrical Equipment Safety

All portable electrical hand tools and cords will be inspected daily or when used to ensure safe operation.

Any equipment found defective is to be tagged and removed from service until repairs are completed.

All portable equipment will be run through a portable ground fault circuit interrupter (GFCI).

Each GFCI will be tested daily using the test circuit built into the unit. Any unit failing the test will be tagged and removed from service until repairs can be completed.

All receptacles will be tested prior to use (using portable tester) to ensure that the receptacle has an adequate ground circuit and the wiring is proper.

Units that fail the test will be tagged and put out of service until repairs can be made.

All electrical equipment and power cables used in and around wells or structures containing petrochemical contamination must be explosion-proof and/or intrinsically safe and equipped with a three-wire ground lead.

10.5 Fire Prevention

If the potential for the accumulation of flammable vapors exist, periodic vapor-concentration measurements should be taken with an explosimeter (i.e., LEL/O_2 meter). If at any time the vapor concentrations exceed 10% of LEL, then the Health & Safety Representative, or designated field worker, should immediately shut down all operations.

Only approved safety cans will be used to transport and store flammable liquids.

All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filling.

Smoking is not allowed during any operations within 15 feet of any work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

No open flame or spark is allowed in any area containing petroleum products, or other flammable liquids.

10.6 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation, or ingestion of toxic substances exists.

Drinking and driving/operating heavy equipment is prohibited at any time. Driving at excessive speeds is always prohibited.

Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion.

Contact lenses should not be worn by persons working on the site.

10.7 Heat Stress and Stroke Monitoring

Heat stress is the adverse stress to the body due to exposure to excess heat. It can greatly diminish the ability of the body to function properly. Therefore, all personnel involved in work activities will become acquainted with the symptoms of heat stress and the necessary response actions for treatment. Because the incidence of heat stress depends on a variety of factors, all workers will be monitored. Hazards associated with heat stress include the following:

- Heat Rash – may result from continuous exposure to heat or to humid air;

- Heat Cramps – caused by heavy sweating causing cold clammy skin. Usually associated with inadequate electrolyte replacement. Heat cramps can cause muscle spasms, pain in the hands, feet and abdomen;

- Heat Exhaustion – occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Heat exhaustion can cause pale, cool, moist skin, heavy sweating, dizziness, and nausea and fainting; and

- Heat Stroke – the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels (usually above 106 degrees F). Immediate action must be taken to prevent serious injury and death. Competent medical help must be obtained. Heat stroke can cause red, hot unusually dry skin. Symptoms include lack of or reduced perspiration nausea, dizziness, confusion, and strong rapid pulse and coma. Do not try to treat on-site, give liquids or other treatments.

During the day-to-day fieldwork, the SSO, PM, and workers must be alert for the signs and symptoms of heat related incidents. Heat related conditions are hazards that exist when individuals are required to work in warm temperatures while wearing protective equipment. The SSO will monitor the ambient air temperature and humidity utilizing local information sources.

Employees working in protective clothing will be observed for the following signs and symptoms of heat stress, dizziness and nausea, profuse sweating, skin color change, vision problems, delirium, fainting, weakness, fatigue, cramping, and hot red, dry skin.

Employees who exhibit heat-related symptoms will be monitored on-site by the SSO or other competent person. Monitoring heat related symptoms will consist of measuring the heart rate and body temperature to prevent the onset of heat stress illness. Heart rate will be measured by the redial pulse of the wrist for thirty seconds as early as possible in the resting period. Body core temperature can be measured by means of an “ear” thermometer.

The heart rate at the beginning of the rest period should not exceed 100 beats per minute. If the heart rate is in excess of the above guideline, the next work period will be shortened by one-third, while the length of the rest period stays the same. If the heart rate is in excess of 110 beats per minute at the beginning of the next rest period, the following work cycle will be further shortened by one-third. An employee with a body core temperature in excess of 99.5 degrees F will not be allowed to return to work after the rest period until the core temperature returns to 99 degrees or below.

Breaks in a shaded area will be taken if any worker exhibits or believes necessary to mitigate the symptoms of heat stress such as excessive sweating, muscle spasms, thirst, dizziness, rapid/weak pulse, flushed skin, loss of consciousness, or convulsions. The breaks will last until symptoms are relieved and/or the pulse of the worker is less than 110 beats per minute. Workers experiencing heat stress will be required, if conscious, to consume two to four pints of electrolyte fluid or cool water every hour while resting in a shaded area.

The individual should not return to work until symptoms are no longer recognizable. If the symptoms appear critical, persist or get worse, immediate medical attention will be sought. For severe heat stress, workers will be examined by a health-care professional as soon as possible.

Additionally, during periods of hot weather or other potentially heat stress conditions the following safe work practices must apply:

- Be on the alert to signs and symptoms of heat illness during periods of abnormally high heat;

- Know the symptoms of heat illness to watch for which includes excessive sweating, headache, poor concentration, muscle pain, headache, cramping, dizziness, irritability, loss of coordination, vomiting, blurry vision, confusion, lack of sweating, fainting, or seizures;

- Drink plenty of water throughout the day. Employees working in the heat need to drink 4 eight ounce glasses of water per hour, including at the start of the shift to replace the water lost to sweat;

- Dress for conditions: wear lightweight, light-colored loose clothing, a wide-brimmed hat if possible, sunscreen, and sunglasses;

- Use cool compresses to stay cool;

- Take scheduled rest periods and spend them in the shade;

- Tell your supervisor immediately if you feel you may be getting sick from the heat;

- Know the locations of your closest drinking water supplies;

- Keep track of your co-workers; and

- Know how to contact emergency services in the event of heat illness and how to effectively report the work location to 911.

10.8 Cold Stress Prevention

Exposure to cold weather can lead to frost bite and/or hypothermia. The signs and symptoms of excessive exposure to cold are listed below:

When weather conditions are cold, wet, and windy, the following precautions will be instituted:

- Field personnel should wear layered clothing. Mittens, heavy socks, hats, jackets/ vests, long underwear, glove liners or other suitable clothing should be worn when air temperatures fall below 40°F. Chemical protective clothing will be worn over the warm garments when protective clothing is required by the field operations;

- At temperatures below 30°F, temperature insulating suits and gloves should be considered;

- Protective outerwear should be used to prevent wetting of work shoes and feet, when appropriate;

- Additional clothing worn in layers allows gradual removal as work activities generate metabolic heat;
- At temperatures below 35°F, raingear should be worn if an employee could become wet on the job;
- At temperatures below 35°F, employees shall be provided with warm (65°F or above) break areas. If appropriate, space heaters will be provided to warm hand and feet;
- Hot liquids such as soups and warm drinks should be consumed during break periods. Caffeine beverages should be limited due to attendant diuretic and circulatory effects;
- A buddy system shall be practiced at all times. An employee that is observed shivering or showing signs of frostbite shall leave the cold area immediately;
- Work should be arranged to avoid sitting or standing for long periods; and
- All employees, who work in cold areas should be trained in the following subjects:
  - Proper first aid treatment for cold stress;
  - Proper clothing practices;
  - Proper eating and drinking habits;
  - Recognition of impending adverse health effects due to cold; and
  - Safe work practices.

10.9 Sunburn Prevention

Sunburn is caused by overexposure to ultraviolet light (sunshine). The symptoms of exposure are not usually apparent until two to four hours after the exposure ceases. Depending upon the severity of the exposure, the symptoms can range from reddening of the skin, accompanied by mild discomfort, to painful deep burns and blisters. Although light-haired, fair-skinned, blue-eyed personnel are at the greatest risk of sunburn, all complexion types can develop sunburn.

The physical hazard of sunburn can be controlled by: (1) providing a shady rest area; (2) wearing appropriate clothing (long pants and tee shirts, i.e. no tank tops); (3) wearing sunscreen with an appropriate protection factor, as appropriate; and (4) working in shifts.

10.10 Noise

Control of noise hazards shall be in accordance with 29 CFR 1910.95. Noise hazard areas (greater than the 8-hour Time Weighted Average of 85 dBA or 140 dB impact/pulse) must be appropriately marked and hearing protection for noise attenuation worn when in the area.

11.0 WASTE MANAGEMENT

11.1 Management of Soil

All soil excavation, management, handling, and stockpiling activities shall be conducted consistent with procedures specified in the SMP.

11.2 Management of Groundwater

Based on the depth to groundwater at the site (approximately 8 to 12 feet bgs) and construction plans, it is not expected that dewatering activities will be necessary in excavations for foundations and underground utilities. In the event that dewatering becomes necessary (e.g., localized deep excavations for elevator pits), the general groundwater management procedures described in the SMP and summarized below shall be applied.

It is anticipated that the water generated during dewatering activities will be discharged under permit to the publicly owned treatment works (POTW) operated by East Bay Municipal Utility District (EBMUD) The water will be treated (if necessary) and discharged in compliance with a permit that will be obtained from EBMUD. In the event that small quantities of groundwater are generated or effluent criteria are not attainable, the fluids may be temporarily stored on-site in applicable storage containers or transported to a permitted facility.

It is not expected that significant quantities of rainwater will collect within excavations or trenches. However, should significant rainwater accumulate within open excavations/trenches, the water should be handled as if it were groundwater.

12.0 REFERENCES

OSHA Regulations in 29 CFR 1910.120 (Federal Register 45654, December 19, 1986; Updated March 6, 1989.

APPENDIX A

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

APPENDIX A

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

Site Safety Plan Agreement

All project personnel and subcontractors are required to sign the following agreement prior to conducting work at the site.

1. I have read and fully understand the plan and my individual responsibilities.

2. I agree to abide by the provisions of the plan.

Name	Signature
Company	Date
Name	Signature
Company	Date
Name	Signature
Company	Date
Name	Signature
Company	Date
Name	Signature
Company	Date

Name	Signature
Company	Date
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Company	Date

APPENDIX B

SITE SAFETY PLAN AMENDMENT SHEET

APPENDIX B

SITE SAFETY PLAN AMENDMENT SHEET

Project Name:____

Project Number:____

Location:____

Changes in field activities or hazards:

Proposed Amendment:

Proposed by:__________________________Date:_____________________

Approved by:__________________________Date:_____________________

Declined by:__________________________Date:_____________________

Amendment Number:___________________________

Amendment Effective Date:______________________

APPENDIX C

EXPLANATION OF HAZARD EVALUATION GUIDELINES

APPENDIX C

EXPLANATION OF HAZARD EVALUATION GUIDELINES

Hazard: Airborne Contaminants

Guideline	**Explanation**
Threshold Limit Value Time-Weighted Average	The time-weighted average concentration for a (TLV-TWA) normal 8-hour workday and a 40- nearly all workers may be repeatedly exposed without adverse effect.
Permissible Exposure Limit (PEL)	Time-weighted average concentration similar to (and in many cases derived from) TLV values.
Immediately Dangerous to Life or Health (IDLH)	"IDLH" or "Immediately Dangerous To Life or Health" means any atmospheric condition which poses an immediate threat to life, or which is likely to result in acute or immediate severe health effects. This includes oxygen deficiency conditions.

Hazard: Explosion

Guideline	**Explanation**
Lower Explosive Limit (LEL)	The minimum concentration of vapor in air below which the propagation of a flame will not occur in the presence of an ignition source.
Upper Explosive Limit (UEL)	The maximum concentration of vapor in air above which propagation of a flame will not occur in the presence of an ignition source.

Hazard: Fire

Guideline	**Explanation**
Flash Point	The lowest temperature at which the vapor of a combustible liquid can be made to ignite momentarily in air.

APPENDIX D

DIRECT READING INSTRUMENT LOG

APPENDIX D

DIRECT READING INSTRUMENT LOG

Project Name: Address: ______________________
Surveyor's Name: __________________________ Date: _____________________
Instrument: ______________________________ Serial Number: ____________________
Calibration Date and Time: ____

Contaminant	Time	Reading		Contaminant	Time	Reading

APPENDIX E

CODE OF SAFE PRACTICES

APPENDIX E

CODE OF SAFE PRACTICES

(This is a suggested code. It is general in nature and intended as a basis for preparation by the contractor of a code that fits his operations more exactly.)

GENERAL

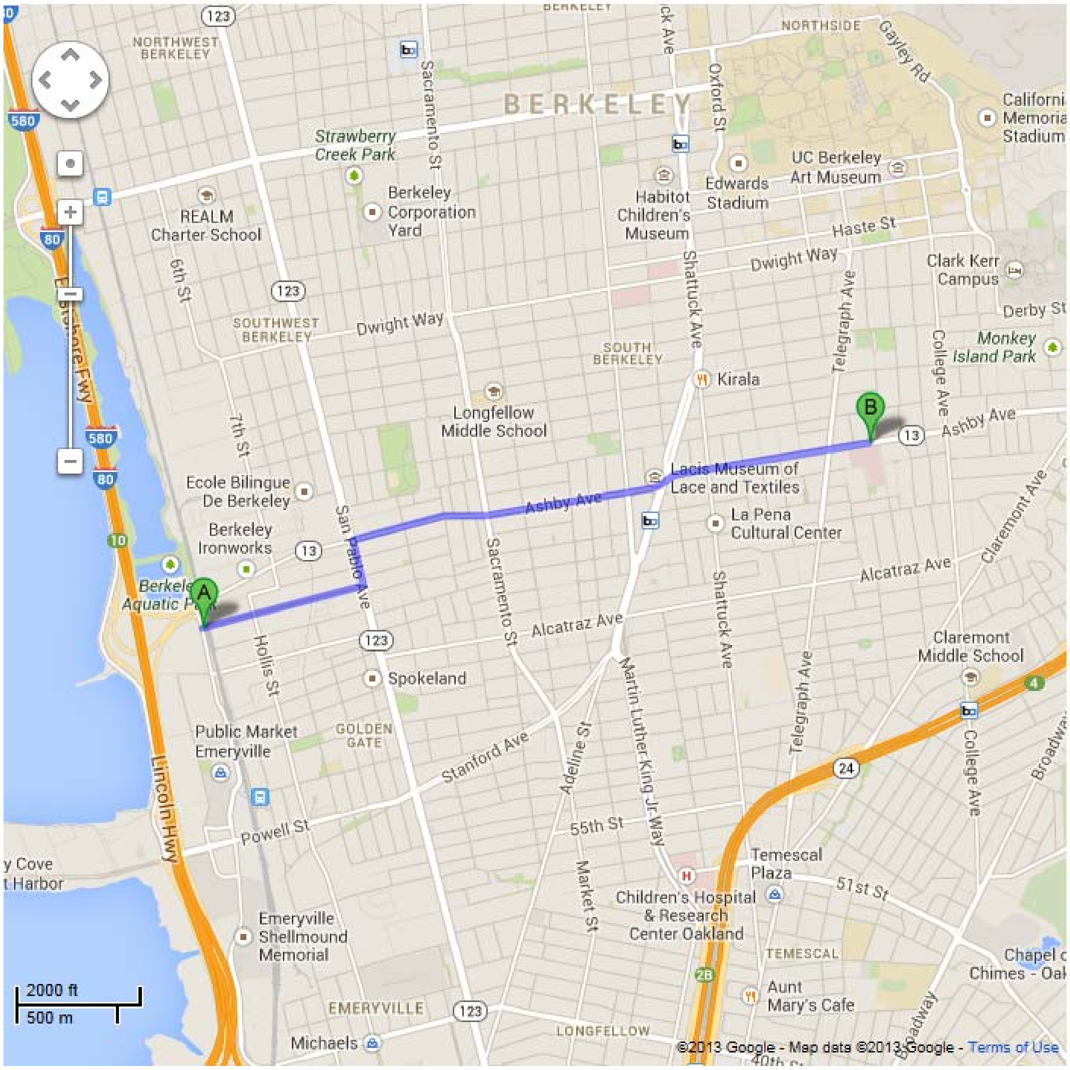
1. All persons shall follow these safe practice rules, render every possible aid to safe operations, and report all unsafe conditions or practices to the foreman or superintendent.
2. Foremen shall insist on employees observing and obeying every rule, regulation, and order as is necessary to the safe conduct of the work, and shall take such action as is necessary to obtain observance.
3. All employees shall be given frequent accident prevention instructions. Instructions shall be given at least every 10 working days.
4. Anyone known to be under the influence of drugs or intoxicating substances that impair the employee's ability to safely perform the assigned duties shall not be allowed on the job while in that condition.
5. Horseplay, scuffling, and other acts that tend to have an adverse influence on the safety or well-being of the employees shall be prohibited.
6. Work shall be well planned and supervised to prevent injuries in the handling of materials and in working together with equipment.
7. No one shall knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that it might unnecessarily expose the employee or others to injury.
8. Employees shall not enter manholes, underground vaults, chambers, tanks, silos, or other similar places that receive little ventilation, unless it has been determined that is safe to enter.
9. Employees shall be instructed to ensure that all guards and other protective devices are in proper places and adjusted, and shall report deficiencies promptly to the foreman or superintendent.
10. Crowding or pushing when boarding or leaving any vehicle or other conveyance shall be prohibited.
11. Workers shall not handle or tamper with any electrical equipment, machinery, or air or water lines in a manner not within the scope of their duties, unless they have received instructions from their foreman.
12. All injuries shall be reported promptly to the foreman or superintendent so that arrangements can be made for medical or first aid treatment.
13. When lifting heavy objects, the large muscles of the leg instead of the smaller muscles of the back shall be used.
14. Inappropriate footwear or shoes with thin or badly worn soles shall not be worn.
15. Materials, tools, or other objects shall not be thrown from buildings or structures until proper precautions are taken to protect others from the falling objects.

APPENDIX F

HOSPITAL LOCATION MAP

APPENDIX F

ROUTE TO HOSPITAL



Starting at 6701 Shellmound Street, Emeryville, California:

1.	Head **south** on **Shellmound Street** toward **67th Street**	**go 7 feet**
2.	Take the 1st left onto **67th Street**	**go 0.5 miles**
3.	Turn left onto **CA-123 North/San Pablo Avenue**	**go 0.1 miles**
4.	Take the 3rd right onto **State Hwy 13 South/Ashby Avenue**	**go 1.6 miles**

Destination will be on the right

APPENDIX E

INTRUSIVE EARTHWORK GUIDANCE PLAN

PES Environmental, Inc.
Engineering & Environmental Services

A Report Prepared for:

Anton Emeryville, LLC
1415 L Street, Suite 450
Sacramento, California 95814

INTRUSIVE EARTHWORK GUIDANCE PLAN
6701 – 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

MAY 19, 2015

Mark B. Winters

Mark B. Winters
Senior Geologist

Kyle S. Flory, P.G.
Principal Geologist

1448.001.01.004

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

1.0 GENERAL

1.1 Introduction

This Intrusive Earthwork Guidance Plan (Plan), including additional soil management procedures, was prepared by PES Environmental, Inc. (PES) on behalf of Anton Emeryville, LLC (Anton) to manage intrusive earthwork activities that may occur at an indefinite future date at the property located at located at 6701 through 6707 Shellmound Street, Emeryville, California (subject property or site; Plate 1).

This Plan or guidance document is not intended to be utilized as a site Health and Safety Plan (HASP). Rather, this document has been developed to provide: (1) an overview of subsurface environmental conditions at the site; (2) a description of unregulated or routine activities which may be conducted at the site; (3) a description of regulated activities to which this Plan applies; (4) procedures to be followed prior to commencement of regulated activities; (5) guidance for Contractor development of a work-specific HASP; and (6) soil management procedures so that potentially hazardous materials, if encountered, are handled, managed and disposed in accordance with applicable regulatory requirements.

1.2 Background Information

1.2.1 Topography and Geology

According to the United States Geological Survey (USGS) *Oakland West, California* Quadrangle 7.5-minute series topographic map dated 1993, the site is situated at an elevation of approximately 18 feet above mean sea level. The site is relatively flat, but the vicinity slopes gently to the west/southwest. The nearest surface water body is San Francisco Bay, located approximately 1,000 feet west of the subject property.

The site is comprised entirely of land that was reclaimed from San Francisco Bay. During the late 1930s through the early to mid-1950s, the subject property and vicinity were filled in by non-native soils to create buildable land. The fill material ranges in thickness from approximately 10 to 19 feet and generally consists of coarse-grained sands and gravels that contain varying amounts of fines, and fine-grained silts and clays. The fill material often contains debris material (e.g., brick, concrete, metal, asphalt, glass, wood, fabric, and rubber). Fine-grained soils are present directly below the fill material. These soils generally consisted of dark-colored clays and occasional silts with organic material that represent Old Bay Mud deposits. Groundwater has been encountered on the subject property at depths ranging from approximately 8 to 12 feet below ground surface (bgs). The predominant groundwater flow direction beneath the site is to the south-southwest toward the San Francisco Bay.

1.2.2 Site Development

The subject property, as shown on Plate 1, currently consists of two commercial buildings (a two-story office building and a warehouse building), surface-level parking, and landscaped areas on approximately 2.27 acres identified by Alameda County Assessor's Parcel Number (APN) 049-14906-02.

Planned redevelopment of the site includes a new multi-story, multi-family residential development to be constructed on the subject property. Existing buildings and related improvements will be demolished and removed followed by grading and excavation for new construction. The project consists of a seven-story building comprising the majority of the subject property with open parking garage, lobby, and amenities spaces occupying the first (on-grade) and second floors of the building. A limited portion of the first and second floors will be developed as residential units. After redevelopment, the entire site will be covered by the building, and associated paved parking and driving areas with the exception of planter and landscaped areas. The ground (first) floor development plan for the new building and exterior improvements are shown on Plate 2.

1.2.3 Historical Use

The site and vicinity of the subject property were created by filling with non-native materials to create buildable land during the 1930s to 1950s. The existing site buildings were constructed over the fill materials in approximately 1963 and from that time through 2014 the site was used for industrial and commercial purposes. The related business activities have included manufacturing of label tape products, lithography and printing, and packaging and distribution of communication and audio systems.

1.2.4 Environmental Conditions

Numerous soil and groundwater characterization, removal, and remediation activities have been performed at the site since 1989. Environmental conditions at the site have been characterized, and analytical data from previous investigations indicate that petroleum hydrocarbons quantified as gasoline, diesel, and motor oil (TPHg, TPHd, and TPHmo, respectively), oil & grease, volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals (including lead) have been detected in soil and groundwater. VOCs have been detected in soil vapor samples. Remediation has been conducted to address portions of the site affected by past hazardous materials storage and three former underground storage tanks (USTs).

The contaminants of concern (COCs) identified in the subsurface at the site are related to the historical fill materials originally used to create the subject property. The site is underlain by heterogeneous fill placed to create buildable land, like much of the filled bay-shore area of Emeryville. As such, sporadic and various chemicals can be detected when samples of soil, soil gas, and/or groundwater are tested. In addition, releases associated with the former USTs and the site's historical use have contributed to chemical constituents detected in soil, groundwater, and soil vapor samples collected during environmental investigations conducted at the site.

The occurrence of methane in soil vapor has been documented in this area Emeryville. Methane is nontoxic to humans; however, it is a combustible gas when present between 5 and 15 percent by volume in air. Installation and maintenance of a vapor mitigation system (e.g., vapor barrier and passive vents) beneath all areas of the ground floor except the parking garage is being incorporated into the redevelopment design plans to address potential methane and VOCs in subsurface soil vapor.

A listing of previous environmental documents for the site is provided in Appendix A.

1.2.5 Regulatory Status

The subject property is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case with Alameda County Environmental Health Services (ACEH) as the lead environmental regulatory agency. PES is assisting Anton in working with ACEH to obtain SLIC case closure as part of the site redevelopment process. This Plan and a Soil Management and Contingency Plan (SMP) have been prepared in support of the closure process for redevelopment of the site. A Land Use Covenant (LUC) is expected to be recorded for the subject property. All restrictions and requirements for regulatory agency notifications listed in the LUC are to be followed in addition to the procedures herein.

2.0 UNREGULATED ACTIVITIES

The purpose of this Plan is to provide procedures to follow to protect the public and workers involved in potential subgrade construction, maintenance, repair, inspection, or other activity involving subgrade work ("regulated activities"). However, in accordance with a SMP prepared for the site, certain areas of the site will be completed with clean, imported fill material, allowing unregulated or routine activities to be conducted.

The following subgrade activities constitute unregulated activities under this Plan:

- **Shallow Landscaping Work** – any activity related to landscaping that is conducted within the upper 2 feet of fill material within landscaped areas constructed during redevelopment of the site.

3.0 REGULATED ACTIVITIES

This Plan has been developed to provide procedures to follow to protect the public and workers involved in potential subgrade construction, maintenance, repair, inspection, or other activity involving subgrade work ("regulated activities").

The following subgrade activities constitute regulated activities under this Plan:

- **Exterior Subsurface Construction or Repair** – any activity (e.g., construction, utility line repair or installation) that extends below existing grade of pavement, concrete, or other hardscape;

- **Deep Landscaping Work** – any activity related to landscaping that extends deeper than 2 feet beneath existing grade;

- **Interior Sub-Slab Work** – any work that penetrates the first floor concrete floor slab of the building. A vapor mitigation system is planned for installation beneath portions of the new building not used for parking and specific procedures exist for penetration and repair; and

- **Environmental Investigations –** any subsurface soil, groundwater, or soil vapor investigation activities (including planned decommissioning of existing monitoring wells and vapor probes) that may expose workers or the public to subsurface media.

4.0 REGULATED ACTIVITIES REQUIREMENTS

Prior to commencement of any regulated activities, the following tasks must be completed:

- All contractors and subcontractors of either the owner, tenants, or another party causing regulated activities at the site, shall read this Plan and sign the Agreement and Acknowledgment Statement (Appendix B) to certify that they have read, understood and agreed to abide by its provisions;

- Applicable environmental documents and investigations pertaining to the site shall be reviewed, if available;

- Subsurface utilities will be located and verified with Underground Safety Alert (USA) and a private contractor;

- If the planned work includes intruding beneath the floor slab of the new building, no such work shall be performed without completion of an assessment, by a qualified environmental engineer, of the potential for damaging the sub-slab vapor mitigation system, and complying with the *Procedures for Vapor Barrier Penetration and Repair* (refer to Section 5.13); and

- The personnel or subcontractor performing such work will be required to develop a HASP in accordance with the hazardous material regulations found in the Title 29 Code of Federal Regulations (CFR) 1910.120, California Occupational Safety and Health Administration (CAL-OSHA), and Title 8 of the California Code of Regulations (CCR), Section 5192 (Hazardous Waste Operations and Emergency Response (HAZWOPER).

Compliance with this Plan is required of all personnel, subcontractors, etc. associated with the regulated activities identified above.

In addition, installation of water production wells and use of shallow groundwater is not permitted.

5.0 GUIDANCE FOR CONTRACTOR DEVELOPMENT OF HEALTH AND SAFETY PLAN FOR REGULATED ACTIVITIES

All contractors and subcontractors will act in accordance with applicable Federal, State, regional, and local regulations during all phases of the project. Applicable regulations include but are not limited to CAL-OSHA, Title 8 CCR Section 5192, and Title 29 CFR 1910.120.

The Contractor's HASP should include, but not be limited to, the following components.

5.1 Introduction

The main purpose of the introduction is to describe the site, the specific area of the site that the work covered in the Contractor's HASP will encompass, and its applicability to operations.

5.2 Key Personnel

This section should include names, descriptions of responsibilities, and contact numbers for key personnel involved with the project.

5.3 Hazard Assessment

Hazard assessment is a methodology used to identify inherent or potential hazards that may be encountered in the work environment associated with accomplishing a project. The hazard assessment should include the identification of an operation or a job to be assessed, a breakdown of the project, identification of the hazards associated with each task, and determination of the necessary controls for the hazards.

5.4 Safety Training

The environmental conditions of the site shall be disclosed to all construction workers and subcontractors who will be engaged in earthwork activities including soil excavation, dewatering, and other subsurface activities where contact with potentially contaminated soil and/or groundwater is possible. It is the individual contractor/subcontractor's responsibility to provide additional site-specific construction safety training. For construction activities, additional safety meetings should be held daily and may include a discussion of site work plans, personal protective equipment, site rules, site hazards, trenching/shoring, and the requirements of the Contractor's HASP.

5.5 Personal Protective Equipment

Modified Level D is the minimum acceptable level for this site. The Contractor should make the appropriate personal protective equipment (PPE) selection based on the specific project and site hazards.

5.6 Medical Monitoring Program

All construction personnel engaged in regulated subsurface work with potential exposure to contaminated media (soil, groundwater, vapor/dust) will be required to be medically qualified prior to donning a respirator, should respiratory protection become necessary. If site conditions vary drastically from those anticipated in the plan, other medical surveillance procedures may become necessary, as required.

5.7 Air Monitoring

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of sampling equipment. Information gathered will be used to ensure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of personal protection, at the discretion of the Contractor's Health & Safety Representative and/or Manager.

The following air sampling equipment may be utilized for site monitoring by the Contractor's Health & Safety Representative:

- Photo-Ionization Detector (PID) – organic vapors (alternatively, a flame-ionization detector [FID] may also be utilized for this purpose); and

- Lower Explosive Limit and Oxygen (LEL/O_2) Meter.

The PID and/or FID will serve as the primary instrument for personal exposure monitoring for organic vapors. The instrument will be utilized to characterize potential employee exposure and the need for equipment upgrades/downgrades.

During excavation activities, monitoring should be conducted for explosive atmospheres using an LEL/O_2 monitoring device. In addition to the petroleum hydrocarbons, fill materials of the site could present methane or other flammable vapor sources.

Monitoring will be conducted to evaluate the potential for exposure to site personnel during initial operations. Continuous monitoring should be performed during operations that have not been characterized. After initial site screening, monitoring shall be conducted periodically and at times when site conditions might be altered (i.e., weather, drilling, new area of excavation, etc.).

Results of monitoring information shall be recorded in a daily log including time, date, location, operations, and any other conditions that may contribute to potential airborne organic vapors, dust, and lead. All maintenance and calibration information shall be maintained on site. The monitoring equipment will be calibrated in accordance with the manufacturer's specifications, and records of calibrations be maintained with the plan and/or project file.

5.8 Site Control

The site control program is used to control movement of people and equipment in order to minimize worker exposure to hazardous substances. Site work zones, site communication procedures, safe work practices, and a site map should be included.

5.9 Dust Control

Potential concentrations of metals and petroleum hydrocarbon constituents in the soil indicate that dust control measures will be, at a minimum, consistent with standard construction practices. These will include, but are not limited to, the following:

- Watering of active soil construction areas to prevent visible dust plumes from migrating outside of the site limits;

- Misting or spraying while loading transportation vehicles;

- Minimizing drop heights while loading transportation vehicles; and

- Utilizing tarpaulins or other effective covers for soil stockpiles and trucks carrying soils that travel on public roads.

Subsurface activities shall immediately cease should airborne dust become visible and will not recommence until the area is adequately moistened such that no visible dust will be generated. If visible dust is continually being generated, additional measures (e.g., dust monitoring) may be required.

5.10 Decontamination

All personnel and/or equipment leaving a potentially contaminated area are subject to decontamination procedures. If applicable, general decontamination procedures for personnel and equipment are outlined below.

5.10.1 Personal Decontamination

All personnel leaving areas where existing soil (below asphalt, concrete, and/or associated base rock) has been exposed must follow decontamination procedures as outlined in the Contractor's HASP.

5.10.2 Equipment Decontamination

Equipment utilized in the areas of exposed soil (instruments, samples, tools, backhoes, other construction equipment) will be decontaminated prior to leaving the earthwork areas as outlined in the Contractor's HASP.

All contaminated articles and waste decontamination materials shall be containerized, labeled, and disposed of properly.

5.11 Soil Management

All soil management and handling activities shall be conducted in accordance with applicable federal, state, and local regulations. For projects where waste soil (i.e. soil potentially containing contaminants) will be produced, a soil management Plan shall be included in the HASP. The soil management objectives are designed to: (1) reduce the potential for exposure of construction workers at the site, neighboring workers and/or pedestrians, and future users of the site to soil potentially containing chemical residuals; and (2) ensure that soil that is removed from the site is disposed at an appropriately-permitted disposal facility.

Excavated soil suspected to contain chemical residuals and/or requiring off hauling (regardless of the potential for contamination), shall be sampled to evaluate appropriate handling and management alternatives. Soil sampling shall be conducted at a frequency necessary to comply with applicable regulations and disposal facility criteria. The minimum chemical analysis will be determined on the basis of the disposal destination of the material (i.e., landfill, offsite backfill area, etc.).

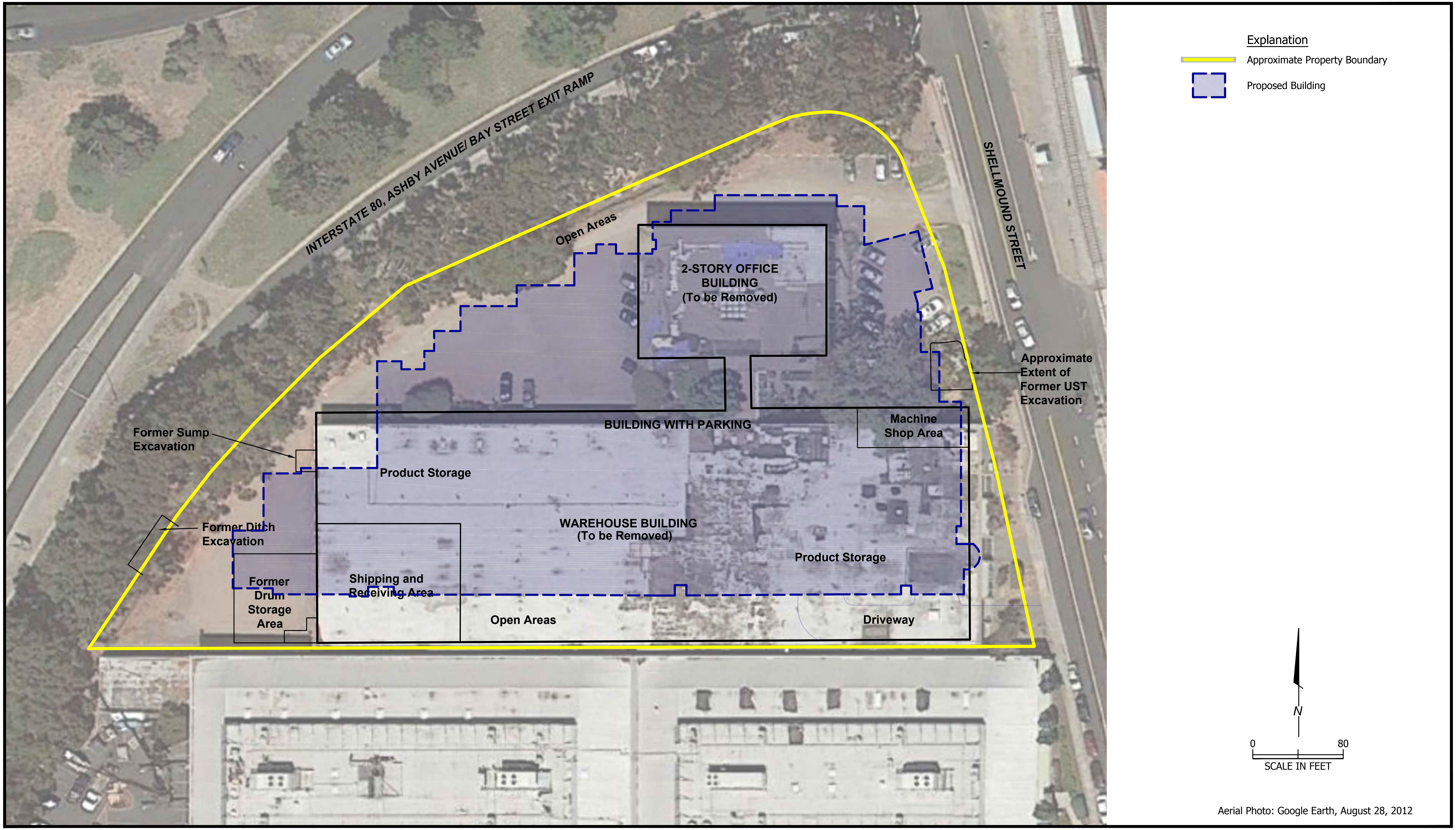
5.12 Groundwater Management

For projects where groundwater may be encountered, the groundwater shall be managed in accordance with applicable regulations. If groundwater requires pumping to allow excavation access, the groundwater shall be stored in appropriate containers and samples be obtained for analysis to assess waste classification and disposal/recycling options. The chemical analyses to be conducted will be determined based on disposal facility requirements. In accordance with the LUC to be recorded for the site, ACEH must be notified prior to conducting dewatering activities.

5.13 Vapor Barrier Penetration and Repair

In the event that subsurface activities are required beneath the concrete floor slab of the building (e.g., underground utility repair), such activities shall comply with *Procedures for Vapor Barrier Penetration and Repair* that will be provided with the vapor mitigation system as-built design. The final as-built design will be provided in the SMP Implementation Report, which should be appended to this Intrusive Earthwork Guidance Plan when available.

PLATES



Aerial Photo: Google Earth, August 28, 2012

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan and Vicinity Map
Intrusive Earthwork Guidance Plan
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
1

1448.001.01.004	1448-00101004_IEGP_1-2	MW	5/15
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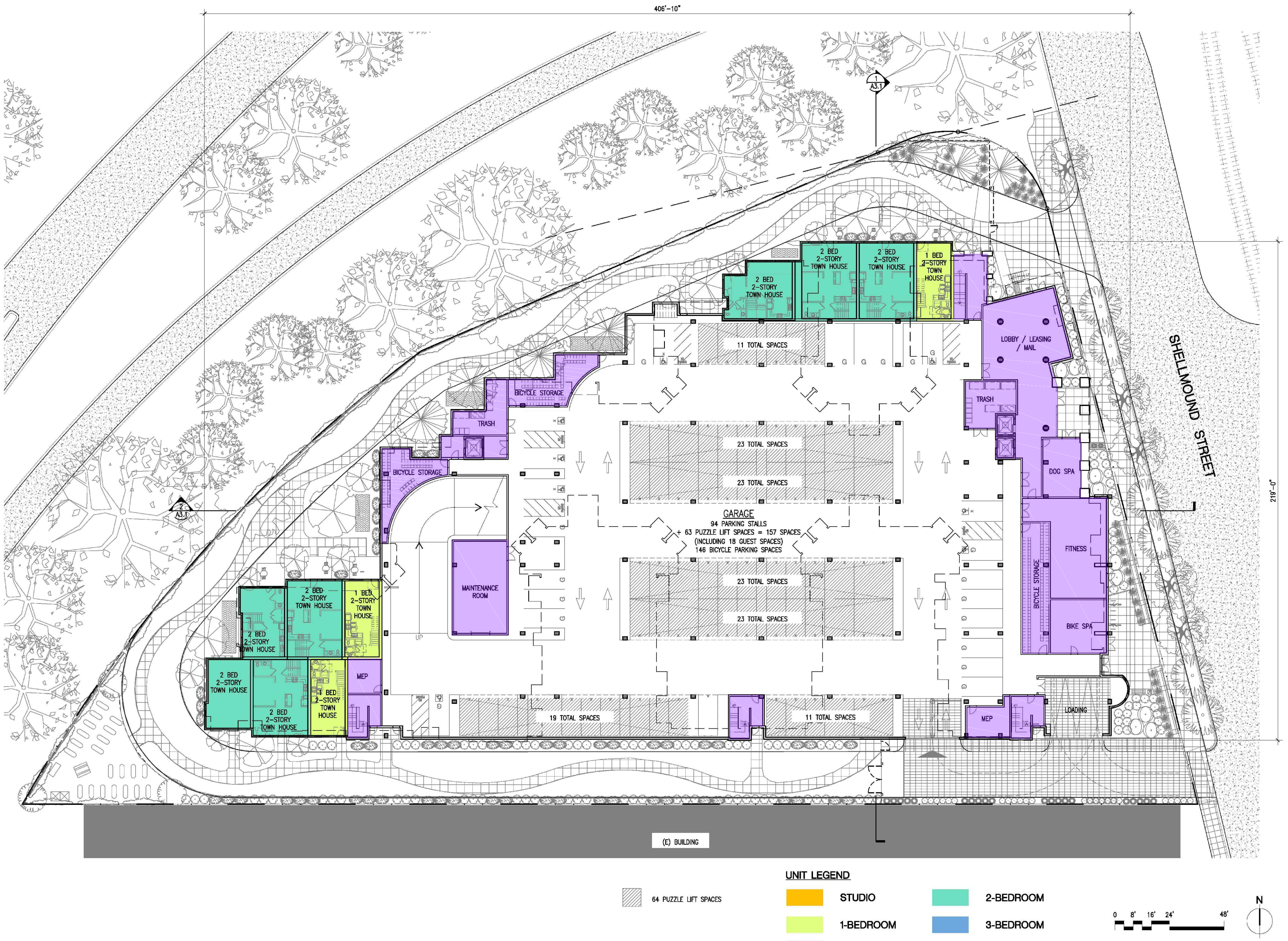

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SCALE IN FEET

Reference: Anton Development Company, Planning Submittal,
First Floor Plan A2.1 (November 7, 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Ground (first) Floor Development Plan
Intrusive Earthwork Guidance Plan
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
2

1448.001.01.004	1448-00101004_IEGP_1-2	*MW*	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

APPENDIX A

ENVIRONMENTAL DOCUMENT LIST

Appendix A
Environmental Document List
6701 - 6707 Shellmound Street
(formerly 6707 Bay Street)
Emeryville, California

Prepared by	Title/Subject	Date
Alameda County Department of Environmental Health	Notice of Violation Letter to James McClay, Mike Roberts Color Productions	2-Mar-89
Alameda County Department of Environmental Health	Letter to MRCP Realty and Nady Systems, Inc. Regarding Deed Notice, Nady's Systems, Inc. (Former MRCP) – 6707 Bay Street, Emeryville, CA 94608	16-Dec-96
Bechtel	Site Inspection, Mike Roberts Color Productions, 6707 Bay Street, Emeryville, California	22-Oct-92
ENVIRON International Corporation	Summary of Environmental Findings, Nady Systems, Inc., 6701 Shellmound Street or 6707 Bay Street, Emeryville, California	29-May-13
ENVIRON International Corporation	Draft Phase I Environmental Site Assessment, Nady Systems, 6701-6707 Bay Street, Emeryville, California	3-Jul-13
ICF Technology Incorporated	Preliminary Assessment, Mike Roberts Color Productions, 6707 Bay Street, Emeryville, California	13-Sep-90
LW Environmental Services, Inc.	Status Report of Activities Related to the Removal and Disposal of Hazardous Waste from M.R.C.P. Property and Analytical Results of Soil & Water Samples Collected in the Northwest Area of the Property, Mike Roberts Color Productions, 6707 Bay Street, Emeryville, California	27-Jun-89
LW Environmental Services, Inc.	Environmental Site Assessment and Subsurface Evaluation – Mike Roberts Color Productions Property, 6707 Bay Street, Emeryville, California	10-Jul-89
LW Environmental Services, Inc.	Supplemental Environmental Site Assessment and Subsurface Evaluation – Mike Roberts Color Productions Property, 6707 Bay Street, Emeryville, California	25-Aug-89
LW Environmental Services, Inc.	Environmental Site Assessment – Phase II Subsurface Evaluation - Mike Roberts Color Productions Property, 6707 Bay Street, Emeryville, California	26-Sep-89
LW Environmental Services, Inc.	Final Report/Tank Removal, Mike Roberts Color Productions, 6707 Bay Street, Emeryville, California	3-Nov-89
McLaren	Phase I Review of Documents and Verification of Groundwater Flow Direction at 6070 Bay Street in Emeryville, California	21-Nov-89
PES Environmental, Inc.	Letter Report Summarizing Results of an Investigation of Site Conditions in the Vicinity of the Former USTs, Nady Systems, Inc. Site, 6707 Bay Street, Emeryville, California	9-Dec-91
PES Environmental, Inc.	Supplemental Subsurface Investigation Report, 6701, 6705, and 6707 Shellmound Street, Emeryville, California	13-Jan-14

Appendix A
Environmental Document List
6701 - 6707 Shellmound Street
(formerly 6707 Bay Street)
Emeryville, California

Prepared by	Title/Subject	Date
PES Environmental, Inc.	Phase I Environmental Assessment, 6701, 6705, and 6707 Shellmound Street, Emeryville, California	17-Jan-14
PES Environmental, Inc.	Conceptual Site Model, 6701 - 6707 Shellmound Street, Emeryville, California, Fuel Leak Case No. RO0000548, GeoTracker Global ID T0600100894	6-Feb-15
Pettit & Martin, Attorneys at Law	Recorded Deed Notice Pursuant to Work Plan and Revised Request for “No Further Action”, Alternative Compliance Points Monitoring Program, 6707 Bay Street, Emeryville, California	1-Feb-95
SCS Engineers	Environmental Review and Assessment of the Michael Roberts Color Production Property located at 6707 Bay Street, Emeryville, California	19-Dec-89
SCS Engineers	Environmental Assessment, 6707 Bay Street, Emeryville, California	30-Jan-90
SCS Engineers	Interim Report One for Construction and Operation of the Remediation Systems, 6707 Bay Street, Emeryville, California	25-Feb-91
Subsurface Consultants, Inc.	Quarterly Groundwater Monitoring and Treatment System Decommissioning, 6707 Bay Street, Emeryville, California	14-Jun-93
Subsurface Consultants, Inc.	Quarterly Groundwater Monitoring, August 1993, 6707 Bay Street, Emeryville, California	15-Sep-93
Subsurface Consultants, Inc.	Quarterly Groundwater Monitoring, November 1993, 6707 Bay Street, Emeryville, California	8-Jan-94
Subsurface Consultants, Inc.	Quarterly Groundwater Monitoring, February 1994, 6707 Bay Street, Emeryville, California	5-Apr-94
Subsurface Consultants, Inc.	Supplemental MIBK Contamination Assessment, 6707 Bay Street, Emeryville, California	21-Sep-94
Subsurface Consultants, Inc.	Addendum No. 1, Work Plan and Revised Request for “No Further Action”, Alternate Compliance Points Monitoring Program, 6707 Bay Street, MIBK Tank Area, Emeryville, California	17-Jan-95
Subsurface Consultants, Inc.	Groundwater Monitoring, February 1995 Event, 6707 Bay Street, Emeryville, California	1-Mar-95
Subsurface Consultants, Inc.	Groundwater Monitoring, November 1995 Event, 6707 Bay Street, Emeryville, California	15-Dec-95
Subsurface Consultants, Inc.	Groundwater Monitoring, May 1996 Event, Request For “No Further Action”, 6707 Bay Street, Emeryville, California	21-Jun-96

APPENDIX B

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

APPENDIX B

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

Intrusive Earthwork Guidance Plan Agreement

All project personnel and subcontractors are required to sign the following agreement prior to conducting work at the site.

1. I have read and fully understand the Plan and my individual responsibilities.
2. I agree to abide by the provisions of the Plan.

Name	Signature	Company	Date

(Add additional sheets if necessary)

APPENDIX F

POST-CONSTRUCTION OPERATIONS AND MAINTENANCE PLAN

PES Environmental, Inc.
Engineering & Environmental Services

A Report Submitted to:

Anton Emeryville, LLC
1415 L Street, Suite 450
Sacramento, California 95814

POST-CONSTRUCTION
OPERATIONS AND MAINTENANCE PLAN
6701 – 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA

MAY 19, 2015

By:

Mark B. Winters

Mark B. Winters
Senior Geologist

Kyle S. Flory, P.G.
Principal Geologist

1448.001.01.004

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LIST OF ILLUSTRATIONS

1.0 INTRODUCTION

This Post-Construction Operations and Maintenance Plan (O&M Plan) has been prepared by PES Environmental, Inc. (PES) on behalf of Anton Emeryville, LLC (Anton, the property developer), for the property located at 6701 through 6707 Shellmound Street in Emeryville, California (the site or subject property). A site plan and vicinity map is shown on Plate 1. The O&M Plan was prepared in support of planned redevelopment of the subject property including construction of a new multi-story building for multi-family residential uses on the site. The ground (first) floor development plan for the new building and exterior improvements are shown on Plate 2. This O&M Plan presents inspection, maintenance and repair procedures for maintaining the effectiveness of long-term site mitigation measures to reduce potential exposure risks associated with chemicals detected in soil and groundwater beneath the site. Details of these mitigation measures are included in the background information below.

The subject property is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case with Alameda County Environmental Health Services (ACEH) as the lead environmental regulatory agency. PES is assisting Anton in working with ACEH to obtain SLIC case closure as part of the site redevelopment process. This O&M Plan and a Site Management and Contingency Plan (SMP) have been prepared in support of the closure process for redevelopment of the site. A Land Use Covenant (LUC) is expected to be recorded for the subject property. All restrictions and requirements for regulatory agency notifications listed in the LUC are to be followed in addition to the procedures herein. This O&M Plan is listed as a component of the LUC and is incorporated into the LUC by reference.

This O&M Plan is based on current information regarding the planned site redevelopment and future configuration of the new building and related site improvements. This plan may be modified and/or amended based on conditions and changes during redevelopment construction work and the actual post-construction site conditions.

2.0 BACKGROUND INFORMATION

The site, which covers an area of approximately 2.27 acres, is located on the west side of Shellmound Street, and just east of Interstate Highway 80 (I-80) and south of Ashby Avenue, in a mixed industrial, commercial and residential area of Emeryville (Plate 1). The site is currently occupied by a two-story office building and a warehouse building. Redevelopment of the subject property, planned to commence in summer 2015, will consist of demolishing the two existing buildings and related improvements followed by grading and excavation for new construction. Planned development includes a seven-story building comprising the majority of the subject property with open parking garage, lobby, and amenities spaces occupying the first (ground) and second floors of the building. A limited portion of the first and second floors will be developed as residential units. Floors 3 through 7 will be comprised of residential units and common outdoor areas. After redevelopment, the entire site will be covered by the building, and associated paved parking and driving areas with the exception and landscaped and open areas around the perimeter of the building areas (Plate 2).

Environmental investigations conducted at the site have identified the presence of organic and inorganic chemical constituents in non-native fill materials originally used to create buildable land at the subject property. Environmental conditions at the site have been characterized, and analytical data from previous investigations indicate that petroleum hydrocarbons quantified as gasoline, diesel, and motor oil (TPHg, TPHd, and TPHmo, respectively), oil & grease, volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals (including lead) have been detected in soil and groundwater. VOCs have been detected in soil vapor samples. The occurrence of methane in soil vapor has been documented in this area of Emeryville. Methane is nontoxic to humans; however, it is a combustible gas when present between 5 and 15 percent by volume in air. Installation and maintenance of a vapor mitigation system (e.g., vapor barrier and passive vents) beneath all areas of the ground floor except the parking garage is being incorporated into the redevelopment design plans to address the potential presence of methane and VOCs in subsurface soil vapor.

Mitigation measures addressing risks potentially associated with the environmental conditions that will be incorporated into the site redevelopment include: (1) installation of a vapor mitigation system (vapor barrier and passive venting) beneath the enclosed ground floor areas of the new building (residential units, elevator pits, and common and amenity areas) to inhibit potential accumulation of VOCs and methane beneath the floor slab and potential migration of VOCs and methane in soil vapor into these ground floor building areas; (2) covering the majority of the site with low-permeability asphalt/concrete paved parking and sidewalks and the building structure concrete slabs; and (3) constructing remaining exterior landscaped and open areas with a minimum of 2 feet of clean fill material to mitigate potential for direct exposure to underlying soil and fill.

A primary component of the O&M Plan is maintenance of the “cap” over the surface of the site after redevelopment. For the purposes of this O&M Plan, the ground floor building slab/floor and elevator pit floors and walls including the associated vapor mitigation system, paved parking areas and sidewalks, and the 2-feet thickness of clean fill beneath unpaved exterior areas, constitute the “cap” for the site.

3.0 CAP MAINTENANCE PROCEDURES

The goal of the inspection and maintenance actions is to maintain the integrity of the cap. To accomplish this goal, the following: (1) details the procedures to be followed and actions to be taken; (2) defines the frequency of inspection maintenance checks; and (3) documents reporting requirements.

3.1 Maintenance and Inspection

The O&M Plan and cap maintenance procedures shall be followed by the owner of the property (and its successors). Other owner responsibilities include supervising any necessary maintenance work and repairs on the cap components, and record keeping.

The cap protects human health by reducing the potential for exposure to chemicals previously detected in soil and groundwater beneath the site. As such, it must be maintained indefinitely unless the cap is deemed unnecessary with regulatory agency approval. Maintenance activities to support the longevity of the cap and building shall be conducted on a regular basis as determined by the owner. Prior to maintenance activities, the owner shall be responsible for informing any employee or contractor of the existence of the cap and provide a copy of the O&M Plan for review. The O&M Plan shall remain on-site in a readily available location.

Annual inspection of the building interior, building exterior, and roof by the property owner, or its designee, is recommended to document the continued integrity of the cap components including the vapor barrier and venting system. The following observations should be made during each annual inspection:

1. The ground surface within approximately 10 feet of the building exterior perimeter should be inspected for evidence of significant settlement or disturbance, such as excavations;

2. The ground floor surface of the entire building interior should be inspected for evidence of damage to the concrete floor slab such as cracking, holes or other defects;

3. The floor and walls of elevator pits should be inspected for evidence of damage to the such as cracking, holes or other defects, and for possible groundwater leaks into the elevator pits;

4. The parking lot asphalt cap and other paved areas should be inspected for signs of cracking or other degradation which might compromise the integrity of the cap;

5. The unpaved landscaped and open areas should be inspected for any significant disturbance or damage including possible digging/burrowing by animals;

6. Any warning placards located in the building should be inspected to verify their presence and legibility; and

7. Any exposed vent piping for the vapor mitigation system and appurtenances on the building exterior and roof should be inspected to confirm the absence of damage and debris, the condition of the UV resistant paint, and the continued presence and legibility of warning placards.

The results of the inspection shall be documented with the results of each annual inspection retained for submittal to the regulatory agency (see Section 3.3, below). An example Annual Inspection Log form is attached.

3.2 Cap Repairs and Maintenance during Future Construction Activities

Prior to any repair or penetration of the cap, the owner shall be responsible for informing any employee or contractor who will perform the repair or penetration of: (1) the existence of the cap and provide a copy of the O&M Plan for review; (2) environmental conditions beneath the cap; and (3) the need for soil and/or groundwater management and worker health and safety considerations. A worker health and safety plan shall be prepared by a qualified environmental professional and implemented during any repair or penetration of the cap.

Breeches of the cap shall be repaired in a timely manner by a qualified contractor. Records of the repairs shall be retained at the site by the owner.

Cap maintenance procedures will be enforced during any post-development construction activities that may disturb the integrity of the cap. To maintain the integrity of the cap and to protect future site workers who may disturb the cap, the following procedures will be adhered to by the owner and/or operator of the site:

1. Notify the regulatory agency of any proposed activity expected to breech the cap thirty (30) calendar days before work commences. In the case of an emergency, the work shall be performed in accordance with the measures described in this O&M Plan, and the regulatory agency shall be notified within 48 hours of completion of the work;

2. Prepare a specific work plan that includes a description of the proposed construction activities, an excess soil and groundwater management plan (if necessary), and a worker safety plan;

3. Direct any contractor or employee who breeches the cap to comply with appropriate local, State and Federal regulations;

4. Direct any contractor or employee engaged in any activities that involve breeching the cap to repair the breeched area as soon as practicable;

5. Collect soil and groundwater produced during construction operations or during cap breeches for chemical analysis and proper disposal (if necessary); and

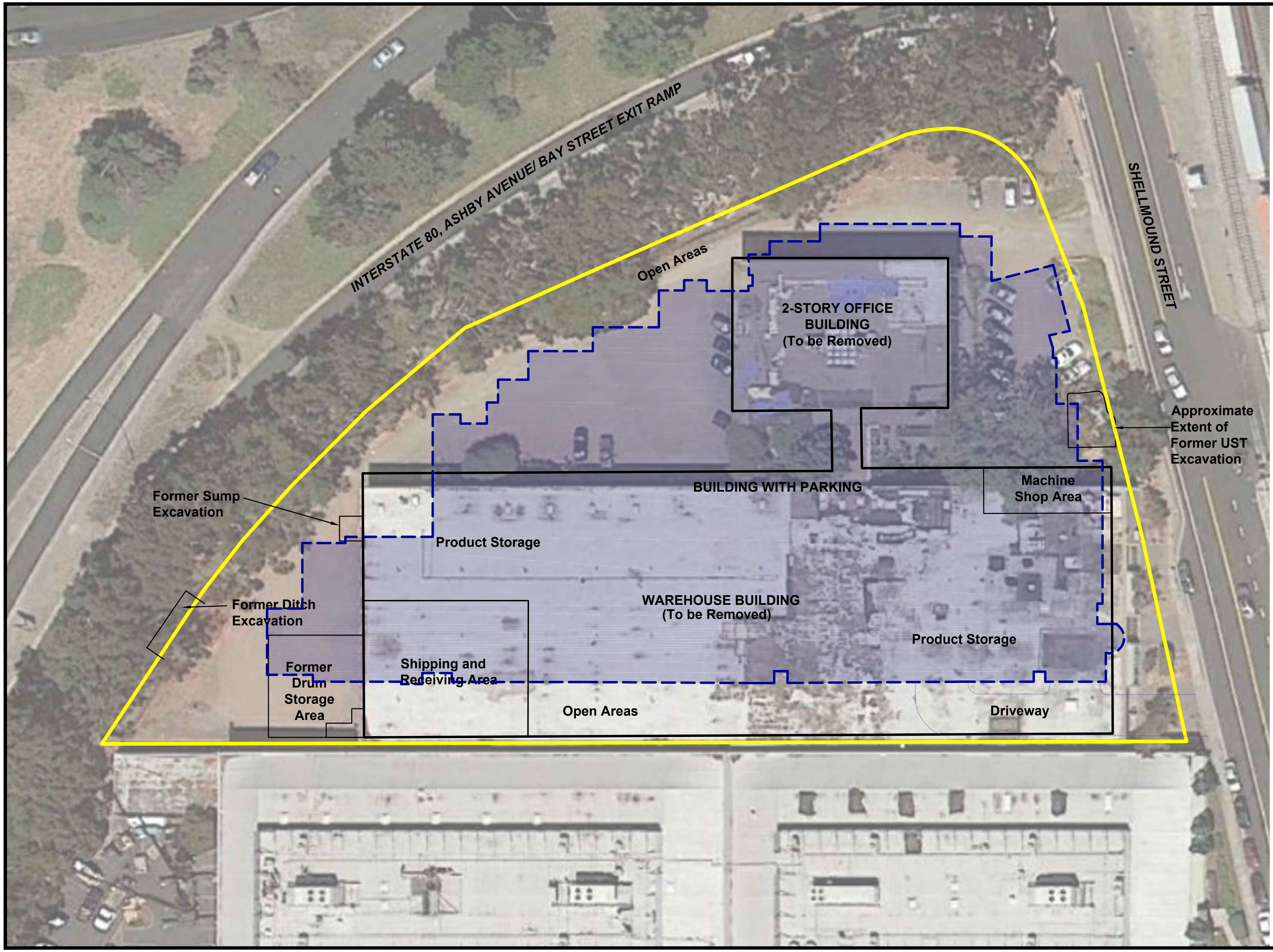
6. Prepare a written report documenting cap maintenance and repair during post-development construction and submit to the regulatory agency.

If damage or other deleterious conditions of the sub-slab vapor barrier and venting components are observed, the damaged component should be repaired or replaced to original condition and in accordance with *Procedures for Vapor Barrier Penetration and Repair* that will be provided with the vapor mitigation system as-built design. The final as-built design will be provided in the SMP Implementation Report, which should be appended to this Operations and Maintenance Plan when available.

3.3 Cap Maintenance and Inspection Reporting

A Cap Maintenance and Inspection report should be prepared and filed by the owner. This report will summarize the annual visual inspections and any maintenance and repairs that were performed to the cap during that time period.

ILLUSTRATIONS



Explanation

▭ Approximate Property Boundary

▨ Proposed Building

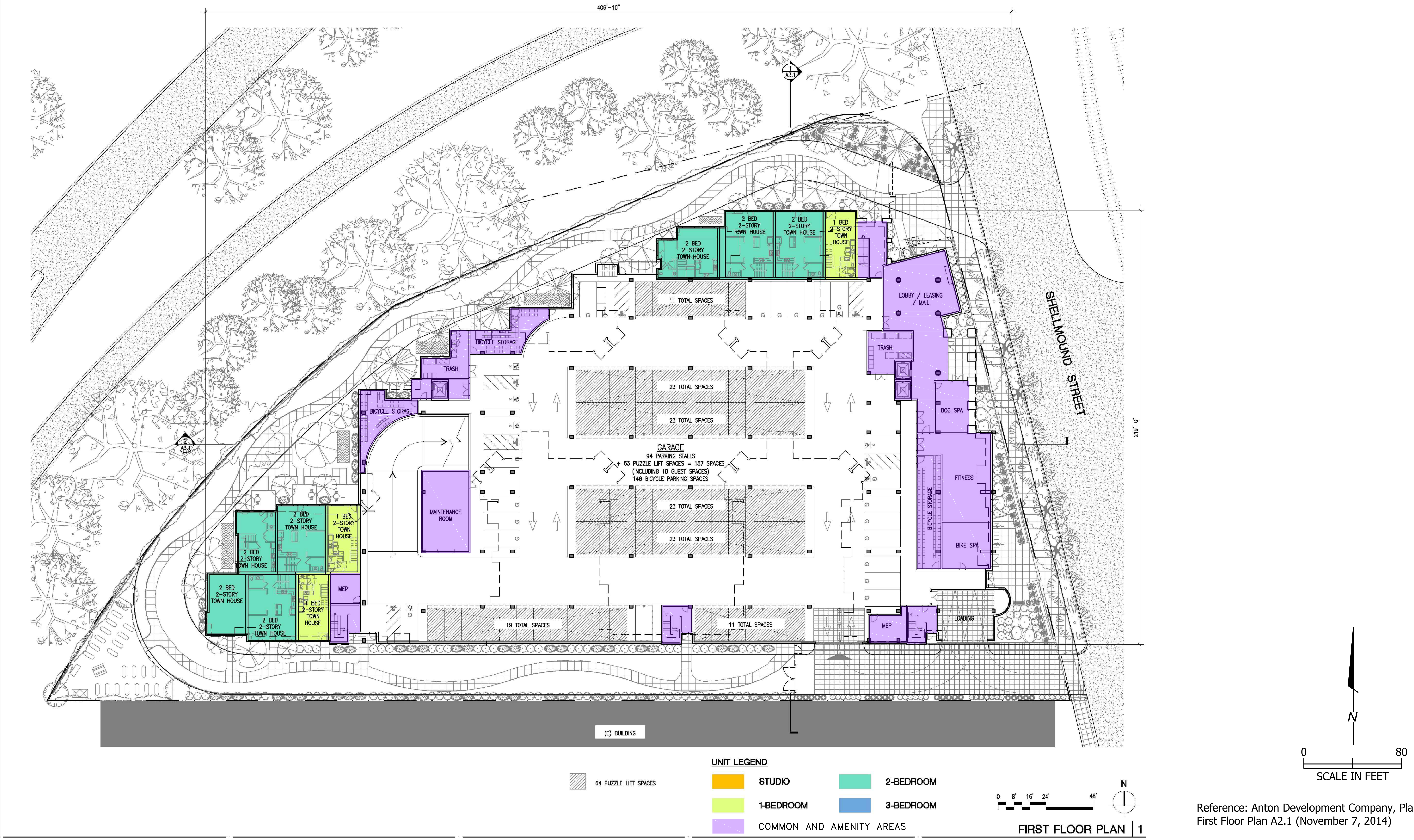
Aerial Photo: Google Earth, August 28, 2012

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan and Vicinity Map
Post-Construction Operations and Maintenance Plan
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
1

1448.001.01.004	1448-00101004_OMP_1-2	MW	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Reference: Anton Development Company, Planning Submittal, First Floor Plan A2.1 (November 7, 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Ground (first) Floor Development Plan
Post-Construction Operations and Maintenance Plan
6701, 6705, and 6707 Shellmound Street
Emeryville, California

PLATE
2

1448.001.01.004	1448-00101004_OMP_1-2	MW	5/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

APPENDIX

ANNUAL INSPECTION LOG FORM

ANNUAL INSPECTION LOG

Post-Construction Operations and Maintenance Plan
6701 – 6707 Shellmound Street
Emeryville, California

Task No.	*Inspection Task*	**Observations**	**Recommendations**	**Repair Date**
1	Inspect the ground surface within approximately 10 feet of the building exterior for evidence of disturbance (such as excavation) or settlement.			
2	Inspect the ground floor surface (leaving floor coverings intact) of the building interior for evidence of settlement, cracking, other damage to the floor slab, or unauthorized construction that penetrates the floor slab.			
3	Inspect floor and walls of elevator pits for evidence of concrete deterioration (cracks, holes, settlement, discoloration) unusual moisture or water, or unauthorized construction that penetrates floors or walls.			
4	Inspect the parking lot asphalt pavement and other paved areas for signs of cracking, settlement, and other degradation, or unauthorized construction that penetrates asphalt/pavement.			

5	Inspect the unpaved landscape and open areas for disturbance including settlement, signs of digging and burrowing animals, or unauthorized construction that penetrates the 2-feet thickness of clean fill.			
6	Inspect the warning placards within the building to verify their presence and legibility.			
7	Inspect exposed vent piping on the building exterior and roof for warning labels, paint condition, vent cap, damage, or obstructions.			
8	Other observations, as applicable.			

Name of Inspector: ______________________________ Affiliation: ____________________

Signature of Inspector: ______________________________ Inspection Date: ____________________

APPENDIX G

DATA FROM PREVIOUS ENVIRONMENTAL INVESTIGATION REPORTS
(PROVIDED ON CD-ROM)

PERTINENT TABLES AND PLATES EXCERPTED FROM REPORTS PREPARED BY PES ENVIRONMENTAL

Table 1
Summary of Laboratory Analytical Results for Soil - VOCs
6701 Shellmound Street
Emeryville, California

Boring Location	Sample Number	Sample Depth (Feet bgs)	Date Collected	Acetone (µg/kg)	Other VOCs (µg/kg)
SB2	SB2-4.0	4	11/7/2013	ND(20)	ND
SB2	SB2-7.5	7.5	11/7/2013	**35**	ND
Residential Soil RSLs [(1)]				**6,100,000**	N/A

Notes:

Detections are shown in bold.

bgs = Below ground surface.

VOCs = Volatile organic compounds.

µg/kg = Micrograms per kilogram.

ND(20) = Not detected at or above the indicated laboratory reporting limit.

ND = Not detected.

NE = Not Established.

N/A = Not applicable.

1. United States Environmental Protection Agency (U.S. EPA), Region 9, November 2013 Regional Screening Levels (RSLs) for residential soil.

▨ - Results equal to or exceeding RSLs are shaded.

Table 2
Summary of laboratory Analytical Results for Soil - SVOCs
6701 Shellmound Street
Emeryville, California

Boring Location	Sample Number	Sample Depth (Feet bgs)	Date Collected	Acenaphthene (µg/kg)	Acenaphthylene (µg/kg)	Anthracene (µg/kg)	Benzo (a) Anthracene (µg/kg)	Benzo (a) Pyrene (µg/kg)	Benzo (b) Fluoranthene (µg/kg)	Benzo (k) Fluoranthene (µg/kg)	Benzo (g,h,i) Perylene (µg/kg)	Chrysene (µg/kg)	Fluoranthene (µg/kg)	Fluorene (µg/kg)	Indeno (1,2,3-cd) Pyrene (µg/kg)	2-Methyl-naphthalene (µg/kg)	4-Methylphenol (µg/kg)	Naphthalene (µg/kg)	N-Nitrosodi-phenylamine (µg/kg)	Phenanthrene (µg/kg)	Pyrene (µg/kg)
SB2	SB2-4.0	4	11/7/2013	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(330)	ND(67)	ND(330)	ND(67)	ND(67)
SB2	SB2-7.5	7.5	11/7/2013	ND(130)	**270**	**630**	**1,200**	**970**	**970**	**380**	**330**	**1,400**	**2,100**	**210**	**340**	ND(130)	ND(660)	ND(130)	ND(660)	**2,400**	**2,300**
SB6	SB6-4.0	4	11/7/2013	ND(660)	ND(660)	**1,200**	**2,400**	**3,000**	**3,700**	**1,500**	**1,400**	**2,900**	**4,400**	**810**	**1,300**	ND(660)	ND(3,300)	**2,900**	ND(3,300)	**5,500**	**4,500**
SB6	SB6-10.0	10	11/7/2013	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(330)	ND(67)	ND(330)	ND(67)	ND(67)
SB7	SB7-2.5	2.5	11/8/2013	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	**10,000**	**1,500**	ND(1,700)	**450**	ND(330)
SB7	SB7-8.0	8	11/8/2013	**500**	ND(330)	**340**	**340**	ND(330)	ND(330)	ND(330)	ND(330)	**470**	**1,100**	**680**	ND(330)	**9,200**	ND(1,600)	**28,000**	**1,700**	**2,400**	**1,100**
SB11	SB11-2.0	2	11/8/2013	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(1,300)	ND(6,600)	ND(1,300)	ND(6,600)	ND(1,300)	**1,300**
SB11	SB11-5.5	5.5	11/8/2013	ND(670)	ND(670)	ND(670)	ND(670)	**980**	**980**	ND(670)	ND(670)	**820**	**1,800**	ND(670)	ND(670)	ND(670)	ND(3,300)	ND(670)	ND(3,300)	**750**	**2,300**
SB13	SB13-1.5	1.5	11/8/2013	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	ND(66)	**92**	ND(330)	**260**	ND(330)	ND(66)	**79**
SB13	SB13-10.0	10	11/8/2013	ND(1,700)	ND(1,700)	ND(1,700)	**2,000**	ND(1,700)	**1,800**	ND(1,700)	ND(1,700)	**2,100**	**4,200**	ND(1,700)	ND(1,700)	**2,000**	ND(8,300)	**2,100**	ND(8,300)	**7,500**	**4,000**
Residential Soil RSLs [(1)]				340,000	NE	1,700,000	150	15	150	1,500	NE	15,000	230,000	230,000	150	23,000	NE	3,600	NE	NE	170,000

Notes:

Detections are shown in bold.

bgs = Below ground surface

µg/kg = Micrograms per kilogram.

ND(67) = Not detected at or above the indicated laboratory reporting limit.

NE = Not established

1. United States Environmental Protection Agency (U.S. EPA), Region 9, November 2013 Regional Screening Levels (RSLs) for residential soil.

▨ - Results equal to or exceeding RSLs are shaded

Table 3
Summary of laboratory Analytical Results for Soil - PCBs
6701 Shellmound Street
Emeryville, California

Boring Location	Sample Number	Depth (feet bgs)	Date Collected	Aroclor-1016 (µg/kg)	Aroclor-1221 (µg/kg)	Aroclor-1232 (µg/kg)	Aroclor-1242 (µg/kg)	Aroclor-1248 (µg/kg)	Aroclor-1254 (µg/kg)	Aroclor-1260 (µg/kg)	Aroclor-1262 (µg/kg)	Aroclor-1268 (µg/kg)	Total PCBs (µg/kg)
SB5	SB5-3.0	3	11/7/2013	ND(170)	ND(330)	ND(170)	ND(170)	ND(170)	ND(170)	**10,000**	ND(170)	ND(170)	**10,000**
SB5	SB5-8.0	8	11/7/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	**180**	ND(12)	**180**
SB5	SB5-11.5	11.5	11/7/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	**140**	ND(12)	**140**
SB6	SB6-4.0	4	11/7/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	**570**	ND(12)	ND(12)	**570**
SB6	SB6-8.0	8	11/7/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	**160**	ND(12)	**160**
SB6	SB6-10.0	10	11/7/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	**48**	ND(12)	**48**
SB7	SB7-2.5	2.5	11/8/2013	ND(82)	ND(160)	ND(82)	ND(82)	ND(82)	ND(82)	**1,900**	ND(82)	ND(82)	**1,900**
SB7	SB7-8.0	8	11/8/2013	ND(42)	ND(84)	ND(42)	ND(42)	ND(42)	ND(42)	ND(42)	**1,500**	ND(42)	**1,500**
SB11	SB11-2.0	2	11/8/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	**380**	ND(12)	ND(12)	**380**
SB11	SB11-5.5	5.5	11/8/2013	ND(42)	ND(83)	ND(42)	ND(42)	ND(42)	ND(42)	**1,200**	ND(42)	**1,400**	**2,600**
SB12	SB12-2.0	2	11/8/2013	ND(42)	ND(85)	ND(42)	ND(42)	ND(42)	ND(42)	**2,000**	ND(42)	ND(42)	**2,000**
SB12	SB12-5.0	5	11/8/2013	ND(41)	ND(82)	ND(41)	ND(41)	ND(41)	ND(41)	ND(41)	**1,200**	ND(41)	**1,200**
SB12	SB12-10.0	10	11/8/2013	ND(83)	ND(170)	ND(83)	ND(83)	ND(83)	ND(83)	ND(83)	**6,500**	ND(83)	**6,500**
SB13	SB13-1.5	1.5	11/8/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	**270**	ND(12)	ND(12)	**270**
SB13	SB13-5.0	5	11/8/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	**18**	ND(12)	ND(12)	**18**
SB13	SB13-10.0	10	11/8/2013	ND(84)	ND(170)	ND(84)	ND(84)	ND(84)	ND(84)	**3,300**	ND(84)	**1,900**	**5,200**
SB14	SB14-3.5	3.5	11/9/2013	ND(12)	ND(24)	ND(12)	ND(12)	ND(12)	ND(12)	**13**	ND(12)	ND(12)	**13**
Residential Soil RSLs (1)				**390**	**140**	**140**	**220**	**220**	**110**	**220**	**NE**	**NE**	**NE**

Notes:

Detections are shown in bold.

bgs = below ground surface.

µg/kg = Micrograms per kilogram.

PCBs= Polychlorinated biphenyls.

ND(24) = Compound not detected at or above the indicated laboratory reporting limit.

NE = Not established.

1. United States Environmental Protection Agency (U.S. EPA), Region 9, November 2013 Regional Screening Levels (RSLs) for residential soil.

▨ - Results equal to or exceeding RSLs are shaded.

Table 4
Summary of laboratory Analytical Results for Soil - California Title 22 Metals, STLC, and TCLP
6701 Shellmound Street
Emeryville, California

Boring Location	Sample Number	Sample Depth (Feet bgs)	Date Collected	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	STLC Lead (mg/L)	TCLP Lead (mg/L)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
SB1	SB1-1.0	1	11/7/2013	ND(0.51)	5.9	160	0.39	0.94	86	13	52	81	--	--	0.22	ND(0.25)	100	ND(0.51)	ND(0.25)	ND(0.51)	51	190
SB1	SB1-5.5	5.5	11/7/2013	--	--	--	--	--	--	--	--	1,300	--	8.1	--	--	--	--	--	--	--	--
SB1	SB1-11.75	11.75	11/7/2013	--	--	--	--	--	--	--	--	2,400	--	0.75	--	--	--	--	--	--	--	--
SB2	SB2-4.0	4	11/7/2013	--	--	--	--	--	--	--	--	20	--	--	--	--	--	--	--	--	--	--
SB2	SB2-7.5	7.5	11/7/2013	--	--	--	--	--	--	--	--	120	2.7	--	--	--	--	--	--	--	--	--
SB2	SB2-10.75	10.75	11/7/2013	--	--	--	--	--	--	--	--	240	--	--	--	--	--	--	--	--	--	--
SB3	SB3-1.5	1.5	11/7/2013	ND(0.46)	3.4	150	0.59	0.44	16	6.9	16	14	--	--	0.39	ND(0.23)	23	ND(0.46)	ND(0.23)	ND(0.46)	26	46
SB3	SB3-7.5	7.5	11/7/2013	--	--	--	--	--	--	--	--	340	1.8	1.1	--	--	--	--	--	--	--	--
SB3	SB3-11.0	11	11/7/2013	3.3	7.5	810	0.39	4.3	46	10	170	460	--	--	0.17	4.6	38	ND(0.50)	ND(0.25)	ND(0.50)	42	920
SB4	SB4-1.5	1.5	11/7/2013	--	--	--	--	--	--	--	--	18	--	--	--	--	--	--	--	--	--	--
SB4	SB4-5.0	5	11/7/2013	--	--	--	--	--	--	--	--	110	7.5	--	--	--	--	--	--	--	--	--
SB4	SB4-10.0	10	11/7/2013	--	--	--	--	--	--	--	--	10,000	--	2.4	--	--	--	--	--	--	--	--
SB5	SB5-3.0	3	11/7/2013	--	--	--	--	--	--	--	--	430	7.7	0.27	--	--	--	--	--	--	--	--
SB5	SB5-8.0	8	11/7/2013	3.1	6.7	100	0.21	0.77	39	6.3	100	100	--	--	0.19	0.34	38	ND(0.50)	ND(0.25)	ND(0.50)	29	170
SB5	SB5-11.5	11.5	11/7/2013	--	--	--	--	--	--	--	--	1,100	--	1.0	--	--	--	--	--	--	--	--
SB6	SB6-4.0	4	11/7/2013	--	--	--	--	--	--	--	--	140	--	--	--	--	--	--	--	--	--	--
SB6	SB6-8.0	8	11/7/2013	--	--	--	--	--	--	--	--	58	--	--	--	--	--	--	--	--	--	--
SB6	SB6-10.0	10	11/7/2013	7.5	5.6	140	0.27	1.9	140	16	390	160	--	--	0.13	4.9	190	6.0	ND(0.26)	ND(0.52)	41	270
SB7	SB7-2.5	2.5	11/8/2013	0.75	5.0	160	0.25	1.2	34	9.0	74	120	--	--	0.19	0.69	49	0.66	ND(0.23)	ND(0.47)	35	220
SB7	SB7-8.0	8	11/8/2013	--	--	--	--	--	--	--	--	250	39	--	--	--	--	--	--	--	--	--
SB7	SB7-12.5	12.5	11/8/2013	--	--	--	--	--	--	--	--	2.1	--	--	--	--	--	--	--	--	--	--
SB8	SB8-3.5	3.5	11/8/2013	--	--	--	--	--	--	--	--	200	--	--	--	--	--	--	--	--	--	--
SB8	SB8-8.0	8	11/8/2013	ND(0.51)	2.3	32	ND(0.10)	ND(0.25)	33	4.4	4.7	3.1	--	--	ND(0.016)	ND(0.25)	24	ND(0.51)	ND(0.25)	ND(0.51)	26	19
SB8	SB8-12.0	12	11/8/2013	--	--	--	--	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--
SB9	SB9-4.5	4.5	11/8/2013	ND(0.49)	5.4	120	0.32	0.81	45	10	46	41	--	--	0.12	1.5	38	ND(0.49)	ND(0.24)	ND(0.49)	36	110
SB9	SB9-10.0	10	11/8/2013	--	--	--	--	--	--	--	--	50	--	--	--	--	--	--	--	--	--	--
SB10	SB10-2.0	2	11/8/2013	ND(0.47)	6.9	550	0.33	0.58	38	6.9	27	45	--	--	0.15	0.61	36	ND(0.47)	ND(0.23)	ND(0.47)	34	90
SB10	SB10-5.0	5	11/8/2013	--	--	--	--	--	--	--	--	49	--	--	--	--	--	--	--	--	--	--
SB10	SB10-10.0	10	11/8/2013	--	--	--	--	--	--	--	--	21	--	--	--	--	--	--	--	--	--	--
SB11	SB11-2.0	2	11/8/2013	--	--	--	--	--	--	--	--	28	--	--	--	--	--	--	--	--	--	--
SB11	SB11-5.5	5.5	11/8/2013	0.62	9.2	140	0.26	1.2	160	10	260	170	--	--	0.17	21	170	ND(0.54)	ND(0.27)	ND(0.54)	36	300
SB11	SB11-11.5	11.5	11/8/2013	--	--	--	--	--	--	--	--	1.7	--	--	--	--	--	--	--	--	--	--
SB12	SB12-2.0	2	11/8/2013	--	--	--	--	--	--	--	--	130	12	1.1	--	--	--	--	--	--	--	--
SB12	SB12-5.0	5	11/8/2013	--	--	--	--	--	--	--	--	320	--	--	--	--	--	--	--	--	--	--
SB12	SB12-10.0	10	11/8/2013	ND(0.49)	5.9	210	0.27	1.3	31	6.6	44	290	--	--	0.18	0.28	29	ND(0.49)	ND(0.25)	ND(0.49)	30	1,900
SB13	SB13-1.5	1.5	11/8/2013	--	--	--	--	--	--	--	--	68	--	--	--	--	--	--	--	--	--	--
SB13	SB13-5.0	5	11/8/2013	ND(0.47)	8.4	270	0.42	0.70	23	26	30	54	--	--	0.070	0.37	27	1.6	ND(0.23)	ND(0.47)	45	100
SB13	SB13-10.0	10	11/8/2013	--	--	--	--	--	--	--	--	3,300	--	--	--	--	--	--	--	--	--	--
SB14	SB14-3.5	3.5	11/9/2013	ND(0.46)	7.7	170	0.54	0.67	140	19	33	11	--	--	0.060	ND(0.23)	190	4.5	ND(0.23)	ND(0.46)	53	63
SB14	SB14-8.5	8.5	11/9/2013	--	--	--	--	--	--	--	--	100	--	--	--	--	--	--	--	--	--	--
SB14	SB14-11.5	11.5	11/9/2013	--	--	--	--	--	--	--	--	250	--	--	--	--	--	--	--	--	--	--

Table 4
Summary of laboratory Analytical Results for Soil - California Title 22 Metals, STLC, and TCLP
6701 Shellmound Street
Emeryville, California

Boring Location	Sample Number	Sample Depth (Feet bgs)	Date Collected	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	STLC Lead (mg/L)	TCLP Lead (mg/L)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
SB15	SB15-2.5	2.5	11/9/2013	--	--	--	--	--	--	--	--	8.2	--	--	--	--	--	--	--	--	--	--
SB15	SB15-7.5	7.5	11/9/2013	3.8	4.6	250	0.27	13	43	6.6	460	870	--	--	0.14	0.43	48	ND(0.50)	ND(0.25)	ND(0.50)	40	1,700
SB15	SB15-11.5	11.5	11/9/2013	--	--	--	--	--	--	--	--	130	--	--	--	--	--	--	--	--	--	--
SB16	SB16-2.5	2.5	11/9/2013	--	--	--	--	--	--	--	--	19	--	--	--	--	--	--	--	--	--	--
SB16	SB16-7.5	7.5	11/9/2013	--	--	--	--	--	--	--	--	280	14	1.8	--	--	--	--	--	--	--	--
SB16	SB16-10.5	10.5	11/9/2013	1.4	11	180	0.34	0.89	53	8.7	51	210	--	--	0.24	ND(0.26)	34	3.4	ND(0.26)	ND(0.52)	41	510
SB17	SB17-2.0	2	11/9/2013	ND(0.47)	7.8	150	0.46	0.61	41	12	32	54	--	--	0.12	ND(0.24)	43	ND(0.47)	ND(0.24)	ND(0.47)	53	87
SB17	SB17-5.0	5	11/9/2013	--	--	--	--	--	--	--	--	27	--	--	--	--	--	--	--	--	--	--
SB17	SB17-9.5	9.5	11/9/2013	--	--	--	--	--	--	--	--	150	--	--	--	--	--	--	--	--	--	--
SB18	SB18-2.0	2	11/9/2013	--	--	--	--	--	--	--	--	30	--	--	--	--	--	--	--	--	--	--
SB18	SB18-5.0	5	11/9/2013	--	--	--	--	--	--	--	--	34	--	--	--	--	--	--	--	--	--	--
SB18	SB18-10.0	10	11/9/2013	ND(0.48)	49	640	0.47	5.5	43	13	450	650	--	--	0.41	5.1	190	2.8	ND(0.24)	ND(0.48)	11,000	2,500
Residential Soil RSLs (2)				3.1	0.61	1,500	16	7.0	12,000 (1)	2.3	310	400	N/A	N/A	1.0	39	150	39	39	0.078	39	2,300
TTLC (3)				500	500	10,000	75	100	2,500	8,000	2,500	1,000	N/A	N/A	20	3,500	2,000	100	500	700	2,400	5,000
STLC and TCLP Regulatory Thresholds				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0	5.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

Detections are shown in bold.

bgs = Below ground surface.

mg/kg = Milligrams per kilogram.

mg/L = Milligrams per liter.

ND(0.24) = Not detected at or above the indicated laboratory reporting limit.

-- = Not analyzed.

N/A = Not applicable.

STLC = Soluble Threshold Limit Concentration.

TCLP = Toxicity Characteristic Leaching Procedure.

1. Value is for chromium III.
2. United States Environmental Protection Agency (U.S. EPA), Region 9, November 2013 Regional Screening Levels (RSLs) for residential soil.
3. TTLC = Total Threshold Limit Concentration.

▨ - Results equal to or exceeding RSLs, STLC or TCLP values are shaded.

Table 5
Summary of Laboratory Analytical Results for Groundwater - Dissolved California Title 22 Metals
6701 Shellmound Street
Emeryville, California

Boring Location	Pre-Pack Well Screen Depth (feet bgs)	Date Collected	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
GGW-1	10 to 20	11/11/2013	ND(10)	ND(5.0)	250	ND(2.0)	ND(5.0)	8.9	ND(5.0)	ND(5.0)	59	0.28	10	5.4	27	ND(5.0)	ND(10)	71	210
GGW-2	10 to 20	11/11/2013	ND(10)	6.4	280	ND(2.0)	ND(5.0)	8.0	ND(5.0)	9.1	190	0.41	ND(5.0)	8.5	26	ND(5.0)	ND(10)	22	360
GGW-3	10 to 20	11/11/2013	ND(10)	32	340	ND(2.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	17	ND(0.20)	8.7	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	29
GGW-4	10 to 20	11/11/2013	ND(10)	ND(5.0)	200	ND(2.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	1.3 J	ND(0.20)	10	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(20)
GGW-5	10 to 20	11/11/2013	ND(10)	ND(5.0)	350	ND(2.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	9.9	0.21	6.6	6.4	ND(10)	ND(5.0)	ND(10)	ND(5.0)	23
GGW-6	10 to 20	11/11/2013	ND(10)	ND(5.0)	94	ND(2.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	3.1 J	ND(0.20)	5.9	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(20)
	California MCLs (1)		6.0	10	1,000	4.0	5.0	50 (2)	NE	1,300	15	2.0	NE	100	50	NE	2.0	NE	NE

Notes:

Detections are shown in bold.

Analytical results presented in micrograms per liter (µg/L).

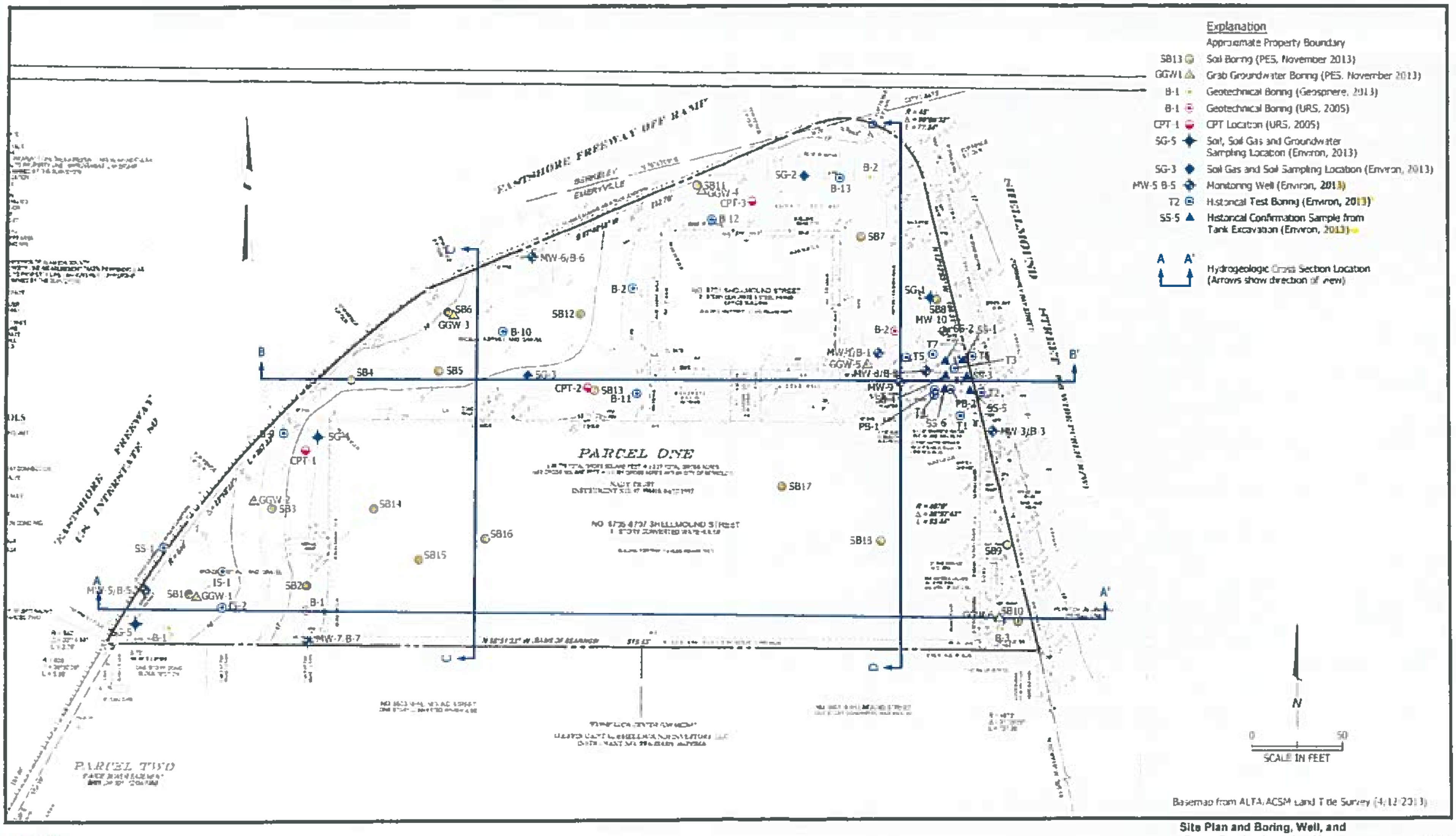
bgs = below ground surface.

ND(5.0) = Compound not detected at or above the indicated laboratory reporting limit.

J = Estimated value.

1. California Department of Public Health Maximum Contaminant Levels (MCLs).
2. ESL value is for chromium (total).

▨ - Results equal to or exceeding MCLs are shaded.

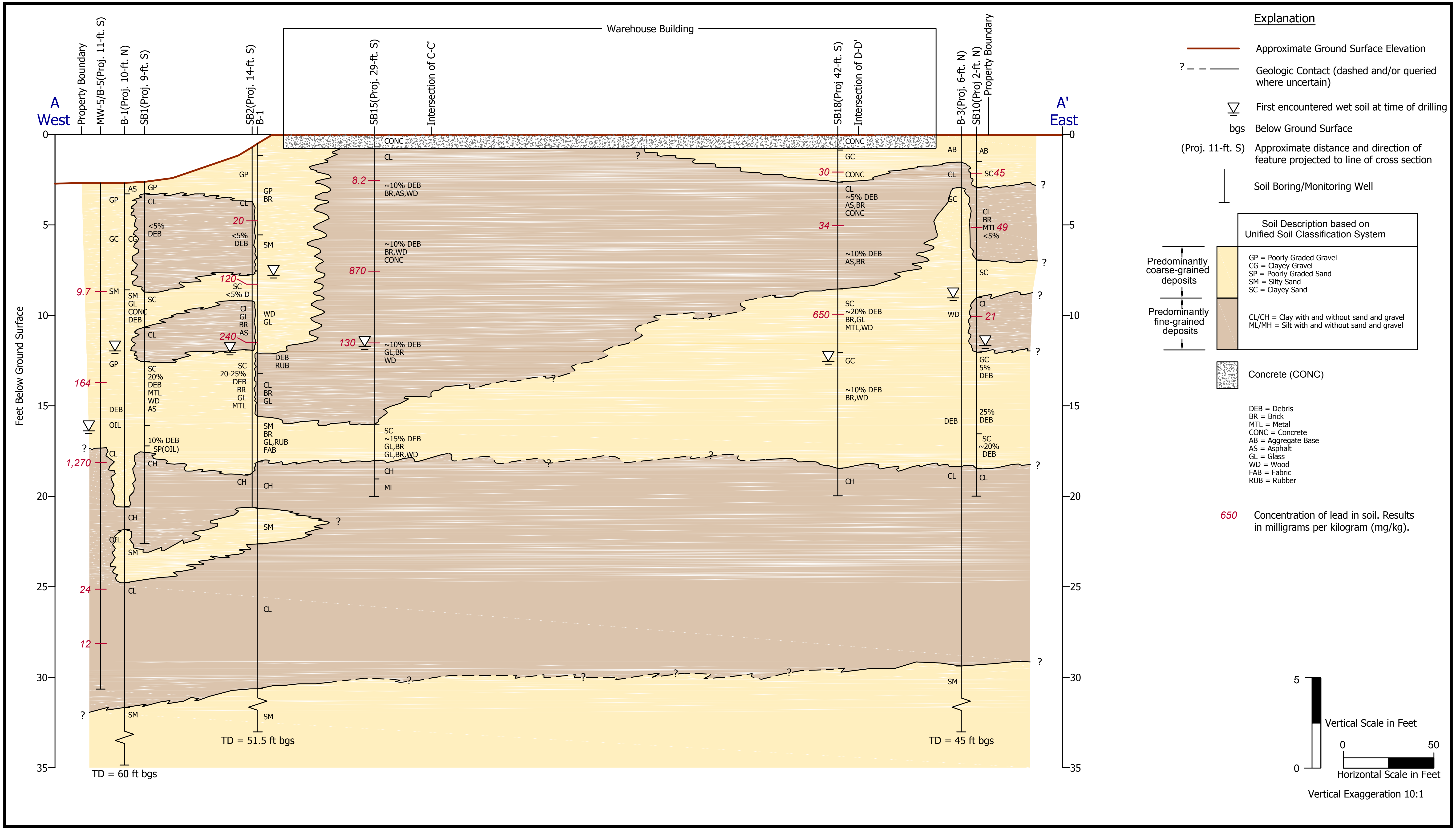


PES Environmental, Inc.
Engineering & Environmental Services

Site Plan and Boring, Well, and Cross Section Location Map
Supplemental Subsurface Investigation Report
6701 Shellmound Street
Emeryville, California

2

1386.001.01.005 138600101005_rsec_1-6 GDT 1/14



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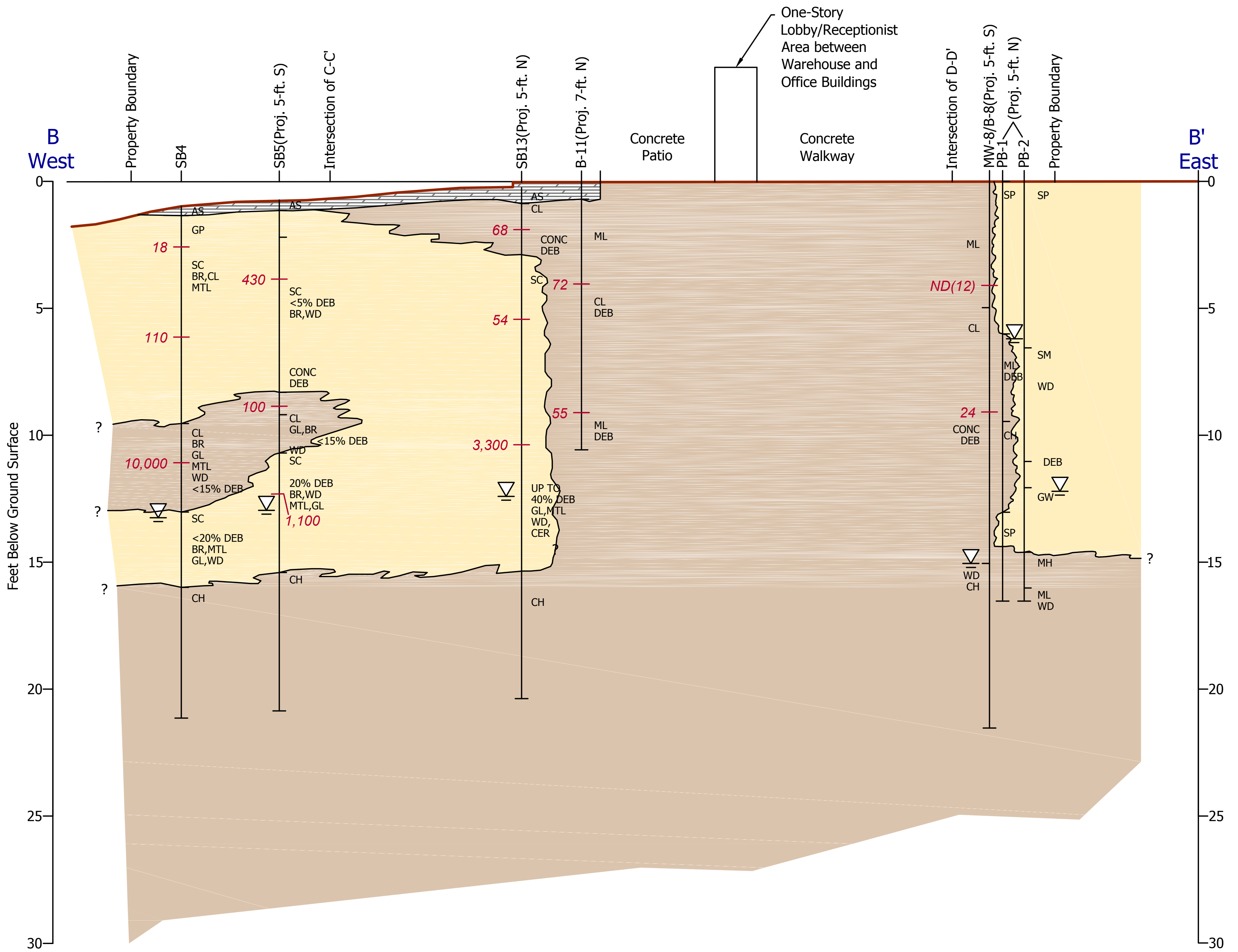
Cross Section A-A'
Supplemental Subsurface Investigation Report
6701 Shellmound Street
Emeryville, California

PLATE
3

1386.001.01.005	138600101005_xsec_1-6	GDT	1/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

Approximate Ground Surface Elevation

? Geologic Contact (dashed and/or queried where uncertain)

First encountered wet soil at time of drilling

bgs Below Ground Surface

(Proj. 5-ft. S) Approximate distance and direction of feature projected to line of cross section

Soil Boring/Monitoring Well

Soil Description based on Unified Soil Classification System

Predominantly coarse-grained deposits
- GP = Poorly Graded Gravel
- CG = Clayey Gravel
- SP = Poorly Graded Sand
- SM = Silty Sand
- SC = Clayey Sand

Predominantly fine-grained deposits
- CL/CH = Clay with and without sand and gravel
- ML/MH = Silt with and without sand and gravel

▨ Asphalt (AS)

DEB = Debris
BR = Brick
MTL = Metal
CONC = Concrete
AB = Aggregate Base
AS = Asphalt
GL = Glass
WD = Wood
FAB = Fabric
RUB = Rubber

3,300 Concentration of lead in soil. Results in milligrams per kilogram (mg/kg).

ND(12) Not detected at or above the indicated laboratory reporting limit.

5 0 Vertical Scale in Feet

0 50 Horizontal Scale in Feet

Vertical Exaggeration 10:1

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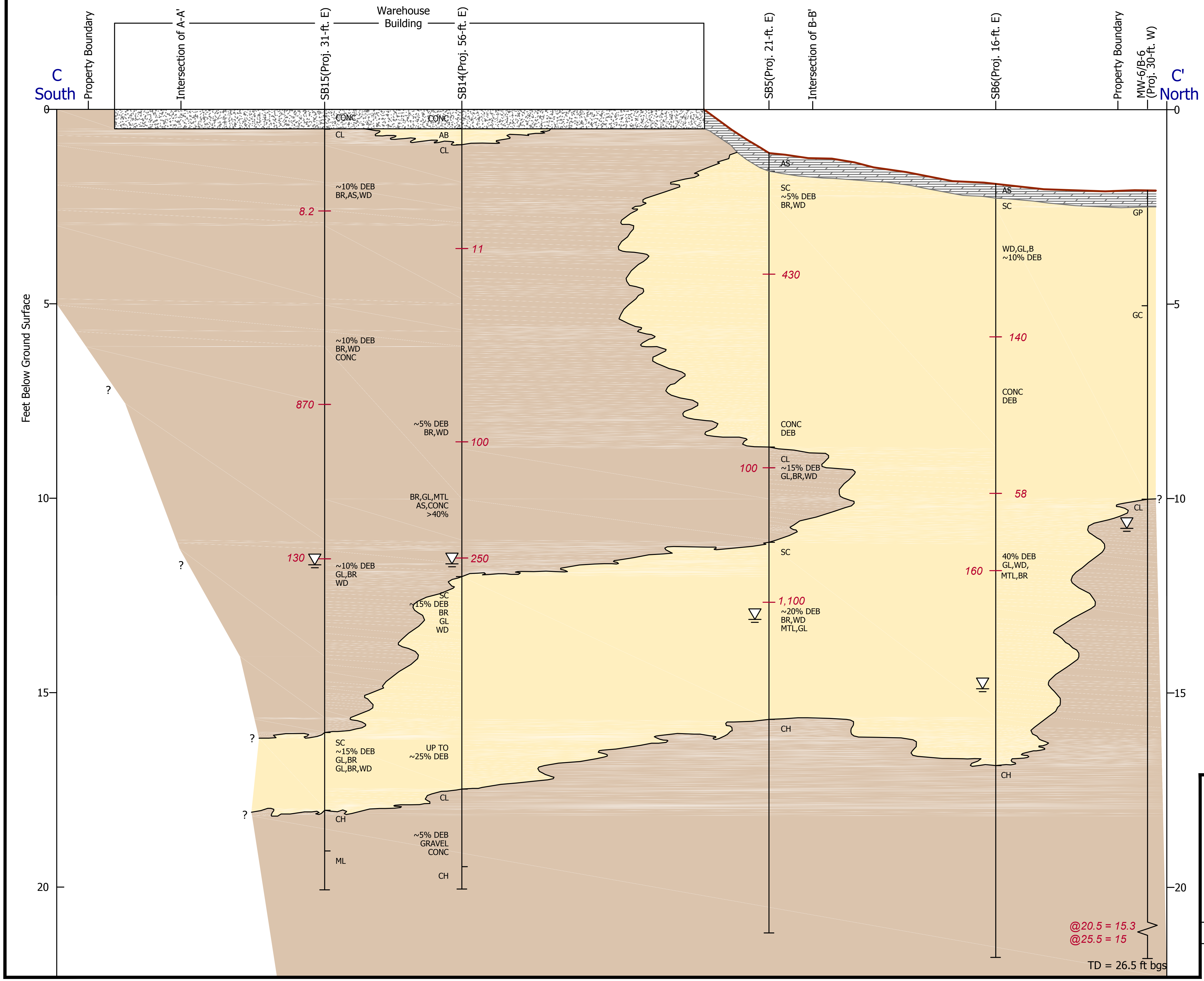
Cross Section B-B'
Supplemental Subsurface Investigation Report
6701 Shellmound Street
Emeryville, California

PLATE
4

1386.001.01.005	138600101005_xsec_1-6	GDT	1/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

Approximate Ground Surface Elevation

? – – —— Geologic Contact (dashed and/or queried where uncertain)

▽ First encountered wet soil at time of drilling

bgs Below Ground Surface

(Proj. 31-ft. E) Approximate distance and direction of feature projected to line of cross section

Soil Boring/Monitoring Well

Soil Description based on Unified Soil Classification System

Predominantly coarse-grained deposits

GP = Poorly Graded Gravel
CG = Clayey Gravel
SP = Poorly Graded Sand
SM = Silty Sand
SC = Clayey Sand

Predominantly fine-grained deposits

CL/CH = Clay with and without sand and gravel
ML/MH = Silt with and without sand and gravel

▤ Asphalt (AS)

▨ Concrete (CONC)

DEB = Debris
BR = Brick
MTL = Metal
CONC = Concrete
AB = Aggregate Base
AS = Asphalt
GL = Glass
WD = Wood
FAB = Fabric
RUB = Rubber

1,100 Concentration of lead in soil. Results in milligrams per kilogram (mg/kg).

2.5
0
Vertical Scale in Feet

0 20
Horizontal Scale in Feet

Vertical Exaggeration 8:1

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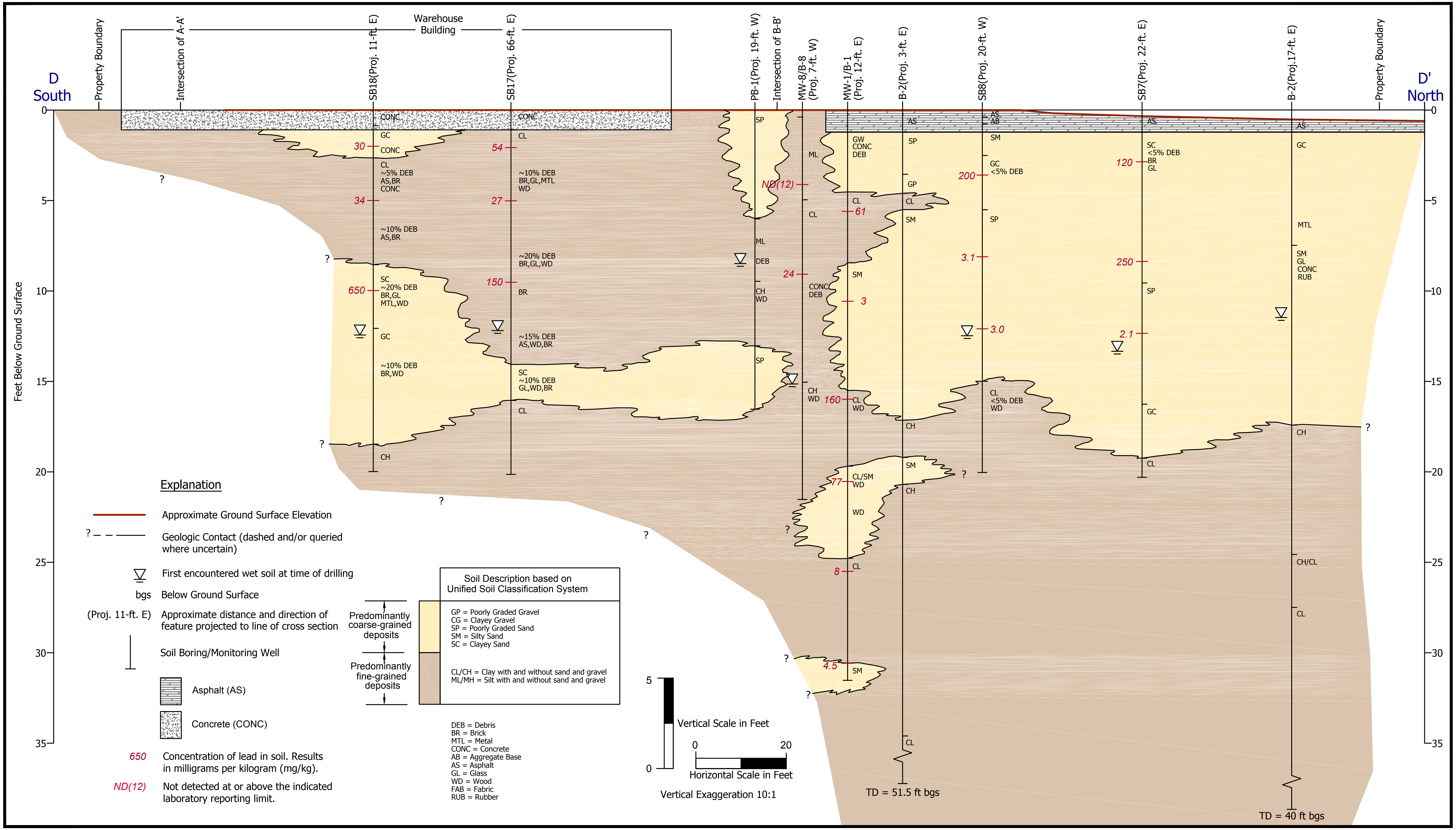
Engineering & Environmental Services

Cross Section C-C'
Supplemental Subsurface Investigation Report
6701 Shellmound Street
Emeryville, California

PLATE
5

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1386.001.01.005	138600101005_xsec_1-6	GDT	1/14



Explanation

Approximate Ground Surface Elevation

? – – —— Geologic Contact (dashed and/or queried where uncertain)

▽ First encountered wet soil at time of drilling

bgs Below Ground Surface

(Proj. 11-ft. E) Approximate distance and direction of feature projected to line of cross section

Soil Boring/Monitoring Well

▤ Asphalt (AS)

▨ Concrete (CONC)

650 Concentration of lead in soil. Results in milligrams per kilogram (mg/kg).

ND(12) Not detected at or above the indicated laboratory reporting limit.

		Soil Description based on Unified Soil Classification System
Predominantly coarse-grained deposits	🟨	GP = Poorly Graded Gravel CG = Clayey Gravel SP = Poorly Graded Sand SM = Silty Sand SC = Clayey Sand
Predominantly fine-grained deposits	🟫	CL/CH = Clay with and without sand and gravel ML/MH = Silt with and without sand and gravel

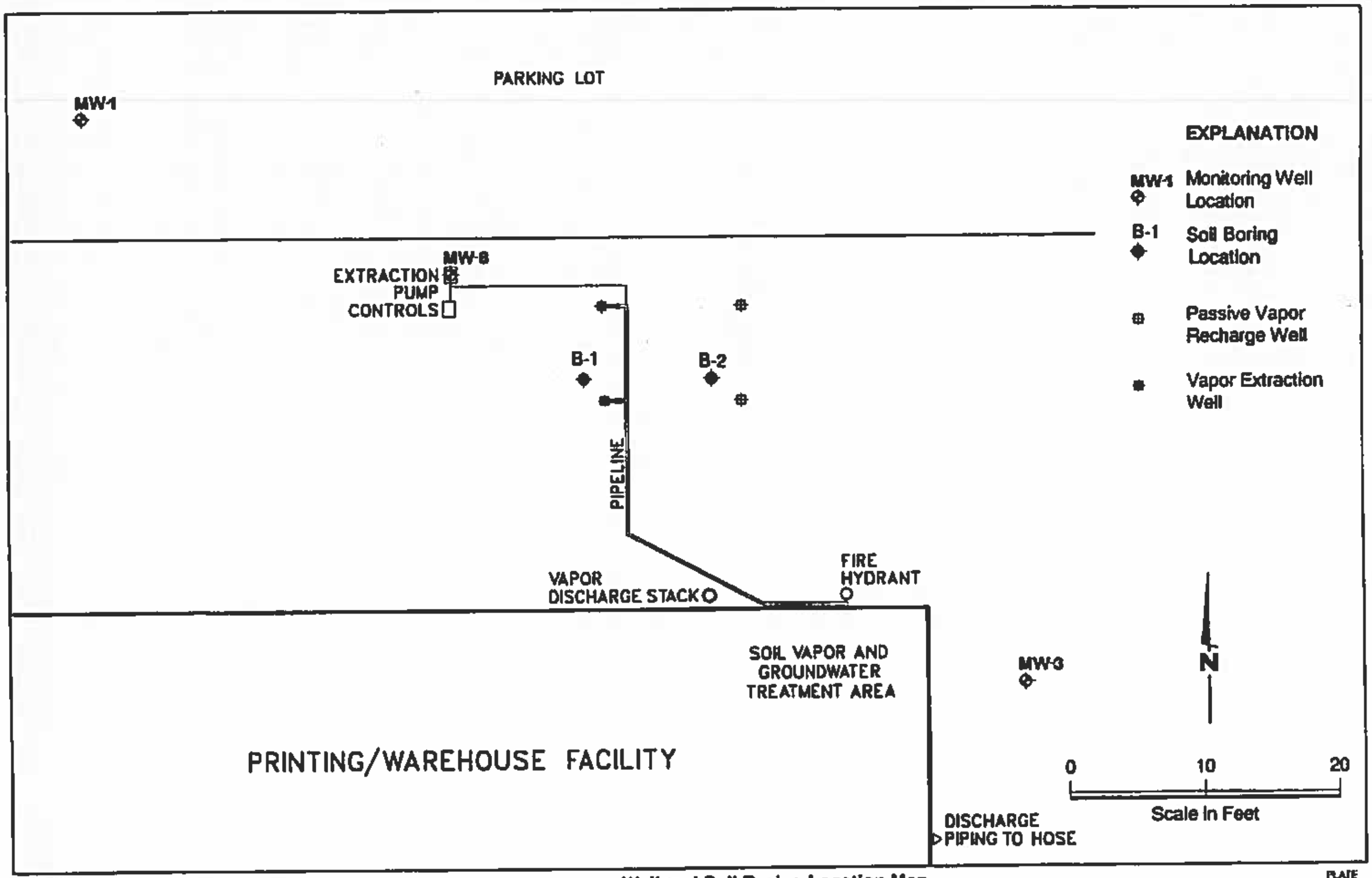
DEB = Debris
BR = Brick
MTL = Metal
CONC = Concrete
AB = Aggregate Base
AS = Asphalt
GL = Glass
WD = Wood
FAB = Fabric
RUB = Rubber

PES Environmental, Inc.
Engineering & Environmental Services

Cross Section D-D'
Supplemental Subsurface Investigation Report
6701 Shellmound Street
Emeryville, California

PLATE
6

1386.001.01.005 JOB NUMBER
138600101005_xsec_1-6 DRAWING NUMBER
GDT REVIEWED BY
1/14 DATE



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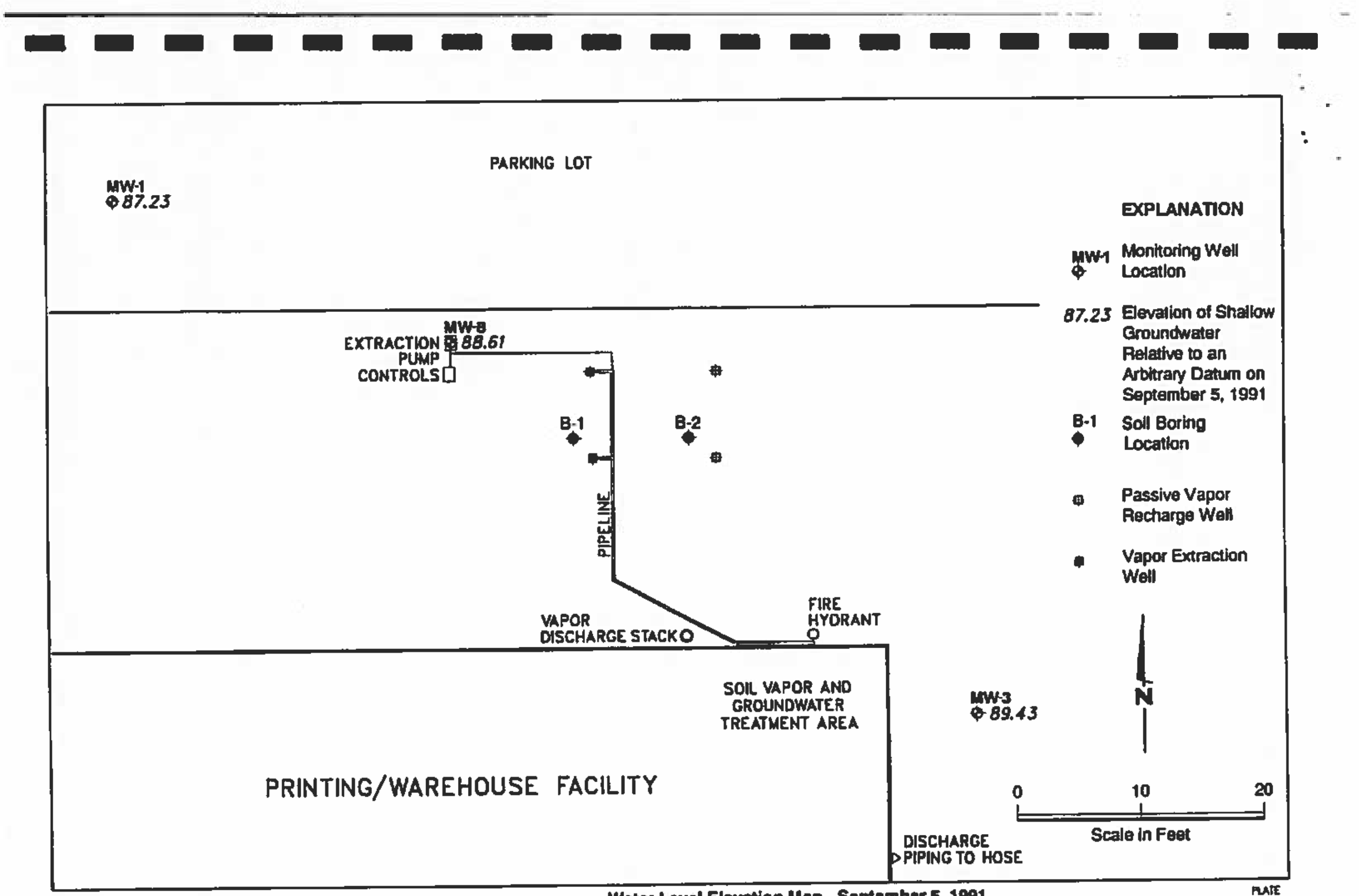
Engineering & Environmental Services

Well and Soil Boring Location Map
Nady Systems Site
6707 Bay Street
Emeryville, California

PLATE
1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
MP001B		11/91		



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Water Level Elevation Map - September 5, 1991
Nady Systems Site
6707 Bay Street
Emeryville, California

PLATE
2

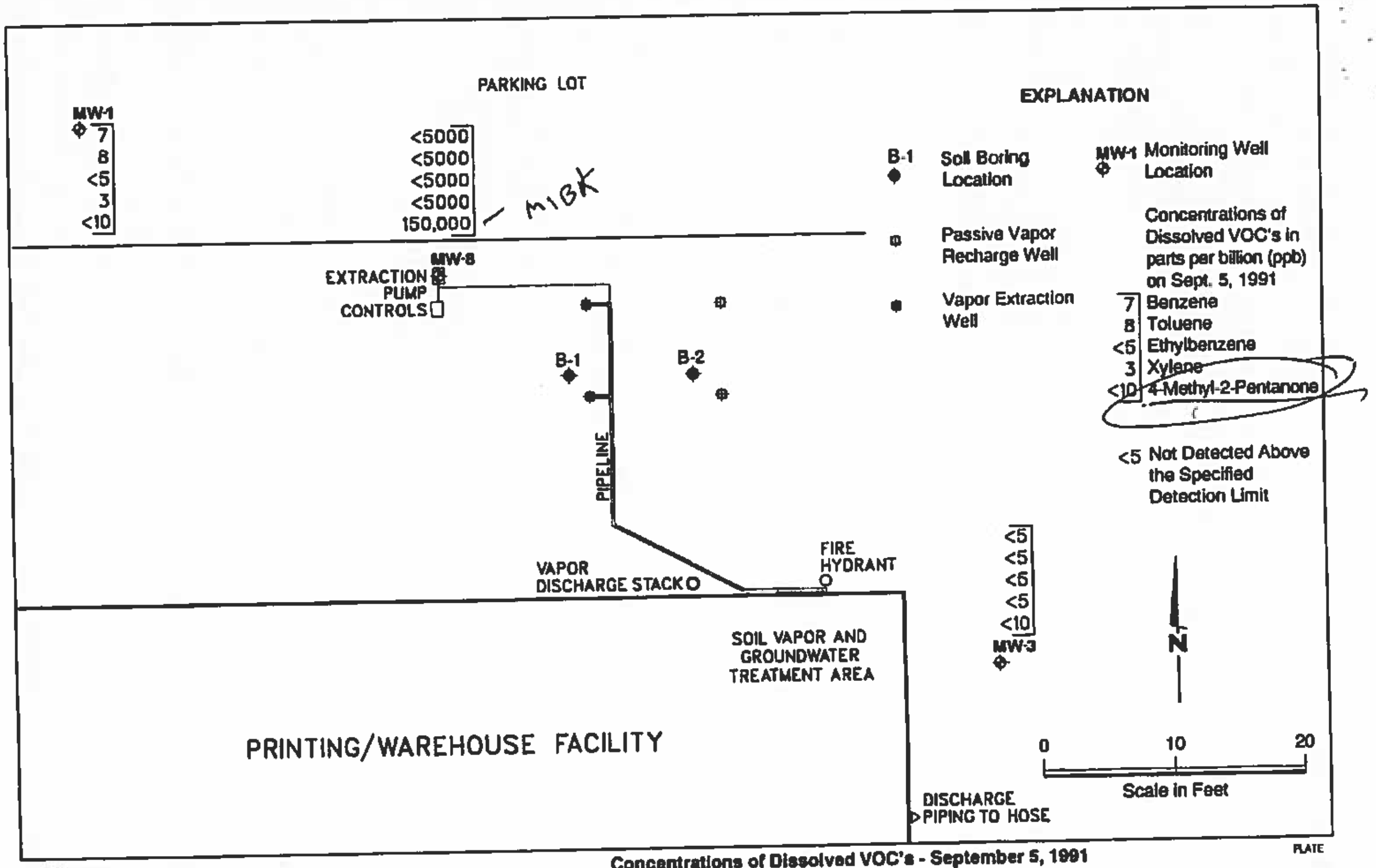
JOB NUMBER
MP001B

REVIEWED BY

DATE
11/91

REVISED DATE

REVISED DATE



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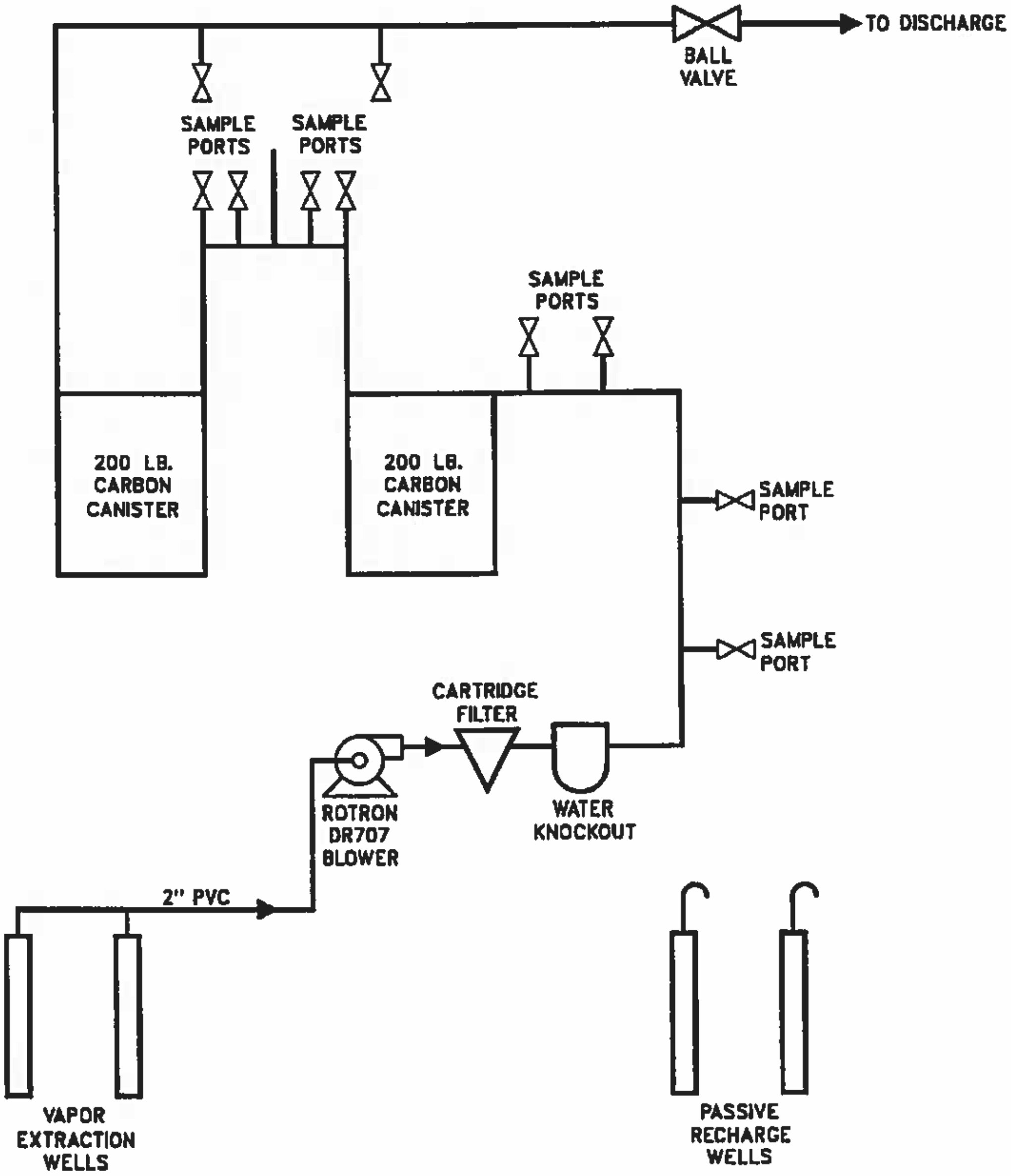
Concentrations of Dissolved VOC's - September 5, 1991
Nady Systems Site
5707 Bay Street
Emeryville, California

PLATE
3

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
MP001B		11/91		



NOT TO SCALE

PES Environmental, Inc.
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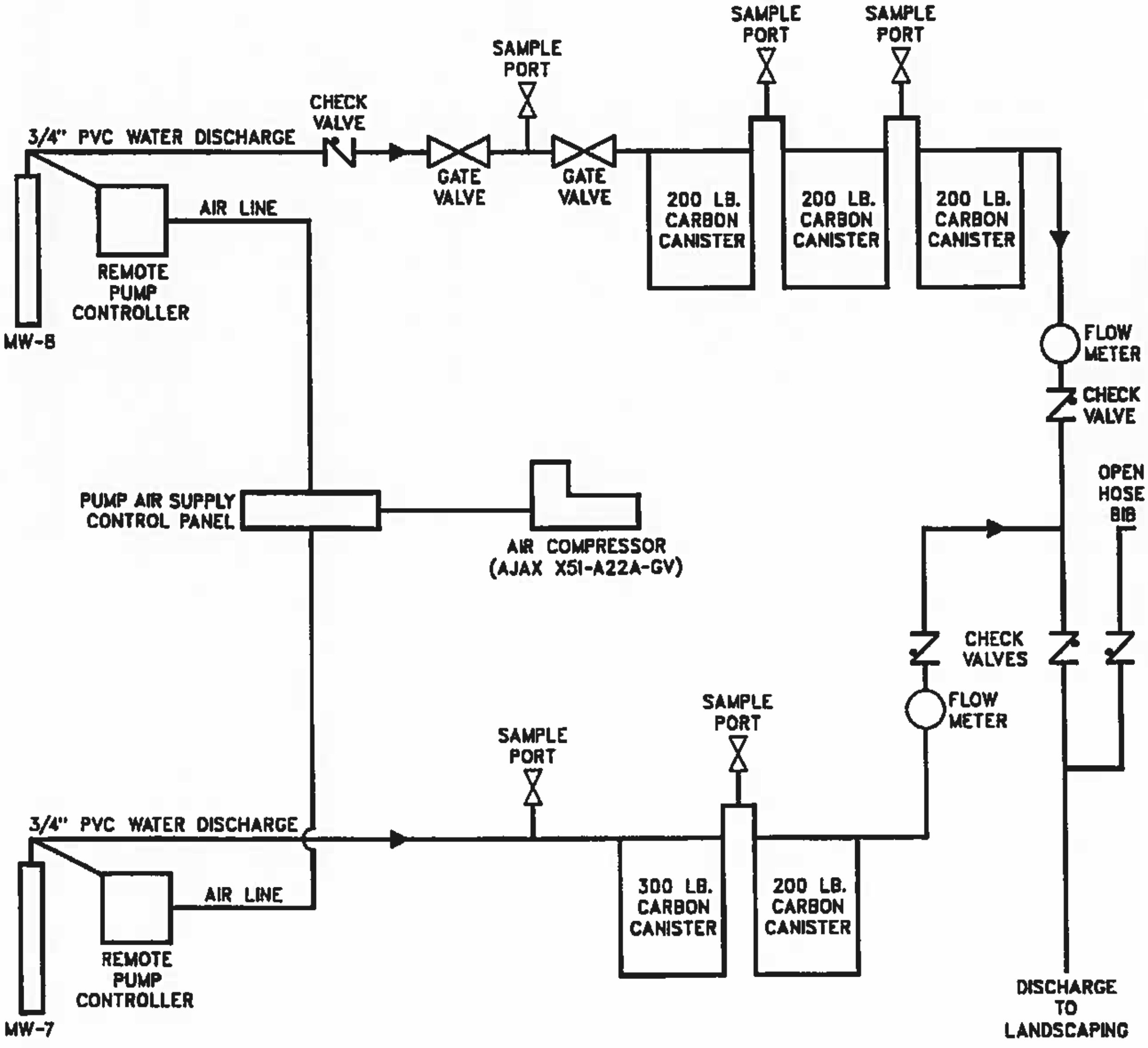
Schematic Diagram of Soil Vapor Extraction and Treatment System
Nady Systems Site
Emeryville, California

PLATE
4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
MP001B	JJ	12/91		



NOT TO SCALE

PES Environmental, Inc.
Engineering & Environmental Services

Schematic Diagram of Groundwater Extraction and Treatment System
Nady Systems Site
Emeryville, California

PLATE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
MP001B	tg	12/91		

PERTINENT TABLES AND PLATES EXCERPTS FROM REPORTS PREPARED BY ENVIRON INTERNATIONAL

Table 1 - Organics in Soil
2013 Subsurface Investigation by ENVIRON
Nady Systems

		TPH (mg/kg)		**Pesticides and PCBs (mg/kg)**		
Borehole ID	**Sample Depth**	**TPH-Diesel**	**TPH-Motor Oil**	**DDT**	**Arochlor 1260**	**Total PCBs**
SG-1	3.5-4.0	**43**	**250**	**0.03**	ND < 0.5	ND < 0.5
SG-2	3.0-3.5	**43**	**340**	**0.068**	ND < 1.0	ND < 1.0
SG-3	3.5-4.0	**290**	**1,400**	**0.25**	**14**	**14**
SG-4	3.5-4.0	**200**	**400**	**0.42**	**8**	**8**
SG-5	4.5-5.0	**33**	**290**	ND < 0.020	ND < 1.0	ND < 1.0
CHHSL - Residential[1]		*na*	*na*	*1.6*	*0.089*	*0.089*
ESL - Shallow Soil, Residential, Non-Drinking Water Resource[2]		*100*	*500*	*1.7*	*0.22*	*0.22*

Notes:

🟨 exceeds regulatory criteria

Only detected compounds are shown.

Detections are in **bold**.

CHHSL: California Human Health Screening Level

DDT: dichlorodiphenyltrichloroethane

ESL: Environmental Screening Level

mg/kg: milligrams per kilogram

na: not available

ND < ##: Not detected at or above laboratory reporting limit shown

NDW: Non-Drinking Water Resource Area

PCBs: Polychlorinated Biphenyls

TPH: Total Petroleum Hydrocarbons

1. California EPA, 2005. *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties*. January.
2. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)*. February.

Table 2 - Metals in Soil
2013 Subsurface Investigation by ENVIRON
Nady Systems

Borehole ID	Sample Depths	Metals (mg/kg, except where noted)																
		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Lead - STLC (mg/L)	Lead - TCLP (mg/L)	Mercury	Molybdenum	Nickel	Silver	Vanadium	Zinc
SG-1	3.5-4.0	5.2	11	280	ND < 0.5	1	100	22	480	990	12	ND<0.2	0.2	4.2	220	0.6	60	490
SG-2	3.0-3.5	1.9	12	160	0.51	0.84	50	11	88	120	4	ND<0.2	0.36	1.3	63	ND < 0.5	50	220
SG-3	3.5-4.0	8.9	7.3	230	ND < 0.5	0.94	54	9.3	160	830	--	--	0.2	1.3	51	ND < 0.5	49	240
SG-4	3.5-4.0	2.6	4.9	170	ND < 0.5	0.82	68	14	78	130	--	--	0.32	2.9	83	ND < 0.5	45	440
SG-5	4.5-5.0	1	9.9	120	ND < 0.5	0.44	44	7.3	44	75	--	--	0.12	0.5	34	ND < 0.5	41	97
CHHSL - Residential [1]		*30*	*0.07*	*5,200*	*150*	*1.7*	*10,000*	*660*	*3,000*	*150*	*N/A*	*N/A*	*18*	*380*	*1,600*	*380*	*530*	*23,000*
ESL - Shallow Soil, Residential, Non-Drinking Water Resource [2]		*20*	*0.39*	*750*	*4*	*12*	*750*	*0.33*	*230*	*80*	*N/A*	*N/A*	*6.7*	*40*	*150*	*20*	*200*	*600*

Notes:

🟨 exceeds regulatory criteria
🟩 exceeds California hazardous waste criteria
Only detected compounds are shown.
Detections are in bold.
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
N/A: Not Applicable
--: not analyzed
ND < ##: Not detected at or above laboratory reporting limit shown
CHHSL: California Human Health Screening Level
ESL: Environmental Screening Level
NDW: Non-Drinking Water Resource Area
STLC: Soluble Threshold Limit Concentration
TCLP: Toxicity Characteristic Leaching Procedure
1. California EPA, 2005. *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties* . January.
2. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)* . February.

Table 3 - Organics in Groundwater
2013 Subsurface Investigation by ENVIRON
Nady Systems

			TPH (ug/L)		VOCs (ug/L)																
Location ID	Depth to Water (ft bgs)	Observations	TPH-Diesel	TPH-Motor Oil	Benzene	TBA	n-Butyl Benzene	sec-Butyl Benzene	Carbon disulfide	Chloro-benzene	Ethyl-benzene	cis-1,2-DCE	Isopropyl-benzene	4-Isopropyl toluene	Naph-thalene	n-Propyl benzene	Toluene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Total Xylenes
SG-1	10.75	Gray color, no odor	**920**	**5,600**	ND < 0.5	ND < 2.0	ND < 0.5	ND < 0.5	**1.1**	**4.4**	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5
SG-4	11.75	Black color, strong H2S odor	**4,700**	**12,000**	**2**	**2.3**	ND < 0.5	**1.3**	**3.9**	ND < 0.5	ND < 0.5	**0.69**	**1.1**	ND < 0.5	ND < 0.5	ND < 0.5	**0.54**	ND < 0.5	ND < 0.5	ND < 0.5
SG-5	10.29	Black color, sheen, H2S odor	**58,000**	**9,500**	**8.1**	ND < 20	**32**	**38**	ND < 5.0	ND < 5.0	**45**	ND < 5.0	**67**	**13**	**84**	**87**	ND < 5.0	**350**	**24**	**59**
California MCL - Drinking Water[1]			*na*	*na*	*1*	*na*	*na*	*na*	*na*	*100**	*300*	*6*	*na*	*na*	*na*	*na*	*150*	*na*	*na*	*1,750*
ESL - Groundwater[2]			*100*	*100*	*1*	*12*	*na*	*na*	*na*	*25*	*30*	*6*	*na*	*na*	*6.2*	*na*	*40*	*na*	*na*	*20*
ESL - Evaluation of Potential Vapor Intrusion Concerns, Residential[2]			*na*	*na*	*27*	*na*	*na*	*na*	*na*	*na*	*310*	*na*	*na*	*na*	*160*	*na*	*95,000*	*na*	*na*	*37,000*

Notes:

🟨 exceeds regulatory criteria
Only detected compounds are shown.
Detections are in bold.
bgs: below ground surface
DCE: dichloroethene
ESL: Environmental Screening Level
H2S: hydrogen sulfide
ug/L: micrograms per liter
na: not available
ND < ##: Not detected at or above laboratory reporting limit shown
NDW: Non-Drinking Water Resource Area
TBA: t-Butyl alcohol
TPH: Total Petroleum Hydrocarbons
VOCs: Volatile Organic Compounds
1. California Department of Public Health, 2013. *California Maximum Contaminant Levels (MCLs)*. March.
2. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)*. February.
*: Indicates USEPA MCL, shown for compounds that have a federal MCL but do not have a California MCL.

Table 4 - Metals in Groundwater
2013 Subsurface Investigation by ENVIRON
Nady Systems

Location ID	Depth to Water (ft bgs)	Observations	Total Metals (ug/L)													
			Antimony	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Silver	Vanadium	Zinc
SG-1	10.75	Gray color, no odor	ND < 50	210	12,000	ND < 25	4,100	820	4,200	2,700	2.7	77	4,600	ND < 19	2,100	5,900
SG-4	11.75	Black color, strong H2S odor	150	650	23,000	210	1,400	210	8,300	26,000	130	270	1,600	19	480	78,000
SG-5	10.29	Black color, sheen, H2S odor	94	1,600	25,000	320	1,800	490	34,000	60,000	52	180	2,700	53	1,900	160,000
California MCL - Drinking Water[1]			*6*	*10*	*1,000*	*5*	*50*	*na*	*1,300*	*15*	*2*	*na*	*100*	*na*	*na*	*na*
ESL - Groundwater[2]			*6*	*36*	*1,000*	*0.25*	*50*	*3*	*3.1*	*2.5*	*0.025*	*180*	*8.2*	*0.19*	*15*	*81.0*
STLC - California Hazardous Waste Criteria			*15,000*	*5,000*	*100,000*	*1,000*	*5,000*	*80,000*	*25,000*	*5,000*	*200*	*350,000*	*20,000*	*5,000*	*24,000*	*250,000*

Notes:

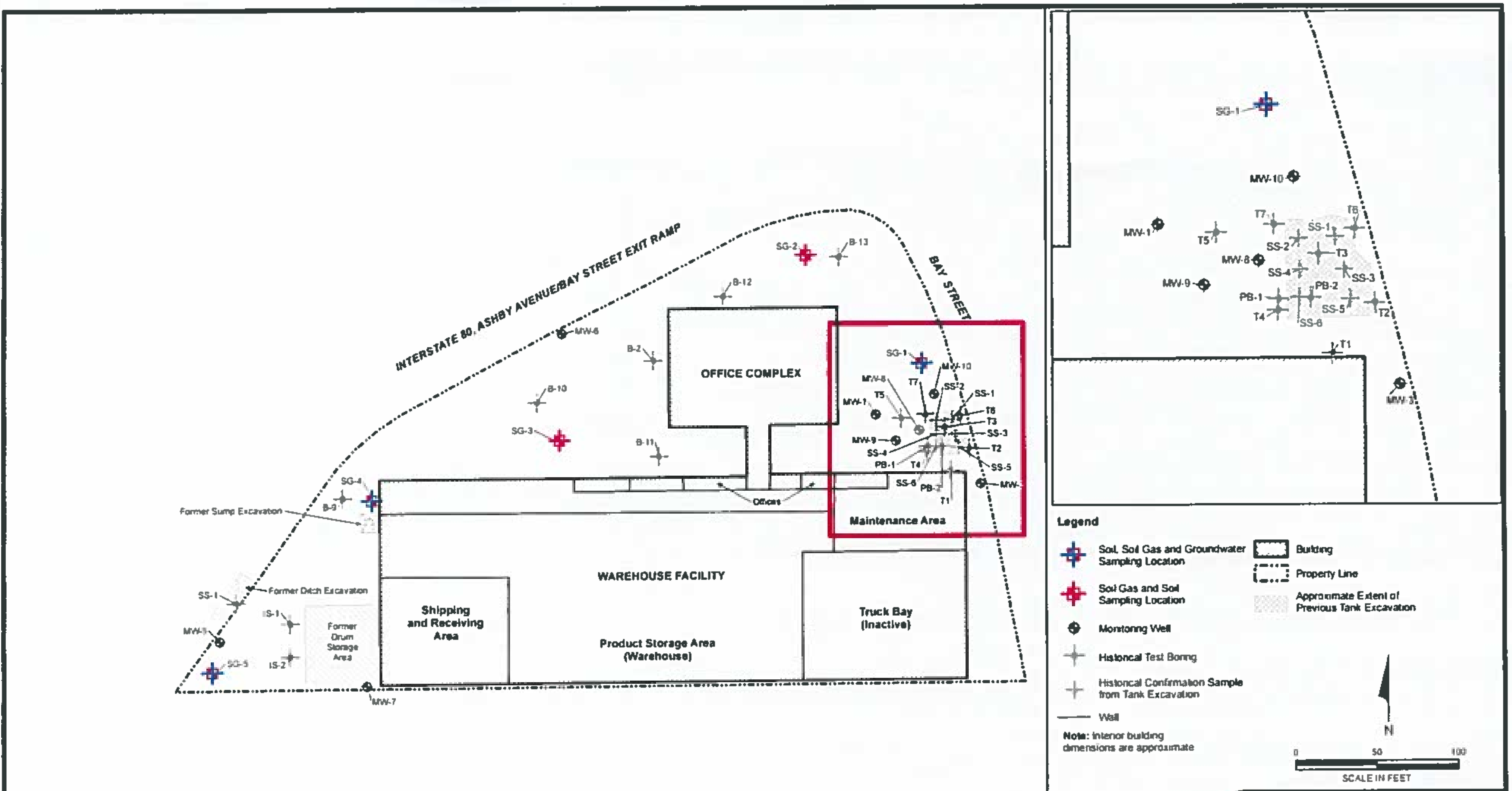
🟨	exceeds regulatory criteria
🟩	exceeds hazardous waste and regulatory criteria

Only detected compounds are shown.
Detections are in bold.
bgs: below ground surface
ug/L: micrograms per liter
H2S: hydrogen sulfide
na: not available
ND < ##: Not detected at or above laboratory reporting limit shown
STLC: Soluble Threshold Limit Concentration
1. California Department of Public Health, 2013. *California Maximum Contaminant Levels (MCLs)*. March.
2. San Francisco Bay Regional Water Quality Control Board, 2013. *2013 Tier 1 ESL Lookup Tables*. February.

Table 5 - VOCs and Fixed Gases in Soil Gas
2013 Subsurface Investigation by ENVIRON
Nady Systems

Location ID	Depth to Water (ft bgs)	VOCs (ug/m³)															Fixed Gases (% by volume)			
		Acetone	Benzene	Chloro-methane	Ethyl-benzene	4-Ethyl-toluene	2-Butanone (MEK)	PCE	TCE	Toluene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	cis-1,2-DCE	o-Xylene	p/m-Xylene	1,1-DFA (Leak Check)	Methane	Carbon Dioxide	Oxygen and Argon	Nitrogen
SG-1	10.75	ND < 7.2	**8.8**	ND < 1.6	ND < 3.3	ND < 3.7	ND < 6.7	ND < 5.2	ND < 4.1	**3.4**	ND < 11	ND < 3.7	ND < 3.8	ND < 3.3	ND < 13	ND < 8.2	ND < 0.5	**8.49**	**8.9**	**82.6**
SG-2	--	ND < 13	ND < 4.5	ND < 2.9	ND < 6.1	**13**	ND < 12	ND < 9.6	ND < 7.6	ND < 5.3	**37**	**16**	ND < 5.6	ND < 6.1	ND < 24	ND < 15	ND < 0.5	**10.7**	**12**	**77.2**
SG-3	--	ND < 38	**73**	ND < 8.3	ND < 17	ND < 20	ND < 35	**30**	ND < 21	**18**	ND < 59	ND < 20	**24**	ND < 17	ND < 69	**140**	**0.864**	ND < 0.5	**19.9**	**79.3**
SG-4	11.75	**19**	**37**	**2.4**	**4.6**	ND < 3.6	**7.7**	ND < 4.9	**9.6**	**16**	ND < 11	ND < 3.6	ND < 2.9	**5.6**	**16**	ND < 7.8	ND < 0.5	**9.52**	**11.4**	**79.1**
SG-5	10.29	**19**	**9.5**	ND < 1.7	**6.2**	ND < 4.0	ND < 7.3	ND < 5.6	**9.1**	**6.1**	ND < 12	ND < 4.0	ND < 3.3	**12**	**26**	ND < 8.9	ND < 0.5	**8.5**	**13.6**	**77.9**
SG-2-Shroud	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**130,000**	--	--	--	--
Shallow Soil Gas CHHSL - Residential [1]		*na*	*36.2*	*na*	*na*	*na*	*na*	*180*	*528*	*135,000*	*na*	*na*	*15,900*	*315,000*	*317,000*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Notes:
🟨 exceeds regulatory criteria
Only detected compounds are shown.
Detections are in bold.
na: not available
N/A: not applicable
ND < ##: Not detected at or above laboratory reporting limit shown
--: not analyzed
bgs: below ground surface
CHHSL: California Human Health Screening level
DCE: dichloroethene
DFA: difluoroethane
PCE: tetrachloroethene
TCE: trichloroethene
ug/m³: micrograms per cubic meter
1. California EPA, 2005. *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties*. January.



ENVIRON

Soil, Soil Gas, and Groundwater
Sampling Locations
6707 Bay Street
Emeryville, California

Date 4/29/13	Contract Number 03-32356A		Figure 3
Drafter RS	Approved	Revised	

Table D4-1 - Historical Total Petroleum Hydrocarbons (TPH) Data
Nady Systems

				TPH (mg/kg)		
Borehole ID	**Date**	**Rationale**	**Sample Depths**	**Oil & Grease**	**TEPH**	**Total VOCs**
IS-1	4/26/1989	Drum Area	3.5	1,915	46	ND<10
			7	3,390	200	ND<10
			10	36,535	ND<10	ND<10
IS-2	4/26/1989	Drum Area	3	1,305	50	ND<10
			8.5	2,185	ND<10	300
B-1/MW-1	7/5/1989	West of Tanks	5.5	845	12	ND<10
			10.5	ND<50	ND<10	ND<10
			16	1,600	63	ND<10
			20.5	80	ND<10	ND<10
			25.5	95	ND<10	ND<10
			30.5	ND<50	ND<10	ND<10
B-2	7/5/1989	West of office	0.5	ND<50	ND<10	ND<10
			6	1,160	19	ND<10
			10	14,900	172	20
			16	ND<50	ND<10	ND<10
B-3/MW-3	8/28/1989	SE of Tanks	5	1,845	30	ND<10
			12	95	20	ND<10
			15	625	260	120
			20	ND<20	ND<10	ND<10
			25	20	ND<10	ND<10
B-4	8/28/1989	Location unknown	4.5	6,685	ND<10	ND<10
			10	25,470	170	ND<10
			14.5	ND<20	ND<10	ND<10
B-5/MW-5	8/31/1989	At trench and drum area	6	330	ND<10	ND<10
			11	3,580	15	25
			15.5	1,200	15	20
			22.5	110	20	ND<10
			25.5	115	ND<10	ND<10
B-6/MW-6	8/31/1989	NW site boundary	20.5	100	ND<10	ND<10
			25.5	190	ND<10	ND<10
SS-1-E	10/5/1989	UST Confirmation	2' Beneath UST	–	12	12
SS-2-W	10/5/1989	UST Confirmation	2' Beneath UST	–	11	ND<10
SS-3-E	10/5/1989	UST Confirmation	2' Beneath UST	–	ND<10	ND<10
SS-4-W	10/5/1989	UST Confirmation	2' Beneath UST	–	60	240
SS-5-E	10/5/1989	UST Confirmation	2' Beneath UST	–	35	115
SS-6-W	10/5/1989	UST Confirmation	2' Beneath UST	–	700	460
B-7/MW-7	1/3/1990	Drum Area	4	9,000	ND<10	ND<10
			9	8,800	788	ND<10
B-8/MW-8	1/3/1990	Downgradient of USTs	4	2,000	ND<10	ND<10
			9	20,000	ND<10	ND<10
B-9	1/4/1990	At sump	4	23,000	ND<10	ND<10
			9	15,000	5,050	ND<10
B-10	1/4/1990	NW part of site	4	9,500	380	ND<10
			9	6,300	ND<10	ND<10
B-11	1/4/1990	Between office and warehouse	4	45,000	ND<10	ND<10
			9	30,400	ND<10	ND<10
B-12	1/4/1990	N of office	4	12,000	ND<10	ND<10
			9	38,800	ND<10	ND<10
B-13	1/4/1990	N part of site	4	9,400	ND<10	ND<10
			9	3,000	ND<10	ND<10
Sump	1/5/1990	Sump Excavation	Confirmation	10,500	ND<10	ND<10
MW-9	4/13/1994	W of Tank Excavation	8.5	–	ND<1	–
			15.5	470	–	–
MW-10	4/14/1994	N of Tank Excavation	9.5	–		
			15.5	9,400	7,300	2
T-1	4/13/1994	S of tank excavation	8	–	–	–
			14	–	96	ND<1
T-2	4/13/1994	SE tank excavation	6	160	40	–
			8.5	–	–	ND<1
T-3	4/13/1994	Bottom tank excavation	8	–	–	ND<1
			14.5	–	–	–
T-4	4/14/1994	SW tank excavation	9	–	–	ND<1
			14.5	–	–	–
T-5	4/14/1994	W of tank excavation	5	710	ND<10	ND<1
			9	ND<50	ND<1	ND<1
			14.5	–	–	–
T-7	4/14/1994	NW tank excavation	7.5	68	ND<10	ND<1
			14	–	ND<20	160
ESL - Shallow Soil, Residential, Non-Drinking Water Resource Area [1]				*500*	*100*	*na*

Notes:

🟨 exceeds regulatory criteria

Only locations with detected TPH and/or Total VOC data are shown.

mg/kg: milligrams per kilogram

na: not available

ND<##: Not detected at or above laboratory reporting limit shown.

TEPH: Total Extractable Petroleum Hydrocarbons

TPH: Total Petroleum Hydrocarbons

VOCs: Volatile Organic Compounds

UST: Underground storage tank

1. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)*. February.

Table D4-2 - Historical Volatile OrganicCompound (VOC) Data
Nady Systems

Borehole ID	Date	Rationale	Sample Depths (ft bgs)	VOCs (ug/kg)											
				Acetone	Benzene	Ethylbenzene	Toluene	Total Xylenes	MIBK	1,2-DCB	1,3-DCB	1,4-DCB	MEK	Carbon Disulfide	Methylene Chloride
SS-1-E	10/5/1989	UST Confirmation	2' Beneath UST	ND<200,000	1,300	40	NR	300	600,000	ND<30	120	280	ND<200,000	ND<80,000	ND<30
SS-2-W	10/5/1989	UST Confirmation	2' Beneath UST	ND<20	230	30	60	50	28	ND<30	ND<30	ND<30	ND<20	ND<3	ND<30
SS-3-E	10/5/1989	UST Confirmation	2' Beneath UST	40	ND<30	ND<30	50	18	ND<20	ND<30	ND<30	ND<30	ND<20	ND<3	ND<30
SS-4-W	10/5/1989	UST Confirmation	2' Beneath UST	ND<2,000,000	1,400	110	NR	1,300	1,900,000	70	2,000	2,400	ND<2,000,000	ND<800,000	ND<30
SS-5-E	10/5/1989	UST Confirmation	2' Beneath UST	ND<400,000	ND<300	ND<300	NR	1,000	180,000	ND<30	ND<30	ND<30	ND<40,000	ND<70,000	ND<30
SS-6-W	10/5/1989	UST Confirmation	2' Beneath UST	ND<2,000,000	4,600	ND<1,500	NR	7,300	5,000,000	ND<30	ND<30	ND<30	ND<2,000,000	ND<800,000	ND<30
B-7/MW 7	1/3/1990	Drum Area	4	ND<50	ND<10	ND<10	ND<10	ND<10	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
			9	ND<50	ND<10	250	61	1,020	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
B-8/MW 8	1/3/1990	Downgradient of USTs	4	ND<50	ND<10	ND<10	ND<10	ND<10	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
			9	ND<50	ND<100	ND<100	ND<100	ND<100	8,300	ND<100	ND<100	ND<100	ND<500	ND<100	ND<50
B-9	1/4/1990	At sump	4	ND<50	ND<10	ND<10	12	ND<10	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
			9	ND<50	54	140	28	380	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
B-11	1/4/1990	Between office and warehouse	4	ND<50	ND<10	ND<10	15	ND<10	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
			9	ND<50	ND<10	ND<10	ND<10	ND<10	ND<30	ND<10	ND<10	ND<10	ND<50	ND<10	ND<50
PB-1	9/5/1991	Soil Boring in tank area	6	ND<20	ND<5	ND<5	ND<5	ND<5	ND<10	ND<5	2	ND<5	ND<20	ND<5	ND<5
			8.5	ND<20	ND<5	ND<5	ND<5	ND<5	ND<10	3	4	ND<5	ND<20	ND<5	ND<5
PB-2	9/5/1991	Soil Boring in tank area	5.5	ND<20	ND<5	ND<5	ND<5	ND<5	ND<10	ND<5	ND<5	ND<5	ND<20	ND<5	ND<5
			8	ND<20	5	ND<5	ND<5	ND<5	ND<10	4	4	ND<5	ND<20	ND<5	ND<5
MW-9	4/13/1994	W of Tank Excavation	8.5	70	ND<5	ND<5	ND<5	ND<5	6	NR	NR	NR	18	ND<5	ND<10
			15.5	140	4	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	28	ND<5	ND<10
MW-10	4/14/1994	N of Tank Excavation	9.5	30	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	ND<10	ND<5	ND<10
			15.5	120	ND<10	ND<10	ND<10	ND<10	11	NR	NR	NR	120	20	40
T-2	4/13/1994	SE tank excavation	6	--	--	--	--	--	--	--	--	--	--	--	--
			8.5	110	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	20	ND<5	ND<10
T-3	4/13/1994	Bottom tank excavation	6	70	4	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	18	ND<5	ND<10
			14.5	180	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	20	ND<5	ND<10
T-4	4/14/1994	SW tank excavation	9	50	ND<5	ND<5	ND<5	ND<5	18	NR	NR	NR	8	4	ND<10
			14.5	180	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	40	ND<5	ND<10
T-5	4/14/1994	W of tank excavation	5	--	--	--	--	--	--	--	--	--	--	--	--
			9	20	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	ND<10	ND<5	ND<10
			14.5	ND<20	12	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	10	ND<5	ND<10
T-6	4/14/1994	NE tank excavation	7.5	100	ND<5	ND<5	ND<5	ND<5	6	NR	NR	NR	10	ND<5	ND<10
			14	ND<100	ND<30	ND<30	ND<30	ND<30	ND<50	NR	NR	NR	ND<50	ND<30	ND<50
T-7	4/14/1994	NW tank excavation	7.5	30	ND<5	ND<5	ND<5	ND<5	ND<10	NR	NR	NR	9	ND<5	ND<10
			14	ND<1,000	ND<1,000	600	ND<300	ND<300	300	NR	NR	NR	ND<500	ND<300	ND<500
ESL - Shallow Soil, Residential, Non-Drinking Water Resource Area [1]				*500*	*44*	*2,900*	*2,900*	*2,300*	*2,800*	*1,100*	*7,400*	*590*	*6,500*	*na*	*77*

Notes:

🟨 exceeds regulatory criteria
Only locations with detected VOCs are shown.
Only detected compounds are shown.
ug/kg: micrograms per kilogram
bgs: below ground surface
DCB: dichlorobenzene
MEK: Methyl ethyl ketone
MIBK: Methyl isobutyl ketone
na: not available
ND<##: Not detected at or above laboratory reporting limit shown
TCA: trichloroethane
TCE: trichloroethene
UST: Underground storage tank
1. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)*. February.

Table D4-3 - Historical Semi-Volatile Organic Compound (SVOC) Data
Nady Systems

				SVOCs (ug/kg)													
Borehole ID	Date	Rationale	Sample Depths	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(k) fluoranthene	Chrysene	Fluor-anthene	Isophor-one	2-Methyl naphthal-ene	Naphthal-ene	Nitro-benzene	Phen-anthrene	Pyrene	Bis (2-ethylhexyl) phthalate	4-Methyl phenol	1,2,4-TCB
SS-3-E	10/5/1989	UST Confirmation	2' Beneath UST	ND<30	ND<30	ND<30	ND<70	ND<30	ND<30	ND<30	ND<30	ND<30	ND<30	ND<30	ND<300	200	200
SS-5-E	10/5/1989	UST Confirmation	2' Beneath UST	ND<200	ND<200	ND<200	ND<400	ND<200	ND<200	1,000	300	ND<200	ND<200	ND<200	ND<2,000	ND<200	ND<200
B-7/MW-7	1/3/1990	Drum Area	4	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<2,000	ND<300	ND<300
			9	ND<300	ND<300	ND<300	390	320	ND<300	1,500	750	ND<300	530	380	ND<2,000	ND<300	ND<300
B-8/MW-8	1/3/1990	Downgradient of USTs	4	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<2,000	ND<300	ND<300
			9	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	410	ND<2,000	ND<300	ND<300
B-9	1/4/1990	At sump	4	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<2,000	ND<300	ND<300
			9	ND<300	ND<300	ND<300	690	340	ND<300	1,100	8,500	ND<300	590	550	ND<2,000	ND<300	ND<300
B-11	1/4/1990	Between office and warehouse	4	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	320	ND<2,000	ND<300	ND<300
			9	580	ND<300	ND<300	820	1,100	ND<300	ND<300	ND<300	ND<300	560	1,800	ND<2,000	ND<300	ND<300
B-12	1/4/1990	N of office	4	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	370	ND<2,000	ND<300	ND<300
			9	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<2,000	ND<300	ND<300
B-13	1/4/1990	N part of site	4	ND<300	470	ND<300	390	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	920	ND<2,000	ND<300	ND<300
			9	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<2,000	ND<300	ND<300
MW-9	4/13/1994	W of Tank Excavation	8.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			15.5	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	400	ND<300	ND<300
T-2	4/13/1994	SE tank excavation	6	ND<300	ND<300	200	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300
			8.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T-5	4/14/1994	W of tank excavation	5	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000	ND<3,000
			9	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	ND<300	400	ND<300	ND<300
			14.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHHSL - Residential [1]				*na*	*38*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*na*
ESL - Shallow Soil, Residential, Non-Drinking Water Resource Area [2]				*380*	*38*	*380*	*3,800*	*40,000*	*na*	*250*	*1,700*	*na*	*11,000*	*85,000*	*160,000*	*na*	*7,600*

Notes:

🟨 exceeds regulatory criteria
Only locations with detected SVOCs are shown.
Only detected compounds are shown.
na: not available
ND<##: Not detected at or above laboratory reporting limit shown
SVOCs: Semivolatile Organic Compounds
TCB: trichlorobenzene
ug/kg: micrograms per kilogram
UST: Underground storage tank
1. California EPA, 2005. *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties (Revised 2009)* . January.
2. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)* . February.

Table D4-6 - Historical Metals Data

Hody Systems

Borehole ID	Date	Location	Sample Depth (ft bgs)	Metals (mg/kg)														
				Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Silver	Vanadium	Zinc
FS-1	4/26/1989	Drum Area	3.5	8.5	ND<2.2	110	0.86	4.1	20.1	8.8	70	[illegible]	ND<5	1.2	21.1	11.2	15.4	200
			7	1.4	ND<2.2	100	ND<0.025	4.7	21.5	8.8	106	130	ND<5	ND<1	31.5	ND<0.1	17.3	40.9
			10	1.6	ND<2.2	235	ND<0.025	[illegible]	63.5	11.6	1,062	[illegible]	ND<5	8.7	47.8	ND<0.1	17.3	[illegible]
FS-2	4/26/1989	Drum Area	3	ND<1	ND<2.2	98	ND<0.025	3.1	18.5	8	56.7	90	ND<5	1.2	20.9	ND<0.1	13.6	270
			8.5	ND<1	ND<2.2	38.7	ND<0.025	3.5	6.6	3.8	13.6	5.3	ND<5	ND<1	13.5	ND<0.1	6.7	22.9
B-1/MW-1	7/5/1989	West of Tanks	5.5	ND<1	ND<2.2	86	ND<0.025	1.4	43	8.7	23	34	ND<5	ND<1	66	ND<0.1	13	94
			10.5	ND<1	ND<2.2	71	ND<0.025	0.6	12.5	5.5	4	3	ND<5	ND<1	12.7	ND<0.1	7	5.4
			16	4	ND<2.2	78	ND<0.025	10	42	13.6	13.3	180	ND<5	2.6	30	ND<0.1	32	[illegible]
			20.5	ND<1	ND<2.2	61	ND<0.025	3.4	15	8.5	23	77	ND<5	ND<1	19	ND<0.1	18	108
			25.5	ND<1	ND<2.2	32	ND<0.025	2	10	8	13	8	ND<5	ND<1	34	ND<0.1	12	37
			30.5	ND<1	ND<2.2	23	ND<0.025	1.2	9.9	5.6	7.4	4.6	ND<5	ND<1	42	ND<0.1	6.7	16
B-2	7/5/1989	West of office	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			5	1.2	ND<2.2	109	ND<0.025	1.6	11.8	5	92	147	ND<5	ND<1	18.5	ND<0.1	9.7	67
			10	ND<1	ND<2.2	41	ND<0.025	ND<0.3	12.7	2.7	22.3	[illegible]	ND<5	ND<1	12.5	ND<0.1	18	532
			16	1.2	ND<2.2	38	ND<0.025	3.4	43	12	10	11	ND<5	ND<1	79	ND<0.1	20	23
			20.5	ND<1	ND<2.2	86	ND<0.025	1.6	7.6	3.9	9	8.7	ND<5	ND<1	10.6	ND<0.1	17	11
B-3/MW-3	8/31/1989	At trench and drum area	5	ND<1	ND<2.2	29.2	ND<0.025	0.6	13.6	5.8	13.8	9.7	ND<5	ND<1	14	ND<0.1	12	53
			11	1.08	ND<2.2	167.1	ND<0.025	3.16	15.2	8.7	92	164	ND<5	ND<1	22	ND<0.1	23.4	300
			15.5	3.85	ND<2.2	461	ND<0.025	4.1	22.4	8.2	380	[illegible]	ND<5	ND<1	38.8	ND<0.1	30	[illegible]
			22.5	ND<1	ND<2.2	1,130	ND<0.025	3.8	19	40	44.2	34	ND<5	ND<1	131	ND<0.1	58.3	58.4
			25.5	ND<1	ND<2.2	156	ND<0.025	3.1	23	12.3	22.6	12	ND<5	ND<1	34	ND<0.1	31	47
B-4/MW-4	8/31/1989	NW site boundary	20.5	ND<1	ND<2.2	250	ND<0.025	3.6	23	10	22.6	15.3	ND<5	ND<1	48	ND<0.1	58	47
			25.5	ND<1	ND<2.2	16.5	ND<0.025	3.5	29	11	22	15	ND<5	ND<1	50	ND<0.1	25	41.6
B-7/MW-7	1/3/1990	Drum Area	4	ND<10	ND<16	140	0.40	ND<0.7	32	8.8	27	ND<12	ND<0.09	ND<1	42	ND<0.4	26	79
			9	ND<10	ND<16	34	0.15	ND<0.7	23	ND<3	1.5	ND<12	0.088	ND<1	50	ND<0.4	12	100
B-8/MW-8	1/3/1990	Downgradient of USTs	4	ND<10	ND<16	42	0.16	ND<0.7	27	2.6	55	ND<12	ND<0.009	ND<1	18	ND<0.4	15	75
			9	ND<10	ND<16	86	0.15	ND<0.7	9.6	ND<3	41	56	0.36	ND<1	8.8	ND<0.4	8.3	120
B-9	1/4/1990	At sump	4	ND<10	ND<16	140	0.31	ND<0.7	33	7.8	55	40	0.45	ND<1	61	ND<0.4	91	120
			9	ND<10	ND<16	610	0.31	44	180	15	2,800	[illegible]	0.60	27	[illegible]	ND<0.4	26	[illegible]
B-10	1/4/1990	NW part of site	9	ND<10	ND<16	33	0.05	ND<0.7	23	ND<2	80	42	0.1	ND<1	60	ND<0.4	3	91
			9	ND<10	21	140	3.85	1.3	34	6.9	140	[illegible]	0.42	ND<1	34	ND<0.4	28	310
B-11	1/4/1990	ween office and wareho	4	ND<10	ND<16	140	0.06	1	23	8.4	44	11	0.062	ND<1	42	ND<0.4	23	940
			9	ND<10	ND<16	180	0.31	0.7	31	3.6	ND<4 500	56	0.013	ND<1	34	ND<0.4	17	100
B-12	1/4/1990	N of office	4	ND<10	ND<16	80	0.23	ND<0.7	38	3.4	170	120	ND<0.009	ND<1	66	ND<0.4	23	130
			9	ND<20	16	140	0.36	7.7	190	28	2,300	[illegible]	ND<0.009	20	130	ND<0.4	22	[illegible]
B-13	1/4/1990	N part of site	9	ND<10	ND<16	160	0.44	ND<0.7	62	8.3	120	520	ND<0.009	ND<1	42	ND<0.4	27	800
			9	ND<10	ND<16	37	0.15	ND<0.7	70	3.8	4.9	12	ND<0.009	ND<1	14	ND<0.4	15	210
Sump	1/5/1990	Sump Excavation	Confirmation	ND<10	ND<16	130	0.44	ND<0.7	26	16	48	62	0.022	ND<1	133	ND<0.4	26	150
MW-9	4/13/1994	W of Tank Excavation	8.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			15.5	ND<1	4.2	100	0.41	ND<0.25	28	12	30	11	ND<0.083	ND<1	48	ND<0.1	27	16
MW-10	4/14/1994	N of Tank Excavation	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			15.5	4.4	19	140	0.23	3.3	90	10	230	290	0.77	3.1	37	1.1	24	130
T-2	4/13/1994	SE tank excavation	4	5.1	9.3	170	0.23	1	33	6.7	2,300	800	ND<0.087	1.5	66	0.5	26	140
			8.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T-5	4/14/1994	W of tank excavation	5	ND<2.9	6	130	0.31	0.27	25	9.2	48	61	0.23	ND<0.98	29	ND<0.49	38	68
			9	ND<5	ND<2.5	85	ND<0.10	ND<0.25	23	4.2	10	1.5	ND<0.087	ND<1	18	ND<0.1	15	16
			14.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T-7	4/14/1994	NW tank excavation	7.5	ND<5	4.2	150	0.44	0.28	27	30	40	6.1	ND<0.087	ND<0.99	37	ND<0.5	37	62
			14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHHSL - Residential[1]				*30*	*0.07*	*5,200*	*16*	*1.7*	*100,000*	*660*	*3,000*	*80*	*18*	*380*	*1,600*	*380*	*530*	*23,000*
ESL - Shallow Soil Residential Non Drinking Water Resource Area[2]				*20*	*0.39*	*750*	*4*	*12*	*750*	*0.33*	*230*	*80*	*0.7*	*40*	*150*	*20*	*200*	*600*

Notes:

🟩 exceeds regulatory and California hazardous waste criteria

🟨 exceeds regulatory criteria

Only detected compounds are shown.

bgs: below ground surface

mg/kg: milligrams per kilogram

ND<## Not detected at or above laboratory reporting limit shown

1. California EPA, 2005. *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties (Revised 2005)*. January.
2. San Francisco Bay Regional Water Quality Control Board (SF RWQCB), 2013. *2013 Tier 1 Environmental Screening Levels (ESLs)*. February.

Table D4-5- Historical PCBs Data
Nady Systems

				PCBs (mg/kg)	
Borehole ID	**Date**	**Rationale**	**Sample Depths**	**Arochlor 1260**	**Other PCBs**
B-7/MW-7	1/3/1990	Drum Area	4	ND<1	ND
			9	ND<1	ND
B-8/MW-8	1/3/1990	Downgradient of USTs	4	ND<1	ND
			9	2.3	ND
B-9	1/4/1990	At sump	4	ND<1	ND
			9	ND<1	ND
B-10	1/4/1990	NW part of site	4	ND<1	ND
			9	ND<1	ND
B-11	1/4/1990	Between office and warehouse	4	2.2	ND
			9	ND<1	ND
B-12	1/4/1990	N of office	4	ND<1	ND
			9	ND<1	ND
B-13	1/4/1990	N part of site	4	3.1	ND
			9	ND<1	ND
Sump	1/5/1990	Sump Excavation	Confirmation	4.2	ND
CHHSL - Residential[1]				*0.089*	*0.089*
ESL - Shallow Soil, Residential, Non-Drinking Water Resource Area[2]				*0.22*	*0.22*

Notes:

🟨 exceeds regulatory criteria

Only locations with detections are shown.

Only detected compounds are shown.

mg/kg: milligrams per kilogram

ND<##: Not detected at or above laboratory reporting limit shown

PCBs: Polychlorinated biphenyls

UST: Underground storage tank

PERTINENT TABLES AND PLATES EXCERPTS FROM REPORTS PREPARED BY SUBSURFACE CONSULTANTS

Table 1
Groundwater Elevation Data

Well	Date	TOC Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
SCI MW-7	5/9/96		Dry	--
SCI MW-8	5/20/93	20.72	9.55	11.17
	6/4/93		10.81	9.91
	8/25/93		10.93	9.79
	11/18/93		11.72	9.00
	2/25/94		9.05	11.67
	4/20/94		10.18	10.54
	4/22/94		10.48	10.24
	4/26/94		10.13	10.59
	8/8/94		10.99	9.73
	2/9/95		7.85	12.87
	5/9/95		9.05	11.67
	11/13/95		11.00	9.72
	5/9/96		9.71	11.01
SCI MW-9	4/20/94	20.69	10.26	10.43
	4/22/94		10.31	10.38
	4/26/94		10.26	10.43
	8/8/94		11.24	9.45
	2/9/95		7.55	13.14
	5/9/95		8.88	11.81
	11/13/95		10.46	10.23
	5/9/96		9.60	11.09
SCI MW-10	4/20/94	20.42	10.72	9.70
	4/22/94		10.73	9.69
	4/26/94		10.72	9.70
	8/8/94		11.60	8.82
	2/9/95		7.10	13.32
	5/9/95		8.70	11.72
	11/13/95		11.70	8.72
	5/9/96		9.54	10.88
PES MW-2	2/9/95	15.79	10.64	5.15
	5/9/95		10.60	5.19
	11/13/95		11.18	4.61
	5/9/96		10.78	5.01
PES MW-3	2/9/95	12.43	6.86	5.57
	5/9/95		7.16	5.27
	11/13/95		8.44	3.99
	5/9/96		7.72	4.71
PES MW-4	2/9/95	12.24	8.11	4.13
	5/9/95		7.76	4.48
	11/13/95		7.95	4.29
	5/9/96		7.64	4.60

Table 1
Groundwater Elevation Data

Well	Date	TOC Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
PES MW-5	2/9/95	12.82	5.68	7.14
	5/9/95		5.38	7.46
	11/13/95		6.89	5.93
	5/9/96		6.00	6.82
PES MW-6	2/9/95	12.03	7.66	4.37
	5/9/95		8.57	3.46
	11/13/95		8.15	3.88
	5/9/96		7.64	4.39
PES MW-7	2/9/95	12.90	7.57	5.33
	5/9/95		5.15	7.75
	11/13/95		5.98	6.92
	5/9/96		6.11	6.79
PES MW-8	2/9/95	15.01	10.23	4.78
	5/9/95		10.48	4.53
	11/13/95		11.02	3.99
	5/9/96		10.50	4.51

Reference Elevation: MSL

Table 2
Volatile Organic Chemical Concentrations in Groundwater

Well	Date	4-Methyl-2 Pentanone (μg/l)[1]	Vinyl Chloride (μg/l)	Acetone (μg/l)	2-Butanone (μg/l)	4-Methyl-2 Pentanol (μg/l)	Benzene (μg/l)	Toluene (μg/l)	Ethyl benzene (μg/l)	Xylene (μg/l)	Trans-1,2 Dichloro-ethene (μg/l)	Other EPA 8240 Compounds (μg/l)
Sump-Well	8/21/89	<20	<4	<20	<20	NR[2]	<2	<2	<3	<3	<3	ND[3]
MW1	7/6/89	<20	<4	<20	<20	NR	<2	<2	<3	<3	<3	ND
	9/7/89	<20	<4	<20	<20	NR	<2	<2	<3	<3	<3	ND
	1/10/90	NR	<30	NR	NR	NR	<5	<5	<5	<5	<5	ND
	9/5/91	<10	<10	<20	<20	NR	7	8	<5	3	<5	ND
	5/20/93	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	8/25/93	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	11/18/93	<10	<10	<40	<10	NR	<5	<5	<5	<5	<5	ND
	2/25/94	<10	<10	<10	<10	NR	<5	<5	<5	<5	<5	ND
	8/8/94	<10	<10	<10	<10	NR	<5	<5	<5	<5	<5	ND
	2/9/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	5/9/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	11/13/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	5/9/96	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
MW3	9/7/89	<20	<4	<20	<20	NR	<2	<2	<3	<3	<3	ND
	1/10/90	NR	<30	NR	NR	NR	<5	<5	<5	<5	<5	ND
	9/5/91	<10	<10	<20	<20	NR	<5	<5	<5	<5	<5	ND
	5/20/93	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	8/25/93	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	11/18/93	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	2/25/94	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	8/8/94	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
MW8	1/10/90	160,000[4]	<6,000	NR	NR	NR	2,100	<1,000	<1,000	<1,000	<1,000	ND
	12/10/90	47,000[4]	<150	3,200[4]	10,000[4]	130,000[4]	160	<25	<25	<25	<25	ND
	9/5/91	150,000	<10,000	<5,000	<20,000	NR	<10,000	<10,000	<5,000	<5,000	<5,000	ND
	5/20/93	100,000	<5,000	<10,000	<5,000	NR	<3,000	<3,000	<3,000	<3,000	<3,000	ND
	8/25/93	48,000	<3,000	<5,000	<3,000	NR	<1,000	<1000	<1000	<1000	<1000	ND
	11/18/93	840	<50	<100	<50	NR	<25	<25	<25	<25	<25	ND
	2/25/94	14,000	<1,000	<2,000	<1,000	NR	<500	<500	<500	<500	<500	ND
	4/21/94	19,000	<1,000	<2,000	<1,000	NR	<500	<500	<500	<500	<500	ND
	5/11/94	140,000	<5,000	<10,000	<3,000	NR	<3,000	<3,000	<3,000	<3,000	<3,000	ND
	8/8/94	61,000	<1,000	<2,000	<1,000	NR	<500	<500	<500	<500	<500	ND
	2/9/95	62,000	<10	40	78	NR	64	<5	<5	<5	<5	7.9[5],10[6]
	5/9/95	<10	<10	<20	<10	NR	89	<5	<5	<5	<5	11[6]
	11/13/95	85,000	<100	<200	<100	NR	63	<50	<50	<50	<50	ND
	5/8/96	15,000	<500	<1000	<500	NR	<250	<250	<250	<250	<250	ND

Table 2
Volatile Organic Chemical Concentrations in Groundwater

- MIBK

Well	Date	Hexanone 4-Methyl-2 Pentanone (µg/l)[1]	Vinyl Chloride (µg/l)	Acetone (µg/l)	MEK 2-Butanone (µg/l)	4-Methyl-2 Pentanol (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl benzene (µg/l)	Xylene (µg/l)	Trans-1,2 Dichloro-ethene (µg/l)	Other EPA 8240 Compounds (µg/l)
MW9	4/21/94	120	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	8/8/94	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	2/9/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	5/9/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	11/13/95	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
	5/8/96	<10	<10	<20	<10	NR	<5	<5	<5	<5	<5	ND
MW10	4/21/94	23	<10	<20	<10	NR	22	<5	<5	<5	<5	ND
	8/8/94	<10	<10	<20	<10	NR	14	<5	<5	<5	<5	ND
	2/9/95	<10	<10	<20	<10	NR	6.6	<5	<5	<5	<5	3.2[6]
	5/9/95	<10	<10	<20	<10	NR	12	<5	<5	<5	<5	3.0[6], 3.0[7]
	11/13/95	<10	<10	<20	<10	NR	31	<5	<5	<5	<5	ND
	5/8/96	<10	<10	<10	<10	NR	7.5	<5	<5	<5	<5	3.5[6]

1 micrograms per liter
2 Not reported
3 Not detected at concentrations above the reporting limits
4 Tentatively identified compound concentrations
5 2-Hexanone (reporting limit = 10 ug/l)
6 Chlorobenzene (Reporting Limit = 5.0 µg/l)
7 Carbon Disulfide (Reporting Limit = 5.0 ug/l)

Table 3
Petroleum Hydrocarbon Concentrations in Groundwater

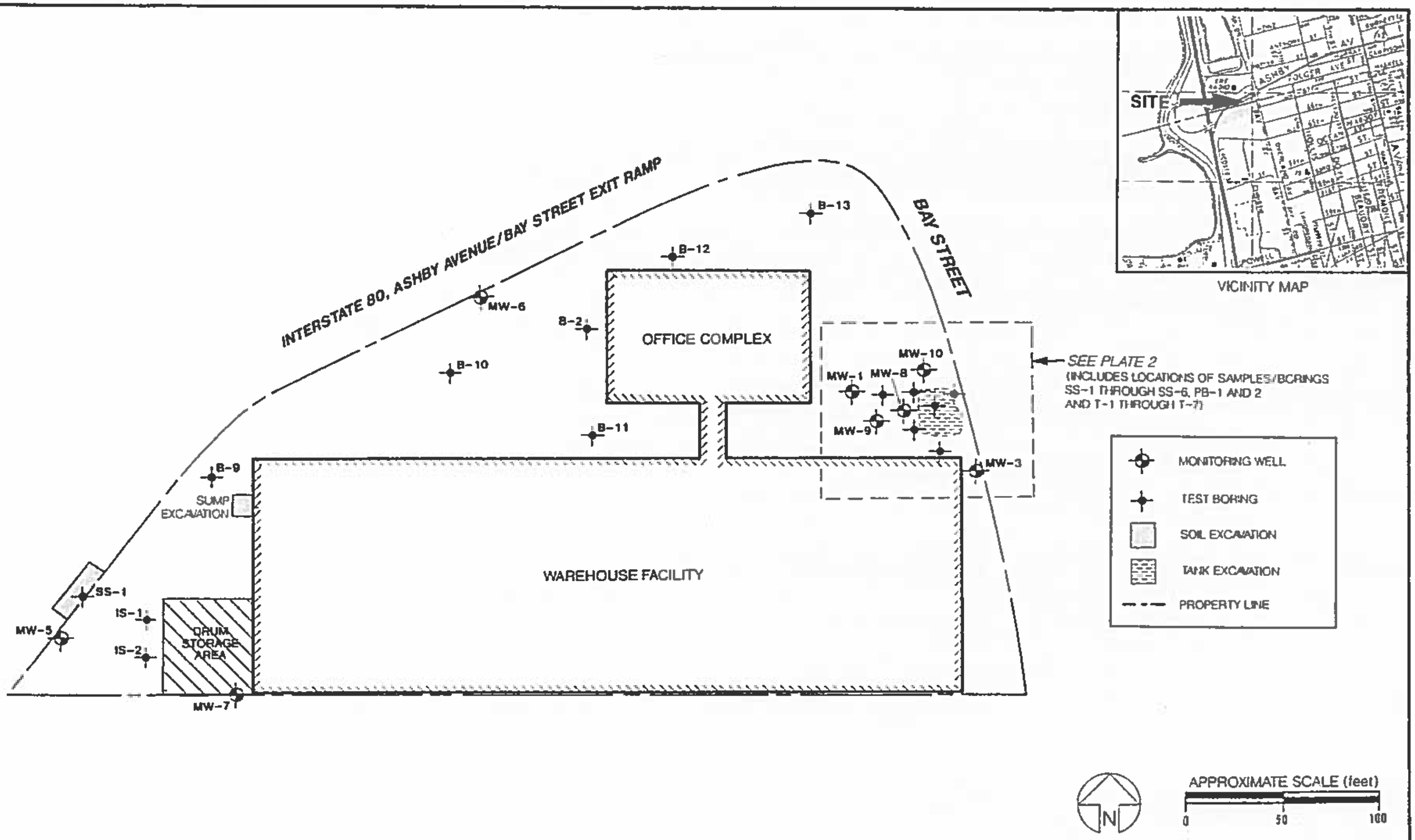
Date	Well	Total Recoverable Hydrocarbons (mg/l)	Oil and Grease (mg/l)	TEH (mg/l)	TVH (mg/l)
7/6/89	MW-1	--	--	<0.5	<0.5
9/7/89		--	<10	<0.5	<0.5
1/10/90		0.5	--	<10	<10
5/20/93		--	<5	--	--
8/25/93		--	<5	--	--
11/18/93		--	<5	--	--
2/25/94		--	<5	--	--
8/8/94		--	--	<0.05	<0.05
2/9/95		--	--	1.0^b	<0.05
5/9/95		--	--	1.2^b	0.95^a
11/13/95		--	--	<0.05	<0.05
5/9/96		--	--	1^b	0.05^a
9/7/89	MW-3	--	<10	<0.5	<0.5
1/10/90		0.6	--	<10	<10
5/20/93		--	<5	--	--
8/25/93		--	<5	--	--
11/18/93		--	<5	--	--
2/25/94		--	<5	--	--
4/21/94		--	<5	0.43	0.08
8/8/94		--	<5	1.2	<0.05
1/10/90	MW-8	103	--	<10	<10
12/10/90		10.5	--	--	--
5/20/94		--	<5	--	--
8/25/93		--	<5	--	--
11/18/93		--	14	--	--
2/25/94		--	<5	--	--
4/21/94		--	<5	2.8	5.9
8/8/94		--	<5	3.8	7.2
2/9/95		--	--	2.8^b	9.1^a
5/9/95		--	--	4.9^b	0.95^a
11/13/95		--	--	1.9^b	18^a
5/8/96		--	--	4.8^b	3.6^a
4/21/94	MW-9	--	<5	0.88	0.92
8/8/94		--	<5	1.2	0.86
2/9/95		--	--	0.730^b	0.400^a
5/9/95			--	0.900^b	0.440^a
11/13/95		--	--	0.340^b	0.430^a
5/9/96		--	--	5.7^b	0.2^a
4/21/94	MW-10	--	<5	2.1	0.68
8/8/94		--	<5	4.4	0.61
2/9/95		--	--	1.3^b	0.150^a
5/9/95		--	--	2.8^b	0.280^a
11/13/95		--	--	2.2^b	0.660^a
5/9/95		--	--	2.2^b	0.8^a

-- = Test not requested

[a] = Sample chromatogram does not resemble gas standard

[b] = Sample chromatogram does not resemble diesel standard

[c] = Sample exhibits unknown single peak or peaks



SITE PLAN

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6707 BAY STREET – EMERYVILLE, CA

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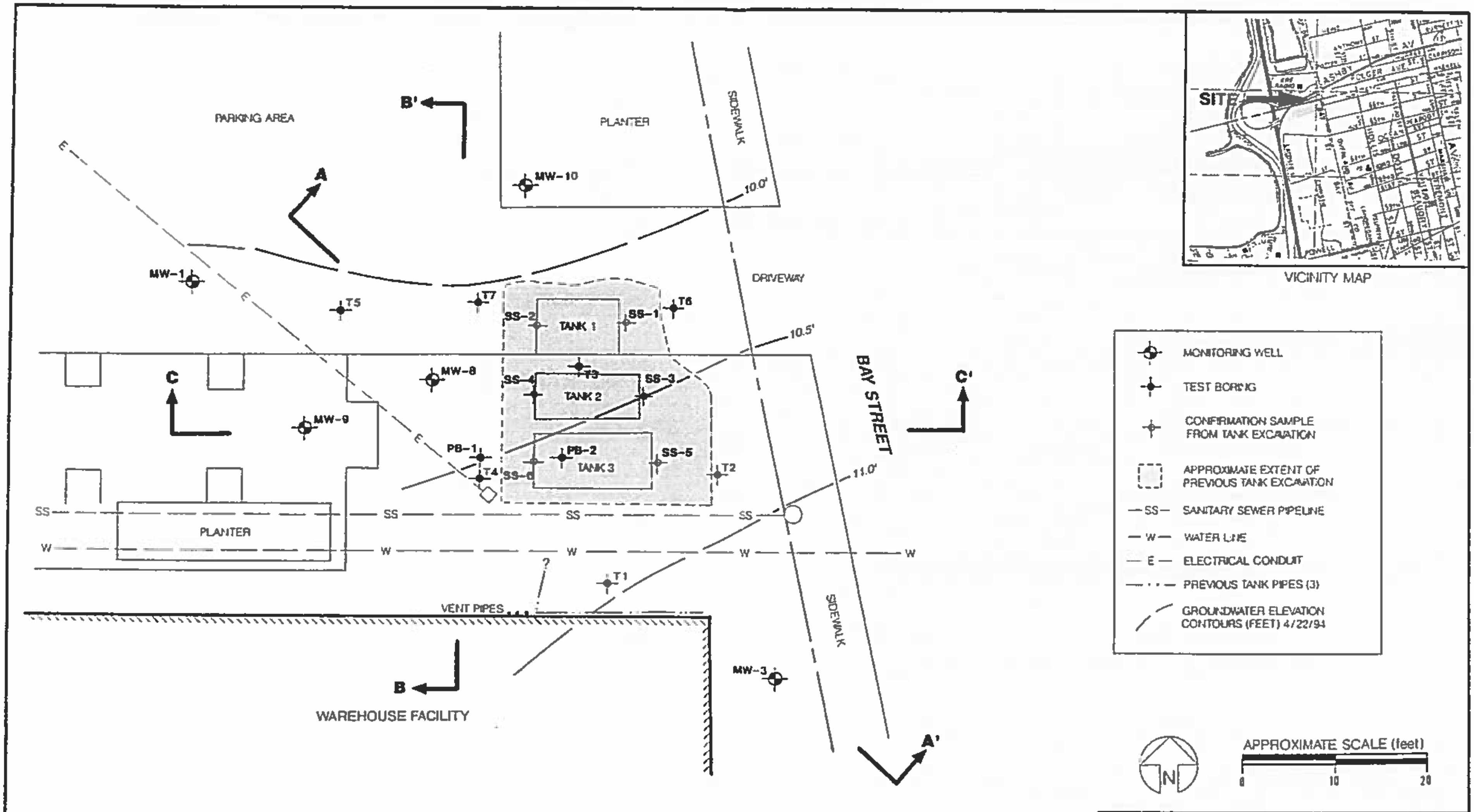

TANK AREA PLAN

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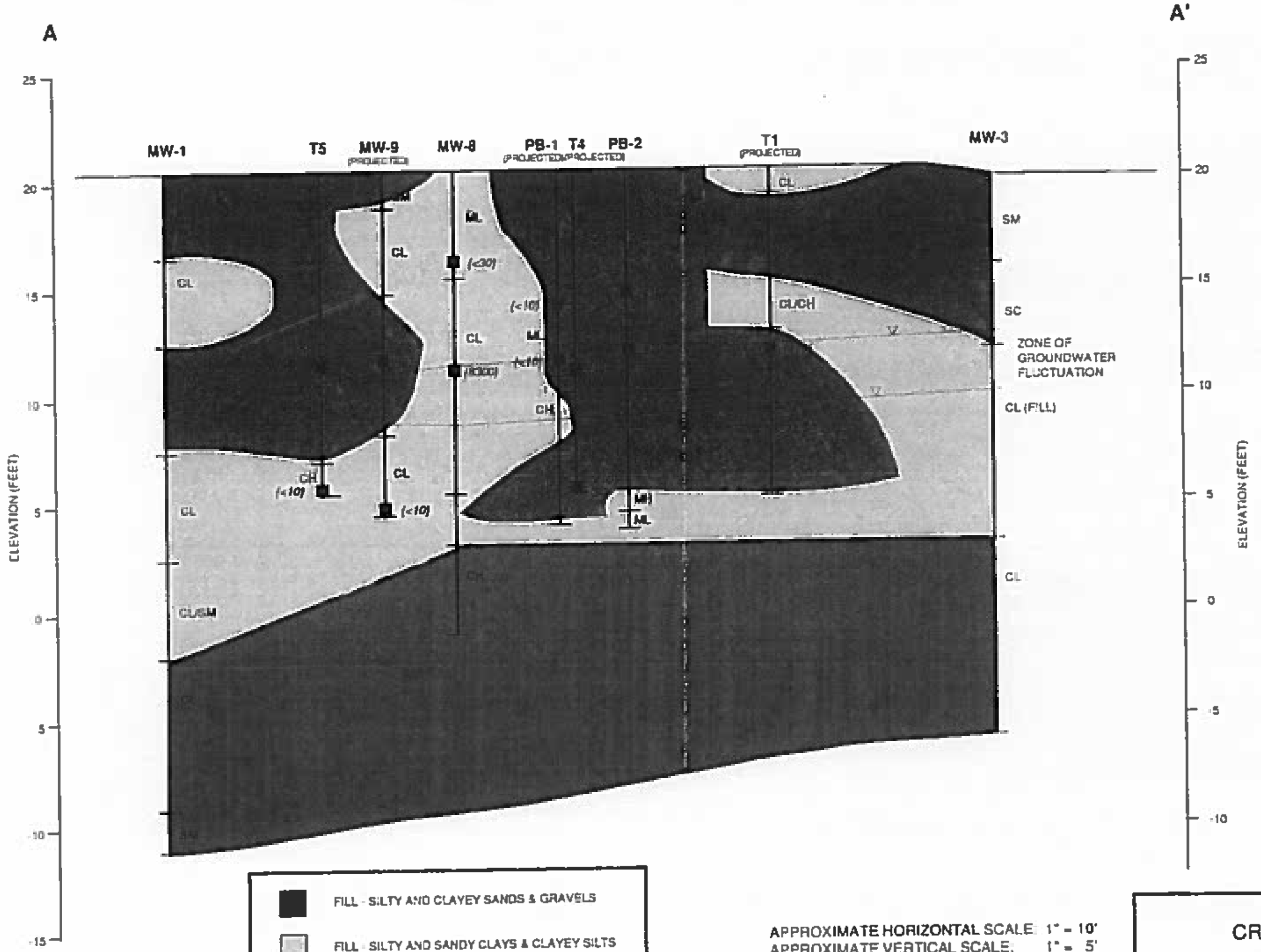

ELEVATION REFERENCE: MSL

■	FILL - SILTY AND CLAYEY SANDS & GRAVELS
▨	FILL - SILTY AND SANDY CLAYS & CLAYEY SILTS
■	BAY AND MARSH DEPOSITS
(15)	MIBK CONCENTRATION IN SOIL (µg/kg)

APPROXIMATE HORIZONTAL SCALE: 1" = 10'
APPROXIMATE VERTICAL SCALE: 1" = 5'

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CROSS SECTION A - A'

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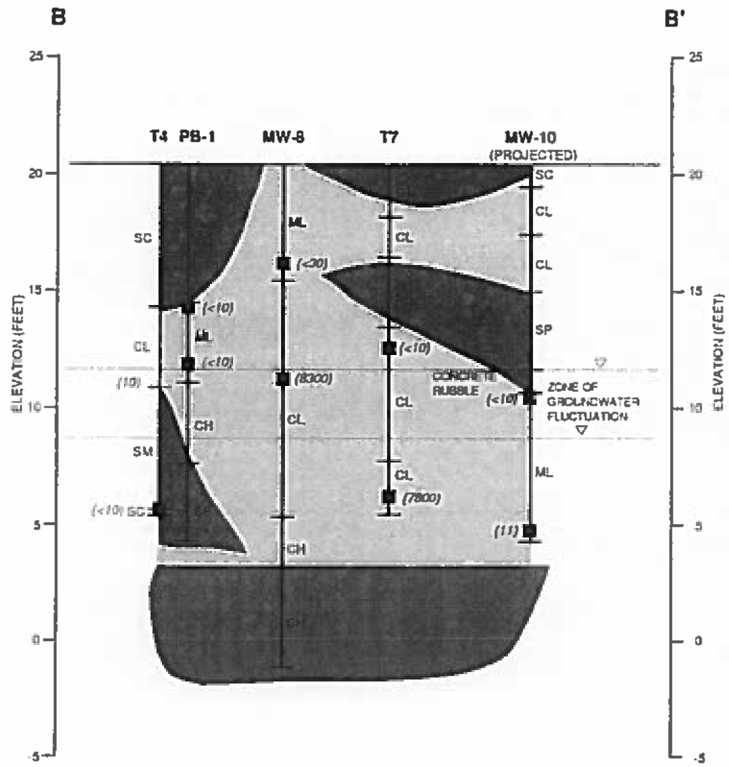
820 001	5/6/94		14



▨	FILL - SILTY AND CLAYEY SANDS & GRAVELS
☐	FILL - SILTY AND SANDY CLAYS & CLAYEY SILTS
■	BAY AND MARSH DEPOSITS
(20)	MIBK CONCENTRATION IN SOIL (µg/kg)

ELEVATION REFERENCE: MSL

APPROXIMATE HORIZONTAL SCALE: 1" = 10'
APPROXIMATE VERTICAL SCALE: 1" = 5'

CROSS SECTION B-B'

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6707 BAY STREET - EMERYVILLE, CA

JOB NUMBER	DATE	APPROVED	PLATE
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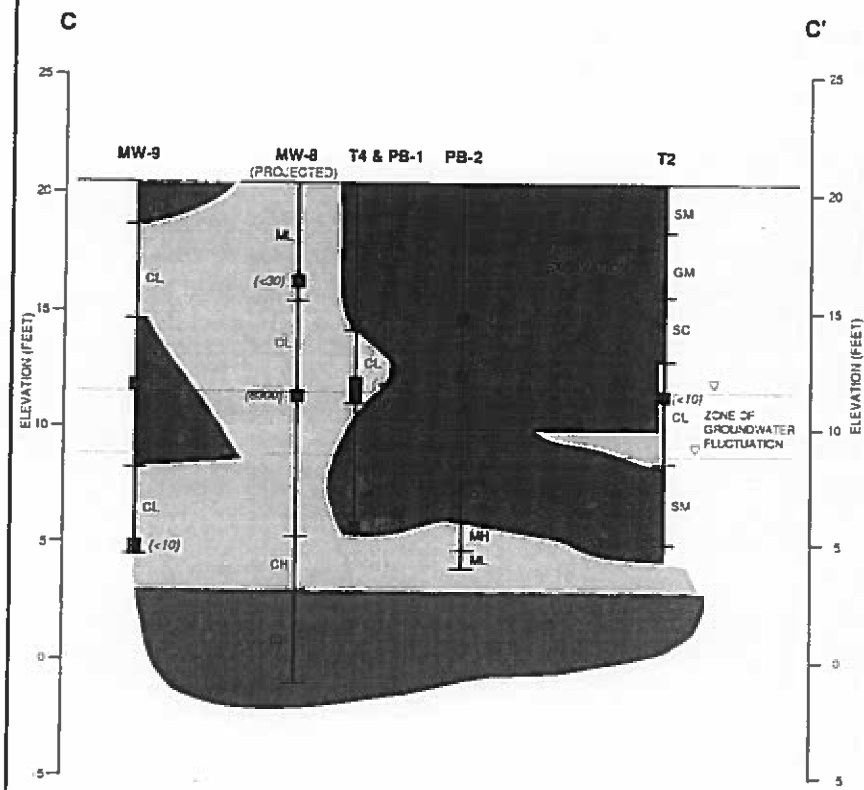

■	FILL - SILTY AND CLAYEY SANDS & GRAVELS
☐	FILL - SILTY AND SANDY CLAYS & CLAYEY SILTS
▨	BAY AND MARSH DEPOSITS
(20)	MIBK CONCENTRATION IN SOIL (µg/kg)

ELEVATION REFERENCE: MSL

APPROXIMATE HORIZONTAL SCALE: 1" = 10'
APPROXIMATE VERTICAL SCALE: 1" = 5'

CROSS SECTION C - C'

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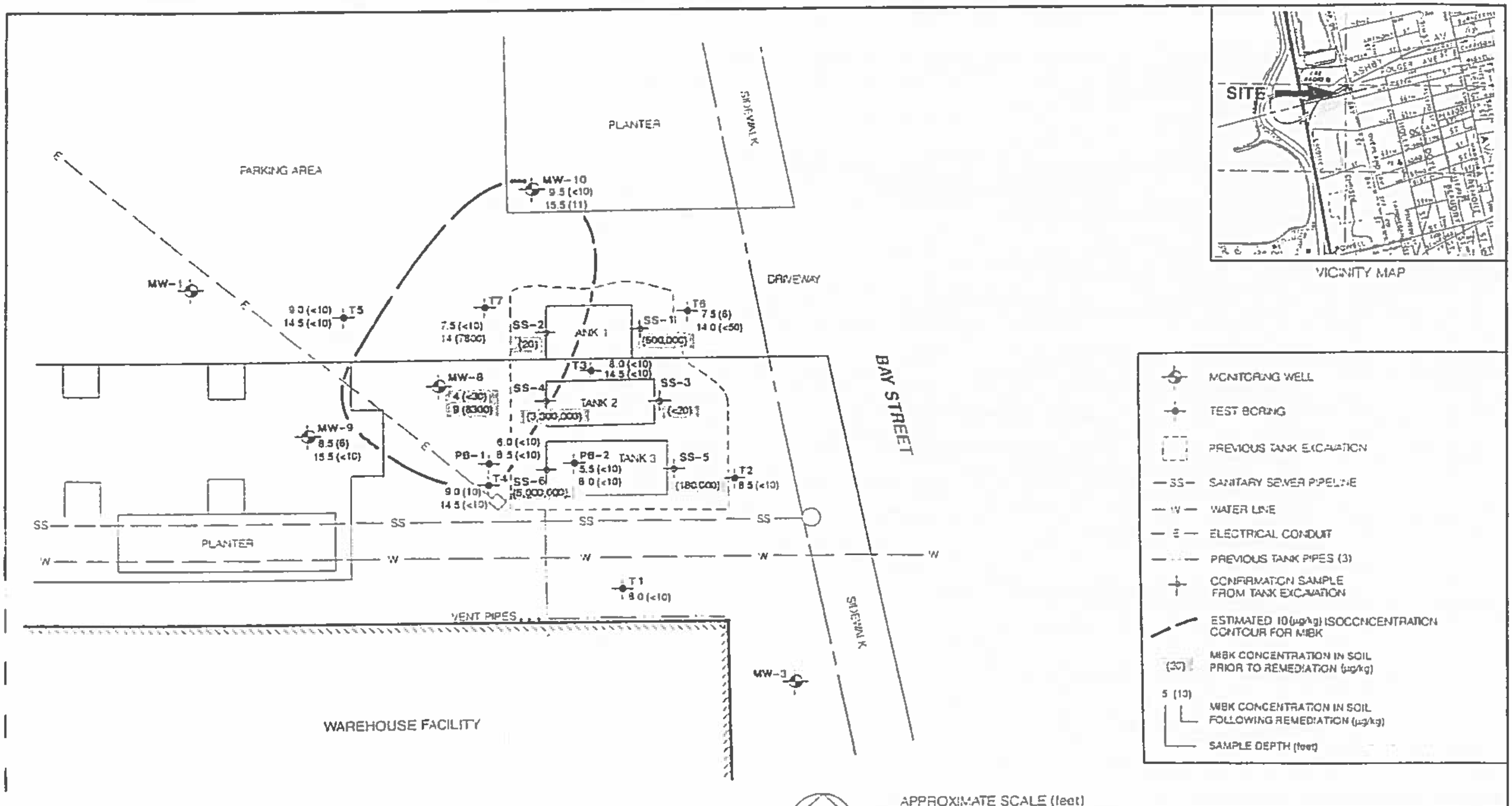
JOB NUMBER	DATE	APPROVED	PLATE
820.001	5/6/94		16



MIBK CONCENTRATIONS IN SOIL

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JOB NUMBER	DATE	APPROVED	PLATE
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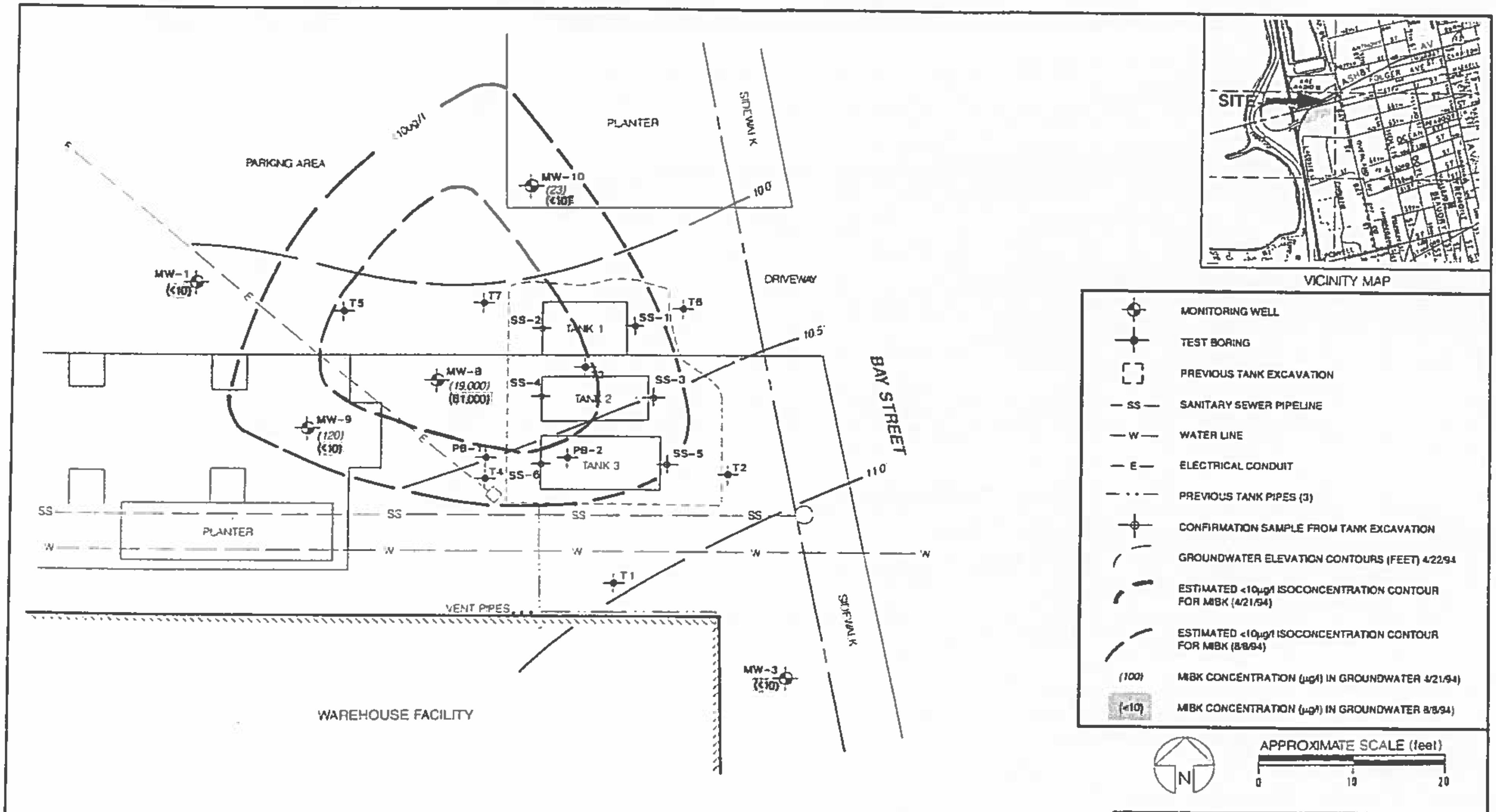

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MIBK CONCENTRATIONS IN GROUNDWATER

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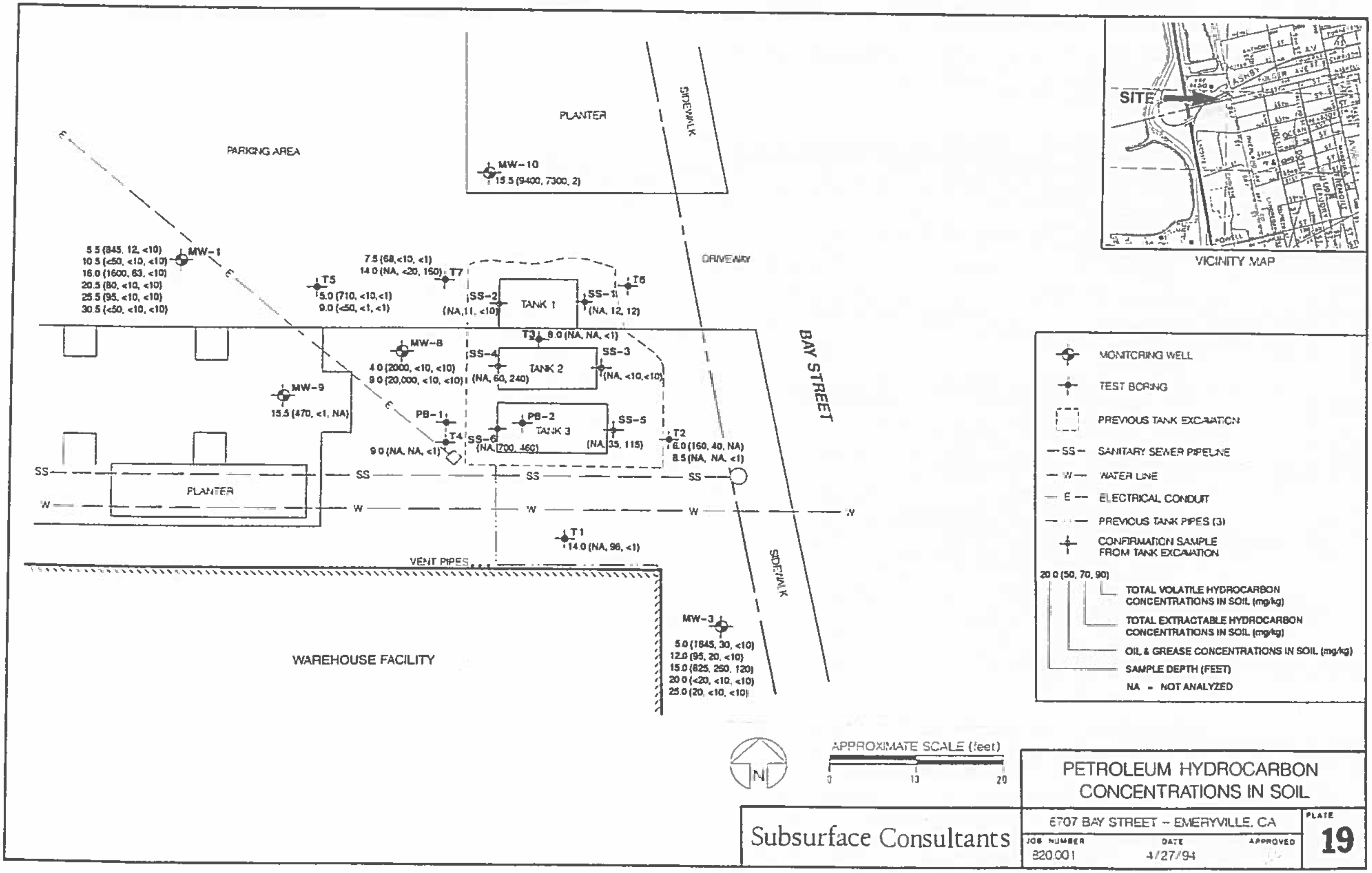

PETROLEUM HYDROCARBON CONCENTRATIONS IN SOIL

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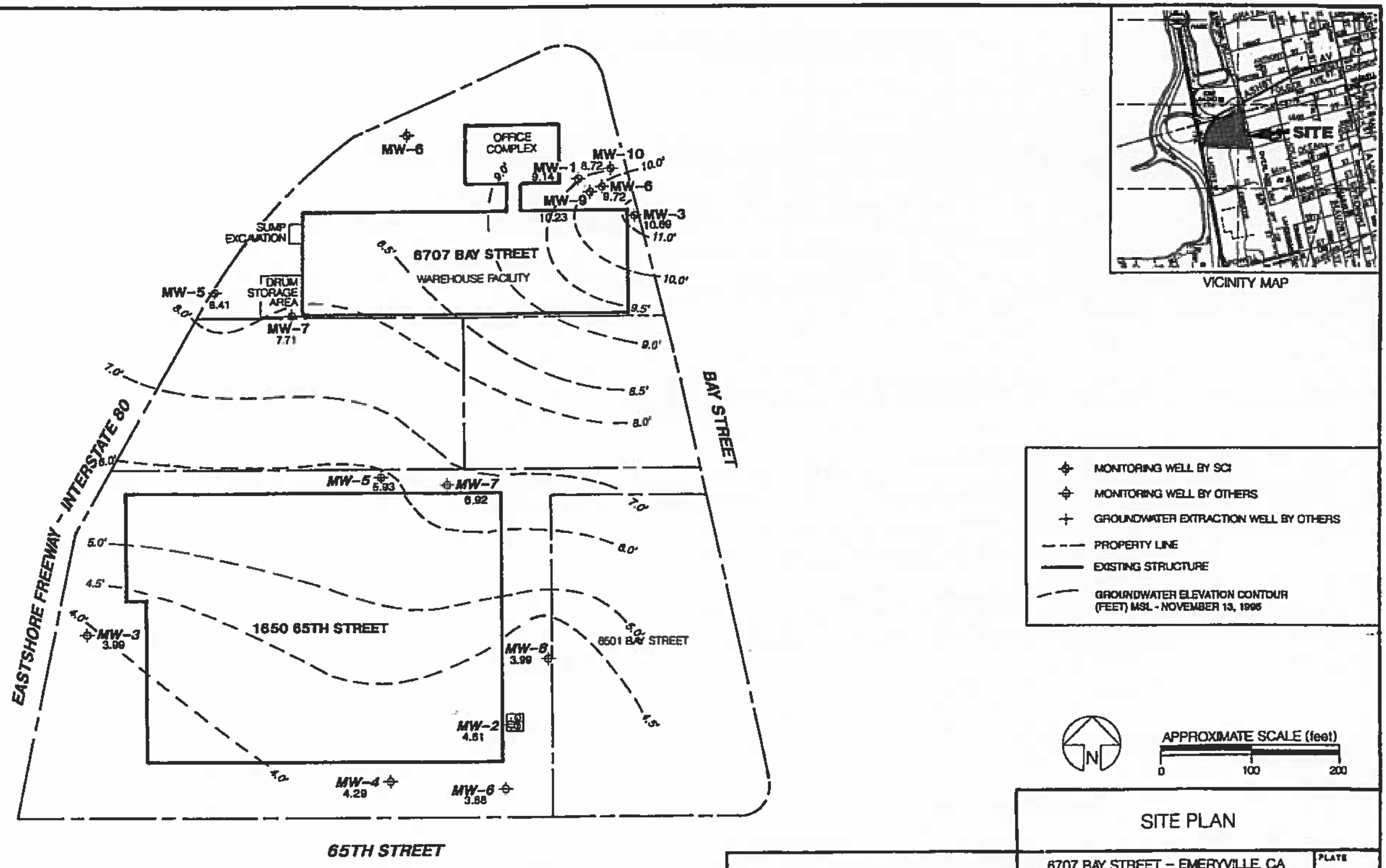

SITE PLAN

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6707 BAY STREET – EMERYVILLE, CA

JOB NUMBER 620.001

DATE 12/6/95

APPROVED

PLATE 1

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QUALITY CONTROL REVIEWER

Robert S. Creps, P.E.
Principal Engineer