RECEIVED

10:46 am, May 28, 2010

Alameda County
Environmental Health

April 30, 2010

Work Plan for Remedial Investigation and Feasibility Study

3442 Adeline Street
Oakland, California

AEI Project No. 281939
ACEH # RO 02936

Prepared For:

Ms. Steffi Zimmerman
3289 Lomas Verdes Place
Lafayette, CA 94545

Prepared By:

AEI Consultants
2500 Camino Diablo Blvd.
Walnut Creek, CA 94597
(925) 746-6000

AEI

TABLE OF CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

AEI Consultants (AEI) has prepared this report on behalf of Ms. Steffi Zimmerman, the owner of the property located at 3442 Adeline Street in the City of Oakland, Alameda County, California (Figure 1). AEI has been retained by Ms. Zimmerman to provide environmental engineering and consulting services relating to the release of gasoline from a former underground storage tank (UST) on the property. The investigation and mitigation of the release is being performed under the direction of the Alameda County Environmental Health (ACEH) Local Oversight program (LOP).

Previous site investigations identified a release of gasoline from the former UST. This workplan summarizes proposed activities to gather additional data necessary for a preliminary evaluation of the feasibility of a variety of remedial alternatives to address gasoline range hydrocarbons present in soil vapor, soil, and groundwater at the site

2.0 SITE DESCRIPTION AND BACKGROUND

The subject site (hereinafter referred to as the "site" or "property") is situated on the northeast corner of 35th Street and Chestnut Street in a mixed commercial, industrial and residential area of Oakland. The main entrance to the property is on 3442 Adeline Street. A second entrance is located at 3433 Chestnut Street. The on-site building covers approximately 65% of the property and is currently being used as a warehouse facility. Refer to Figure 2 for an aerial photo of the property and Figure 3 for a site plan.

2.1 UST Removal

On February 22, 2000, Clearwater Group (Clearwater) supervised the excavation and removal of a single-wall 3,750 gallon UST. Soil samples and a groundwater sample was collected from the excavation pit and analyzed for total petroleum hydrocarbons as gasoline (TPH-g), as diesel (TPH-d), methyl tertiary butyl ether (MTBE) and BTEX (benzene, toluene, ethyl benzene, and total xylenes). TPH-g, TPH-d and benzene were reported at concentrations up to 920 milligrams per kilogram (mg/kg), 850 mg/kg, and 0.3 mg/kg, respectively. The results of the soil analyses are summarized in Table 1, Soil Analytical Data. TPH-g, TPH-d, and benzene were reported in the excavation groundwater sample at concentrations of 7,400 micrograms per liter (µg/L), 34,000 µg/L, and 3,300 µg/L, respectively. The results of the groundwater analyses are summarized in Table 2, Groundwater Analytical Data.

Following receipt of the tank removal report, the City of Oakland Fire Department requested in a letter dated May 15, 2006 additional soil and groundwater samples to further characterize the site. The location of the former UST and sample locations are shown on Figure 3.

2.2 Clearwater Phase II Investigation

On June 23, 2006 Clearwater performed a Phase II Environmental Site Investigation by advancing four (4) additional soil borings (S1 - S4). The location of soil borings are shown on Figure 3. Analysis of groundwater samples reported TPH-g and benzene at concentrations up to 120,000 µg/L and 7,000 µg/L, respectively. TPH-d was not detected at or above the elevated laboratory reporting limits. The results of the soil analyses are summarized in Table 1, Soil Analytical Data. The results of the groundwater analyses are summarized in Table 2, Groundwater Analytical Data.

2.3 AEI Consultants Site Investigation

In October and December of 2007 and May of 2008, AEI performed additional site investigations to further define the nature and extent of the release. Thirty-one (31) soil borings (SB-1 through SB-31) were advanced to an approximate depth of 16 feet bgs and three (3) soil vapor samples were collected from within the building. Soil boring locations are shown on Figure 3.

The maximum concentrations of TPH-g, TPH-d, and BTEX reported in soil were 1,200 mg/kg, 450 mg/kg, 6.9 mg/kg, 2.5 mg/kg, 24 mg/kg and 110 mg/kg, respectively. MTBE was reported at a concentration of 0.14 mg/kg in one sample, SB-11-15. The results of the soil analyses are summarized in Table 1, Soil Analytical Data and on Figures 4, 5, and 6.

The maximum concentrations of TPH-g, TPH-d and BTEX reported in groundwater were 83,000 µg/L, 12,000 µg/L, 10,000 µg/L, 640 µg/L, 2,700 µg/L and 7,900 µg/L, respectively. No MTBE was reported in groundwater samples from any of the soil borings. The results of the groundwater analyses are summarized in Table 2, Groundwater Analytical Data and on Figure 7.

The maximum concentrations of TPH-g, TPH-d and BTEX reported in soil vapor samples were 3,100 µg/m3, 130 µg/m3, 42 µg/m3, 16 µg/m3, and 49 µg/L, respectively. No MTBE was reported in soil vapor samples. The results of the soil vapor analyses are summarized in Table 3, Soil Vapor Analytical Data.

Soil and groundwater analytical data indicated that the gasoline plume in the soil and groundwater trend in a west to northwesterly direction, beneath the warehouse building on the property. TPH-g concentrations decrease rapidly to the north, south and east of the former UST. The results of these and previous soil, soil vapor, and groundwater analyses can be found in AEI's Well Installation Report dated July 31, 2009.

2.4 Interim Source removal

During March and April of 2009, AEI removed impacted soil from down gradient of the former UST and inside the building. The excavation measured 35 feet by 75 feet by approximately 12 feet deep. Excavated soil was disposed of at West Contra Costa Sanitary Landfill (745.37 tons) and Keller Canyon Landfill (352.84 tons). The base of the excavation was backfilled with a layer of permeable drain rock. Five (5) 4-inch diameter casings (BF-1 through BF-5) were installed in the permeable bridge to facilitate dewatering the excavation. The excavation and backfill activities are summarized in AEI's Interim Source Removal Report, dated August 31, 2009.

2.4.1 Excavation

The concrete floor slab overlying the excavation area was cut and removed by the client in February of 2009. Beginning on March 2, 2009 the surface layer of non-impacted soil was removed from the excavation and stockpiled to the northwest in the corner of the building. The shallow soil was excavated to a depth of approximately 4.0 feet bgs to 4.5 feet bgs, the depth below which field screening with a photo-ionization detector (PID) exceeded 100 parts per million by volume (ppmv). Field screening concentrations at depths between 5 and 7 feet bgs ranged from 110 ppmv to 2,100 ppmv. The locations of field screening samples and vapor concentrations are show on Table 3 and Figure 8.

On March 9, 2009, three (3) sets of four (4) discrete soil samples were collected from shallow stockpiled soil to confirm its acceptance for re-use as backfill in the excavation. Analysis of the samples reported TPH-g, and MBTEX at concentrations up to 9.0 mg/kg, ND<0.05 mg/kg, 0.18 mg/kg, 0.049 mg/kg, 0.087 mg/kg, and 0.27 kg/kg respectively meeting the regional water quality control boards guideline for re-use of soil on impacted sites.

The impacted soil was removed in sections beginning in the south end of the excavation proceeding northward. During excavation the impacted soil was temporarily stockpiled under the covered area adjacent to Adeline Street pending profiling and disposal after the excavation was backfilled. Soil was excavated to yellowish brown soil at a depth of approximately 12 – 13 feet bgs, the depth at which field screening of soil at the bottom of the excavation reported PID readings below 100 ppmv.

Following excavation of impacted soil to apparent clean soil in each section and collection of sidewall and bottom confirmation samples, the excavation was backfilled with drain rock to a depth of approximately 9 feet bgs prior to excavation of the next section. During the emplacement of the permeable fill in each section of the excavation, a section of 0.020-inch factory slotted, 4-inch diameter, schedule 40 PVC with a blank riser was installed in a sump at a depth of approximately 13 feet bgs to allow the excavation to be dewatered. Five (5) temporary vertical casings (BF-1 through BF-5) and three (3) horizontal SVE casing were installed during excavation under permit from the Alameda County Public Works Agency (ACPWA). The locations of the backfill casings are shown on Figure 9.

The excavation had overall dimensions of 35 feet by 70 feet with 9 feet indentation by sixteen feet indentation in the northeast corner around the facility bathroom. Impacted soil was excavated to an average depth of 12 feet with an estimated volume of soil removed of 982 cubic yards.

2.4.2 Confirmation Sampling

During excavation, soil samples were collected from the side walls of the excavation to confirm the extent to which impacted soil was being removed. Soil was sampled at an approximately 20 foot intervals along the sides of the excavation at depths of approximately 7 feet bgs and 11.5 feet bgs. A total of 19 soil samples were collected from the excavation side walls and 4 soil samples were collected from the bottom of the excavation. The locations of the confirmation soil samples are shown on Figures, 10 and 11.

No groundwater was collected from the excavation during excavation activities, but a light sheen of free product was seen on the water seeping into the pit during excavation. The results of the confirmation soil sample analyses are shown in Table 4.

2.4.3 Excavation Backfill

As described above, the excavation was backfilled with a permeable bridge of ¾-inch drain rock at the bottom of the excavation, approximately four feet of drain rock was placed in the bottom of excavation. A layer of geo-textile fabric was then placed over the drain rock and the excavation was back-filled to a depth of 7 feet bgs with compacted Class II base rock. Three horizontal SVE wells were installed along the north, east and south sides of the excavation as described below. The purpose of the casing was allow evaluation of the vadose zone adjacent to the excavation in the same interval that field screening indicated the presence of significant concentrations of hydrocarbons. The shallow stockpiled soil and recycled Class II base rock was used to fill the excavation to approximately three feet bgs. The broken concrete from the former floor was placed in a single layer across the excavation then covered with engineered fill to the bottom of the adjacent existing floor. A concrete slab was installed by the client to match the adjacent floor.

2.4.4 Backfill Wells

During the emplacement of the 3/4-inch drain rock permeable bridge in the bottom of each section as it was excavated, a four foot section of 0.020-inch factory slotted, 4-inch diameter, schedule 40 PVC screen with a blank riser was installed in a sump at a depth of approximately 13 feet bgs to allow the excavation to be dewatered. Flush mounted well boxes were placed at the surface to protect the well heads when the final concrete slab was poured by the client.

2.4.5 Horizontal SVE Wells

When the excavation was backfilled to a depth of 7 feet bgs, three horizontal SVE wells were installed along the north, east and south sides of the excavation to allow evaluation and possible remediation of high VOC vapor concentrations seen during field screening of this interval. The horizontal wells consisted of four-inch schedule 40 PVC 0.010 slotted casing with 4-inch blank risers at each end of the horizontal section. The horizontal casings were covered by approximately one foot of pea gravel then covered with geotextile fabric then backfilling of the excavation was completed. The locations of the backfill casings are shown on Figure 9.

On April 27, 2009, concentrations of Total Volatile Hydrocarbons (TVH), methane (CH4), oxygen (O2) and carbon dioxide (CO2) in the soil vapor of the SVE casings were measured to determine hydrocarbon concentrations and potential for remediation of hydrocarbons in the vadose zone. Vapor concentrations were measured by placing a 4-inch to ¼-inch reducing fitting on one end of a horizontal SVE well with an end cap on the other. A vacuum was placed on the well casing using a peristaltic pump. An Eagle multi-gas detector capable of measuring parts per vapor million (ppmv) range organic vapor concentration, as well as percent concentrations of methane, O2, CO2, and CH4 was attached to the discharge side of the pump as shown on Figure 12.

A 1-liter Tedlar bag sample was collected from each well and submitted to McCampbell Analytical, in Pittsburg, CA for analysis. Field TVH concentrations reported ranged from 60 ppmv (SVE-1) to 55 ppmv (SVE-3). Oxygen was reported at concentrations of 10.7 % (SVE-1) to 8.9 % (SVE-3) and CO2 at concentrations of 7.7 % (SVE-1) to 8.1 % (SVE-2). Analysis of the Tedlar bag vapor samples from SVE-2, SVE-2 and SVE-3 reported TPH-g at concentrations of 51 µg/L, 48 µg/L , and ND <25 µg/L.

Re-measurement of the gases in the SVE casings on June 6, 2009 reported TVH as less than at 1 ppmv, and average oxygen and CO2 measurements of 14.26 % and 6.03 %, respectively. The results of vapor sampling from the SVE wells are summarized on Table 5.

2.5 Well Installation

On April 1 - 2, 2009 and May 12 - 13, 2009, AEI advanced eight soil borings (MW-1 through MW-7 and IW-1) at the property and converted seven (7) of the borings (MW-1 through MW-7) into groundwater monitoring wells and one boring (IW-1) into an injection/sparge well. The monitoring wells were installed at a depth of 17 feet bgs; the sparge well was installed at a depth of 15 feet bgs. The locations of the wells are shown on Figure 3.

The details of the well installation are summarized in the AEI's Groundwater Monitoring Well Installation Report, dated July 31, 2009. The details of well construction are summarized on Table 6, Well Construction Details.

TPH-g was reported in soil samples collected from the monitoring wells at concentrations ranging from ND<1.0 mg/kg to 1,100 mg/kg (MW-4-1). TPH-d was reported at concentrations ranging from ND<1.0 mg/kg to 99 mg/kg (MW-4-12). Inspection of 8015 chromatographs indicates that the hydrocarbon present in the soil is weathered gasoline and that the diesel range hydrocarbon concentrations reported represent the heavy portion of gasoline component compounds (See Appendix F, Well Installation Report).

MTBE was reported above reporting limits in samples MW-6-19 and MW-6-25 at 0.12 mg/kg and 0.029 mg/kg, respectively. Benzene was reported at concentrations ranging from ND<0.005

mg/kg to 0.81 mg/kg (MW-2-12). Toluene was reported at concentrations ranging from ND<0.005 mg/kg to 2.9 mg/kg (MW-4-12). Ethylbenzene was reported at concentrations ranging from ND<0.005 mg/kg to 6.7 mg/kg (IW-1-10.5). Xylenes were reported concentrations ranging from ND<0.005 mg/kg to 3.5 mg/kg (IW-1-10.5). The results of analyses of soil sample from the groundwater monitoring wells are

TPH-g was reported in groundwater samples at concentrations ranging from 220 μg/L (MW-1) to 14,000 μg/L (MW-5). TPH-d was reported at concentrations ranging from 97 μg/L (MW-1) to 3,700 μg/L (MW-7). Inspection of 8015 chromatographs indicated that the hydrocarbons present in the soil is gasoline. The diesel range hydrocarbon concentrations reported represent the heavy portion of gasoline component compounds.

MTBE was reported as non-detectable at a laboratory reporting limit of 5.0 μg/L in MW-1 and as non-detectable at elevated reporting limits in the other monitoring wells. Benzene was reported at concentrations ranging from 10 μg/L (MW-1) to 3,000 μg/L (MW-5). Toluene was reported at concentrations ranging from ND<0.5 μg/L (MW-1) to 37 μg/L (MW-7). Ethylbenzene was reported at concentrations ranging from 2.3 μg/L (IW-1) to 340 μg/L (MW-5). Xylenes were reported at a concentrations ranging from 5.4 μg/L (MW-1) to 920 μg/L (MW-3).

On March 27, 2009, TPH-g and MBTEX were reported in backfill well casing BF-1 at concentrations of 19,000 μg/L, ND<250 μg/L, 890 μg/L, 27 μg/L, 460 μg/L, and 1200 μg/L, respectively.

On June 22, 2009, TPH-g and MBTEX were reported in backfill well casing BF-1 at concentrations of 6,700 μg/L, ND<150 μg/L, 840 μg/L, 19 μg/L, 170 μg/L, and 150 μg/L, respectively.

The monitoring wells and selected backfill wells were sampled on August 27, 2009, December 15, 2009, and March 12, 2010.

2.6 SVE and Backfill Well Destruction

Following evaluation of soil gas concentrations in the horizontal SVE wells along the north, south and east sides of the excavation the SVE wells SVE-1, SVE-2, SVE-3 and backfill well BF-4 were destroyed on January 19, 2010. The wells were destroyed by grouting the wells with a neat cement grout. Well destruction was carried out by HEW Drilling under the supervision of AEI and the ACPWA.

3.0 GEOLOGY AND HYDROLOGY

The site lies on the distal end of the Temescal Creek Alluvial Fan at approximately 45 feet above mean seal level (amsl). The Temescal Alluvial Fan is a low relief broad fan sloping westerly and southwesterly from the mouth of the Temescal Creek. The Holocene age alluvial fan deposits are mapped as Qhaf (Helley 1997). The sediments are described as typically, brown to tan gravelly sand or sandy gravel, which generally grades upward into sandy or silty clay.

The sediments in the upper four (4) to five (5) feet underlying the site are black silty clay – clayey silt containing variable amounts of scattered gravel. These sediments are considered to be bay margin sediments.

The shallow fine grained surface layer is underlain by alluvial deposits of intercalated, lenticular bodies of silt, clay, sand, and gravel. The sediments are typically highly variable mixtures of the four primary lithologies. Permeability (transmissivity) of the coarse grained sediments is typically low due to the presence of interstitial clay; however scattered clean sands and gravels are present with good permeability. These permeable bodies appear to act as preferential channels for groundwater flow across the site and are the likely cause of the slightly sinuous, asymmetric appearance of the hydrocarbon plume in the soil and groundwater.

Groundwater was encountered in all borings; however the borings were slow to produce water and in some cases several days were required to accumulate sufficient water to allow collection of groundwater samples. Groundwater elevations have ranged from 24.11 feet amsl (6.53 ft bgs) in well MW-7, located in Chestnut Street to the east, to 19.36 ft amsl (9.98 ft bgs) in well MW-6 adjacent to Adeline Street to the West. Groundwater flow direction is in a westerly direction at an average gradient of 0.019ft/ft.

4.0 CONCEPTUAL SITE MODEL (CSM)

The Site Conceptual Model identifies the source of contaminants, release mechanism, exposure pathways and potential human and ecological receptors.

4.1 Source of Release

The source of the release was a single walled, 3,750 gallon single walled steel tank located under the sidewalk at the south east corner of the property (Figure 3).

4.2 Impacted media

The release impacted the soil immediately surrounding former UST and the groundwater underlying the tank hold and down gradient of the tank hold.

4.3 Nature, Magnitude, Extent of Contamination

4.3.1 Soil

Previous investigations have identified significant concentrations of hydrocarbon contamination in the shallow soil, typically between depths of 5 feet to 12 feet bgs. The distribution of impacted soil is show on Figures 4, 5 and 6. No significant hydrocarbons (TPH-g/TPH-d <50 mg/kg) has been identified above 5 feet bgs. At depths below 5-feet bgs and above 9-feet bgs (smear zone) significant hydrocarbons remain in the area of the former tank hold, along the south end of the source removal excavation and in SB-13 and MW-3 (down gradient of the north portion of the excavation).

At depths below 9-feet bgs and above 14-feet bgs (aquifer) significant hydrocarbons remain in the area of the former tank hold, along the south and east sides of the source removal excavation and in a lobate plume extending west (down gradient) of the source removal excavation for approximately 140 feet. The impacted soil in this interval is related to impacted groundwater in permeable gravels.

At depths below 14-feet bgs, significant hydrocarbons have been identified only in the area of MW-6, adjacent to Adeline Street. The presence of hydrocarbons in MW-6 is related to the impacted groundwater permeable gravels that make up the aquifer stepping downward and the resulting drop in the water table.

The distribution of hydrocarbons in the soil is variable and appears related to vertical (layering) and lateral (channels) variations in lithology and related permeability variations.

4.3.2 Groundwater

Maximum concentrations of TPH-g and BTEX reported in groundwater samples from soil borings were 120,000 µg/L (S-4), 10,000 µg/L (SB-11) 930 µg/L (SB-11), 3,500 µg/L(S-4), and 7,900 µg/L (SB-11), respectively. No MTBE has been reported in groundwater samples.

Maximum concentrations of TPH-g and BTEX reported in groundwater samples from groundwater monitoring wells were 26,000 µg/L (MW-2), 3,800 µg/L (MW-3) 36 µg/L (MW-3), 1,500 µg/L (MW-2), and 3,000 µg/L (MW-2), respectively. No MTBE has been reported in groundwater samples at elevated reporting limits. Historical groundwater concentrations of hydrocarbons are presented on Table 2, Soil Boring Groundwater Analytical Data and current data on Figure 7, Monitoring Well Groundwater Data (12/15/09).

The primary contaminant reported in soil and groundwater analyses is a gasoline range fuel with related BTEX. Diesel range hydrocarbons are typically reported at significantly lower concentration than TPH-g and examination of chromatograph charts of groundwater samples from the wells concentration found no indication of diesel present. Chart patterns that are consistent with a gasoline range fuel release.

An exception to the observation of higher gasoline concentrations and significantly lower diesel concentrations is seen the groundwater samples from soil borings SB-16, SB-18 and SB-19. These borings are located on the up gradient edge of the plume in Chestnut Street and are up gradient of the former UST location. The analytical reports of diesel range hydrocarbons in these samples typically carry laboratory flags indicating the presence of oil range hydrocarbons. The analyses for these samples were re-quantified as diesel and motor oil. The re-quantified results for these samples reported motor oil at significantly higher concentration than either gasoline or diesel. Examination of the chromatograph charts for these three samples show the presence of a hydrocarbon centered in the overlap between the diesel and motor oil ranges. These heavier than diesel hydrocarbons suggest a separate release up gradient of the site, such as heavy heating oil, has occurred.

4.4 Fate and Transport Mechanisms

The calculated direction of groundwater flow is to the west with a average gradient of 0.018 ft/ft. However, the orientation of the hydrocarbon plume and hydrocarbon distribution in the groundwater indicates that the actual groundwater flow is somewhat sinuous and appears to follow permeability channels (sands and gravels). The aquifer is composed of gravelly sands and sandy gravels. The permeability of the sediments is highly variable and appears to have been deposited by braided stream flowing down the alluvial fan.

Attenuation of hydrocarbon concentrations down gradient appears to be primarily by dilution and dispersion. Dissolved oxygen (DO) concentrations within the hydrocarbon plume are typically less than 0.90 mg/L indicate that the aquifer is anaerobic and biodegradation is likely limited by the low levels of dissolved oxygen.

4.5 Preferential Pathways

Groundwater migration is along permeability channels within alluvial sands and gravels. The depth to both the gravels and the water table increases to the west. No known underground utilities intersect the water table down gradient of the former UST.

4.6 Potential Human Exposure Scenarios

Four (4) potential human exposure scenarios and three (3) exposure pathways have been identified in the Site Conceptual Models (Attachment E):

Commercial/industrial worker – This exposure scenario corresponds to long-term exposure by workers to chemicals via incidental ingestion, dermal absorption and inhalation of vapors and particulates. "Commercial/Industrial Use Only" assumes that only working age adults will be present at the site on a regular and frequent basis.

Construction/trench worker – Short-term exposure by construction workers and utility trench workers via incidental ingestion, dermal absorption and inhalation of vapors and particulates during infrequent excavation and trenching activities.

Visitor (Contractor) – This exposure scenario corresponds to short-term exposure by contractors visiting the site, visitors are presumed to be working age adults, via incidental ingestion, dermal absorption and inhalation of vapors and particulates.

Residential – Residential scenarios incorporate conservative assumptions regarding long-term, frequent exposure of children and adults to impacted soils in a residential setting. Residential land use includes hospitals and day-care centers and is intended for sites where land-use restrictions are not desired or allowed.

4.6.1 Commercial/Industrial Workers Exposure

The impacted soil and groundwater at the subject property is isolated below pavement and building floors/foundations from direct contact with residential occupants, commercial/industrial workers and visitors and direct exposure via incidental ingestion and dermal absorption of impacted soil and groundwater is prevented. The potential for direct exposure via inhalation of volatile chemical compounds originating from the subsurface soil and/or groundwater does exist in those areas that overlie soil and/or groundwater impacted by volatile organic compounds.

4.6.2 Construction/Trench Workers

The subject property is serviced by underground water, and gas, as well as by municipal sanitary and storm sewers. Excavation and trenching work is a possibility at the site. Potential short-term exposure risk to construction/trench workers via incidental ingestion, dermal absorption and inhalation will exist whenever contaminated subsurface soil and groundwater are exposed by excavation or trenching on the subject property.

4.6.3 Visitors

A portion of the facility is currently being use as a sports (baseball) facility and is frequented by visitors for short durations. Other portions of the facilities are uses for storage warehouse and are frequented by contractors who load and unload materials, and perform other short-duration tasks. This introduces a potential short-term exposure risk to the visitors via inhalation of volatile chemical constituents originating from subsurface soil and groundwater. Visitors can be assumed to be working age adults. For risk assessment purposes, visitors are treated like construction/trench workers although the exposure risk may be overestimated inasmuch as exposure via incidental ingestion and dermal contact is prevented by the surface overlays and building foundations.

4.6.4 Residential

Adjacent property to the north and south is currently under residential use. Outside of the subject property, the potential human exposure to chemical compounds originating from on-site sources is considered to be low and manageable via institutional controls.

4.7 Potential Ecological Exposure Scenarios

The impacted soil and groundwater below portions of the subject property are isolated from terrestrial ecological receptors by pavement and the building floors/foundations. There are no known wetlands or other eco-systems located within the subject property boundaries. There are no known potential ecological receptors associated with the site of adjacent properties.

The nearest surface water body is the San Francisco bay, approximately 4340 feet (0.82 miles) west of the subject property (Figure 1).

A first-order approximation of the groundwater velocity can be calculated from the hydraulic conductivity and groundwater gradient. The hydraulic conductivity of the shallow water-bearing zone can be estimated from pump or slug test data. The time for groundwater in the shallow water-bearing zone to travel from the subject property to potential outflow points along Bay will be calculated, but is considered to be relatively high relative to the attenuation rate.

Based on the low hydraulic conductivity and distance separating the subject property from surface water receptors, and further considering the effects of dispersion, dilution, absorption and other attenuation, the potential risk to ecological receptors in the Bay and sloughs from impact by groundwater-borne chemicals in the shallow water-bearing zone is not considered to be significant.

5.0 RISK EVALUATION

5.1 RWQCB Environmental Screening Levels

The San Francisco Bay Region, RWQCB document, "Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater" (May 2008), presents a series of conservative environmental screening levels (ESLs) for chemicals in soil and groundwater. The RWQCB developed ESLs for various scenarios to address the environmental protection goals presented in the Basin Plan (RWQCB, June 1995). These goals include aesthetic or nuisance goals (e.g. taste and odor), protection of drinking water resources, aquatic habitats and human health, among others. Under most circumstances and within limitations, the presence of a chemical in soil or groundwater at concentrations below ESLs can be assumed not to pose a significant, long-term threat to human health or the environment. Additional evaluation and/or remediation may be necessary at sites where a chemical is present at concentrations above ESLs.

5.1.1 Soil Screening Levels

• Soil sample data are compared with ESLs for both Residential and Commercial/Industrial Land Use and where groundwater IS NOT considered a potential source of drinking water. The assumption is that future land use will be restricted to commercial/industrial and institutional controls will restrict groundwater use.

• Long-term exposure to residential or commercial/industrial workers via ingestion, dermal absorption or particulate inhalation is not considered significant because the chemically impacted soil and groundwater are isolated in the subsurface by pavement overlays and building foundations.

• The short-term construction/trench worker exposure to shallow soil and groundwater is considered as trenching and excavation work may be performed on the subject property.

• Ecological-based ESLs for shallow soil are not considered applicable at this time because the impacted soil is isolated from potential terrestrial and aquatic receptors by pavement overlays and buildings. Mitigation of ecological impact concerns can be achieved through maintenance of the surface pavement over the impacted areas, and implementation of institutional controls such as a soil management plan and best management practices.

5.1.2 Shallow Groundwater Screening Levels

• Drinking and potable water exposure concerns are not considered applicable

• Volatile organic compounds can volatilize from the groundwater through asphalt and concrete overlays to impact outdoor air or building indoor air. Heating systems and basements in buildings, and strong winds can increase the problem by reducing the building internal air pressure and creating a vacuum effect that enhances the flow of vapors out of the underlying groundwater into the building. The lookup tables in the RWQCB (May 2008) include groundwater ESLs for indoor-air concern.

• Groundwater below the subject property ranges from approximately 5.5 feet bgs to 9.0 feet bgs.

5.2 ESL Summary

The tables below summarize the applicable ESLs based on subsurface conditions, the main chemicals of concern, and the potential human and ecological exposures identified for the subject property.

SHALLOW SOIL ESLs					
	RWQCB ESLs				
Exposure Scenarios:	Residential Direct exposure Table K-1	Commercial / Industrial Worker Direct exposure Table K-2	Residential Gross Contamination ceiling Value Table H-2	Commercial / Industrial Gross Contamination ceiling Value Table H-2	Commercial / Trench Worker Direct Exposure Table K-3
TPH as gasoline	110	450	100	100	4,200
Benzene	0.12	0.27	500	870	12
Toluene	63	210	500	650	62
Ethylbenzene	2.3	5.0	400.0	400	210
Total Xylenes	31	100	420	420	420

mg/kg - Milligrams per kilogram
TPH - Total petroleum hydrocarbons
ESLs - Environmental screening levels for soil where groundwater is NOT a current or potential source of drinking water, RWQCB May 2008

GROUNDWATER ESLs (SHALLOW WATER BEARING ZONE)			
	RWQCB ESLs		
Exposure Scenarios:	Gross Contamination Ceiling Levels Table I-2	Vapor Intrusion into buildings Residential Table E-1	Vapor Intrusion into buildings Commercial / Industrial Table E-1
TPH as gasoline	5,000	Use Soil Gas	Use Soil Gas
Benzene	20,000	540	1,800
Toluene	400	380,000	380,000
Ethylbenzene	300	170,000	170,000
Total Xylenes	5,000	160,000	160,000

mg/kg - Milligrams per kilogram
TPH - Total petroleum hydrocarbons
ESLs - Environmental screening levels for groundwater where groundwater is NOT a current or potential source of drinking water, RWQCB May 2008

5.3 Evaluation of Risk at the Site

The investigations completed to date have determined that the predominant chemicals of concern are gasoline range petroleum hydrocarbons and associated BTEX and other gasoline component VOCs.

Exposure via incidental ingestion, dermal absorption and particulate inhalation is prevented by surface overlays and therefore these exposure pathways are considered incomplete. Potential exposure via inhalation of volatile organic vapors emanating from subsurface soil and/or groundwater on the residential property south of the subject site has not been evaluated due to lack of sufficient soil and groundwater data and lack of access to that area.

One soil vapor sample (VP-1) collected before the source area removal suggested the potential for benzene intrusion risk to residential occupation on the adjacent property to the site via soil-to-air or groundwater-to-air exposure pathways. Depth to groundwater in the vicinity of VB-1 has been recorded as shallow as 5.96 feet bgs. TPH-g and benzene concentration reported in nearby soil boring SB-1 in December 2007 were reported at concentrations of 26,000 µg /L and 2,000 µg/L, respectively.

Vapor concentrations measured in field screening of the vadose zone during the excavation were reported up to 975 ppmv. Following the source removal excavation, hydrocarbon vapor concentrations in the horizontal casings along the sides of the backfilled excavation decreased from a maximum of 60 ppmv on March, 27, 2009 to ND<1.0 ppmv on June, 24, 2009. At the same time oxygen concentrations increased and carbon dioxide concentrations decreased, indicating reduced biodegradation. If benzene concentrations have decreased proportionately, the potential for benzene vapor intrusion is likely minimal.

The soil sample analytical data are below the RWQCB ESLs for commercial/industrial worker and construction/trench worker direct-exposure but exceed residential direct-exposure guidelines (Table 1 and Table 2).

6.0 RESPONSE ALTERNATIVES

Potential response actions were developed based on information gathered from various agency guidelines and documents. Information was gathered from literature reviews and personal contacts, consultants and contractors. AEI also drew upon experience with past and on-going projects in the San Francisco Bay Area.

Four (4) general response actions were considered are:

- No Further Action or Limited Action
- Institutional Controls
- Containment
- Active Remediation

6.1 Evaluation Criteria

The following criteria will used to evaluate the potential response actions.

6.1.1 Reduction of Toxicity, Mobility and Volume

This criterion establishes preferences for alternatives that will produce significant and permanent reductions in the chemicals of concern. The amount of chemicals to be removed or treated, the effectiveness of the treatment, and the types and quantity of chemicals that will remain in-situ are some of the factors to be considered.

6.1.2 Technical Feasibility

Technical feasibility considers potential response action given site constraints, reliability of the technology, and the ability to monitor the effectiveness of the alternative. The evaluation will consider aspects such as how proven and reliable the process is in reducing or containing/immobilizing the contaminants, and attaining cleanup goals.

6.1.3 Cost Effectiveness

Capital, operation and maintenance (O&M) costs will be evaluated on a conceptual level. Capital costs include direct costs, such as equipment, construction and development. O&M costs include labor, materials, repairs, administrative fees and reporting costs during the operation period. For relative comparison purposes, response action alternative costs are classified as low (<$50,000), moderate ($50,000 to $100,000), high (> $100,000).

6.2 Remedial Alternatives

6.2.1 No Further Action or Limited Action

Four (4) alternatives are evaluated and discussed below. These alternatives allow the chemicals of potential concern to remain in-situ and require little or no human action.

6.2.1.1 No Further Action

This alternative means that further remedial investigation, groundwater monitoring and remedial action ceases. No institutional controls would be implemented. This alternative is rejected because of the environmental risks associated with current conditions at the subject property.

6.2.1.2 Natural Attenuation

Natural attenuation is defined as naturally-occurring processes in the subsurface that act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of the chemicals of concern in the subsurface media. These in-situ processes include dispersion, dilution, absorption, volatilization and chemical or biological stabilization or destruction of chemicals in soil and groundwater. Of these processes, degradation of chemicals is generally the most important, since chemical mass is being removed from the system. Dispersion, dilution, absorption and volatilization are generally non-destructive processes. EPA (1998) has developed a technical protocol for data collection and analysis to monitor and provide evidence of natural attenuation for restoration of groundwater impacted with hydrocarbons. The key step for demonstrating natural attenuation is to show that the chemicals of potential concern are attenuating at rates sufficient to be protective of human health and the environment.

To demonstrate natural attenuation, the groundwater would be monitored for the chemicals of potential concern and for natural attenuation parameters such as chemical daughter products, dissolved oxygen, changes in groundwater chemistry and other indicators of chemical degradation.

Natural attenuation without any artificial enhancement is rejected at this time because the process would not achieve cleanup in a timely manner, and monitoring may not provide additional useful data other than to indicate that some unassisted biodegradation of chemicals is occurring. Natural attenuation, however, is retained when combined with chemical degradation or biodegradation enhancement technologies that reduce the time for significant attenuation to occur.

6.2.1.3 Groundwater Monitoring

Groundwater monitoring consists of the periodic monitoring of groundwater for the chemicals of concern and monitoring the site for regulatory compliance. This alternative does not achieve soil and groundwater cleanup by itself, but is necessary for determining the effectiveness of other response alternatives once implemented. Thus, groundwater monitoring is retained for use in combination with other response actions.

6.2.1.4 Additional Site Investigation

This alternative does not achieve soil and groundwater cleanup by itself, but can reduce any uncertainty associated with the known extent of soil and groundwater impact by chemicals of concern, and thus is retained for use in combination with other response actions.

6.2.1.5 Discussion of No Further Action or Limited Action Options

All four (4) alternatives are technically feasible. Cost range from low to moderate to high. The no further action alternative does not reduce toxicity, mobility or volume of contaminants of concern, and is thus rejected. The natural attenuation alternative would be of limited effectiveness in reducing toxicity, mobility or volume of contaminants of concern, and is thus retained for consideration in conjunction with other response actions such as artificial enhancement. Groundwater monitoring and additional site investigation would not reduce toxicity, mobility or volume of contaminants of concern, but are retained for consideration in conjunction with other response actions because of the need to reduce uncertainty associated with the known extent of soil and groundwater impact by chemicals of concern, and to monitor the effectiveness of response actions once implemented.

6.2.2 Institutional Controls

Four (4) institutional controls will be evaluated for the subject property:

6.2.2.1 Risk Management Plan

A risk management plan includes guidelines and construction restrictions to protect current and future occupants, contractors and visitors from exposure to chemicals while performing excavation and trenching in the hydrocarbon-affected areas at the subject property. A clearance process for subsurface work would be established so that occupants and contractors would be alerted if excavation or trenching was planned. Health and safety plans would be required from contractors for authorization to be issued for excavation and other surface disturbances. A construction review process would be implemented to ensure that in the future, new buildings or other structures would not be built over the impacted areas without mitigating potential risks. This alternative is retained for potential use in combination with other alternatives.

6.2.2.2 Groundwater Use Restriction

A groundwater use restriction can be implemented via a deed restriction whereby the use of groundwater on the subject property as a source of potable or irrigation water, or other beneficial use, is restricted or banned. This alternative is retained for potential use in combination with other alternatives.

6.2.2.3 Land Use Restrictions

Land use restrictions (such as commercial/industrial land use only) impose limitations on the future use and development of the subject property. This alternative is retained for potential use in combination with other alternatives.

6.2.2.4 Other Deed Restrictions and Covenants

Other deed restriction and covenants include tools to facilitate property transfer or redevelopment, such as Certificate of Completion (per AB 2061 process) and Prospective Purchaser Agreements. This alternative is retained for potential use in combination with other alternatives.

6.2.2.4 Discussion of Institutional Controls

The four (4) institutional control alternatives are technically feasible and low cost. However, none of the four (4) institutional control alternatives reduce toxicity, mobility or volume of the chemicals of concern at the subject property. For this reason institutional control alternatives will not be further addressed during this phase of the remediation.

6.2.3 Containment

This response action restricts the spread of contaminants in the subsurface media by either physical or hydraulic containment. The two (2) containment actions are evaluated and discussed below.

6.2.3.1 Physical Containment

Physical containment includes surface overlays and vertical barriers, vertical barriers may include slurry walls, grout curtains and steel sheet pile walls. Physical containment involves the construction of impermeable barriers to prevent horizontal and/or vertical migration of the chemicals of concern. This alternative would not directly reduce chemical concentrations in soil and groundwater, but may be effective in reducing their spread or migration. Slurry walls, grout curtains and steel sheet pile walls may be effective in physically containing groundwater-borne contaminants if the barriers can be keyed into an impermeable layer that prevents chemicals from migrating beneath or around the barriers.

6.2.3.2 Hydraulic Containment

Hydraulic containment includes the installation of interceptor trenches or wells in the source areas or immediately down gradient of the source areas. The pumping of groundwater from these trenches or wells artificially depresses the groundwater level and thereby mitigates the outward movement of groundwater-borne contaminants with the natural groundwater flow and gradient. Hydraulic containment is a secondary outcome in groundwater extraction, one of the response actions in Active Restoration, Section 6.4. This alternative is retained for potential use by its' self or in combination with other alternatives.

6.2.4 Active Restoration

Active restoration technologies of potential applicability at the subject property are discussed below.

6.2.4.1 Remedial Excavation

Excavation involves the physical removal of impacted soil to the extent possible. Following soil removal, the excavation is de-watered to remove groundwater-borne contaminants. The permeable bridge in the excavation can be used as a bioreactor by sparging air or hydrogen peroxide into the groundwater.

6.2.4.1 Groundwater Extraction

Traditionally, contaminated groundwater has been remediated by extracting the groundwater and treatment of the water at the surface followed by disposal. Groundwater extraction is a remediation technology designed to remove the groundwater-borne contaminants. Groundwater is pumped from the subsurface using wells or trenches, the extraction points are placed at and hydraulically down gradient of source areas for maximum effectiveness. Groundwater extraction is most effective in sediments with moderate to high permeability where groundwater can move easily into the extraction wells.

Empirical data from soil borings, monitoring wells, and de-watering the interim source removal excavation suggest the over all transmissivity of the formation is low which would limit the effectiveness of groundwater extraction. The formation testing that will be part of the remedial investigation is designed to collect sufficient data to quantify the parameters needed to evaluate groundwater treatment as a remedial option.

6.2.4.2 Soil Vapor Extraction

Soil vapor extraction is a remediation technology designed to remove VOCs in soil above the groundwater table through a vacuum system. A system of vertically and/or horizontally perforated pipes are placed in the unsaturated zone and manifolded into a vacuum blower to extract vapors from soil. The extracted vapors are directed to a vapor treatment system for treatment and discharge to the atmosphere under an air permit. The high water table in the primary source area, the low permeability and clay-rich nature of the shallow soils are not conducive to soil-gas movement and/or extraction. A soil vapor extraction system used in conjunction with an air sparging system may be effective.

6.2.4.3 In-Situ Groundwater Treatment

Options for insitu treatment of soil and groundwater include in-situ chemical oxidation (ISCO) and bio-sparging/Enhanced in-situ bioremediation

ISCO consists of the introduction of hydrogen peroxide, ozone, or other agent into the hydrocarbon-affected soil and groundwater. These agents destroy contaminants through direct in situ chemical oxidation (ISCO) and when producing oxygen as a by product promote natural attenuation through biodegradation and other mass reducing processes. In-situ treatment can be used alone or in conjunction with other remedial actions such as excavation.

Oxidant injection requires a delivery mechanism (wells or temporary borings). Sufficient permeability in the aquifer is required to the inject material (slurry, vapor bubbles, or liquid). Injection can be performed slowly, over longer timeframes (ozone and oxygen diffusion such as ISOC), or on a one-time or periodic basis (ORC, Fenton’s reagent, hydrogen peroxide, potassium permanganate). In addition, a number of the potential oxidants have the effect of raising the oxygen levels in the soil and groundwater, which will augment naturally occurring bio-degradation.

A large amount of the agent would have to be applied and require multiple injections lateral extent of the plume and hydrocarbons in the impervious, clay rich nature of the sediment adjacent to the braded gravel channels that make up the aquifer beneath the site.

Bioremediation of saturated zones containing petroleum hydrocarbons involves stimulation of native soil bacteria to multiply by the addition of oxygen and/or nutrients. Research has demonstrated the ubiquitous nature of indigenous soil bacteria capable of degradation of petroleum hydrocarbon impacted sites. In hydrocarbon impacted sites these bacteria are typically limited by oxygen availability. Oxygen consumption at such sites generally reduces oxygen concentrations to the point where anaerobic bacteria are the primary biomass present. Adding oxygen to the subsurface, such as by sparging air or introducing oxygen or oxygen producing compound into the subsurface via probes or wells, results in an increase in the oxygen dependent biomass and accelerated biodegradation. Other processes such as absorption, diffusion, and dispersion assist in reducing petroleum hydrocarbon concentrations passively.

6.2.4.4 Air Sparging

Air sparging involves in situ stripping of volatile contaminants from groundwater via injection of air beneath the contaminated groundwater. Vapor phase contaminants are then removed by soil vapor extraction. Air sparging/vapor extraction of hydrocarbons occurs most easily when the contaminated sediments have good permeability with good vertical and horizontal continuity. During this process the groundwater and vadose zone soil is oxygenated resulting in enhanced biodegradation. Recent experience indicates insitu remediation approaches which don’t require surface treatment systems tend to be more cost effective. The apparent low permeability of the sediments may limit this approach.

6.2.4.5 Groundwater Extraction

Extraction of groundwater with treatment with surface treatment of the extracted groundwater would reduce groundwater contamination levels and can be used to create hydraulic containment which results in prevention or reduction in the migration of the plume

6.2.4.6 Summary of Active Remediation Options

All of the active remediation alternatives appear to be technically feasible to one extent or other. Conventional air sparging and soil vapor extraction (SVE) appear to have limited application, however air sparging, SVE and bioventing will be evaluated. Groundwater extraction and in-situ treatment would reduce the toxicity, mobility and volume of contaminants of concern at the subject property, and thus are retained for consideration in conjunction with other response actions.

7.0 FEASIBILITY STUDY

AEI will evaluate the relative costs and effectiveness of the following approaches:

<u>No Further Action or Limited Action</u>

- Groundwater Monitoring
- Additional Investigation

<u>Institutional Controls</u>

- None

<u>Containment</u>

- None

<u>Active Restoration</u>

- Groundwater Extraction
- Soil Vapor Extraction
- In-situ Groundwater Treatment
- Air Sparging

Institutional controls, containment and other no further action or limited action options may be revisited later when hydrocarbon concentrations are significantly reduced.

AEI will propose a remedial option based on following factors, which will be evaluated during the course of the remedial investigation:

- Amount and extent of contamination detected in shallow water bearing zone wells
- Characteristics of the impacted water bearing zone including size, estimated storage, flow direction gradient
- Extent of soil and groundwater contamination.
- Permeability of the contaminated sediments including ability to accept injected liquids
- Capital costs
- Operational and maintenance costs.

8.0 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN

8.1 Scope of Work for Additional Investigation and Pilot Tests

The scope of work for the Additional Investigation will consist of the following:

- Install two (2) groundwater monitoring wells in near locations of borings SB-7 (MW-8) and SB-26 (MW-9).
- Install one (1) Air Sparge well (IW-2) midway between the locations of boring SB-22 and well MW-5 near the center of the groundwater plume under the subject property;
- Install one (1) groundwater monitoring well approximately 40 feet west of well MW-IW-1in the center of the plume.
- Install six (6) soil vapor probes at distances of 5-, 10-, 15- and 20-feet of well IW-1;
- Perform air sparging test to determine the feasibility of air sparging and/or ozone injection;
- Perform an air acceptance/bioventing test
- Perform pump and/or falling head tests of selected wells to determine formation transmissivity and the feasibility of air sparging and/or ozone injection;

Following the remedial investigation, a feasibility study will be performed utilizing the data collected to evaluate the alternatives discussed above for remediation of the gasoline range hydrocarbons present in the soil and groundwater underlying the site. The results of the feasibility study well be included in a Remedial Investigation and Feasibility Study report.

8.2 Groundwater Monitoring Wells

Three (3) groundwater monitoring wells will be installed to further delineate the extent of hydrocarbon impact to the groundwater underlying the site. The locations of the wells will be chosen as described below and locations are shown on Figure 13.

Well IDs	Rationale
MW-8	In Chestnut Street near soil boring SB-7 to monitor lateral edge of hydrocarbon plume across gradient from the former UST.
MW-9	Just inside the northern edge of the groundwater plume adjacent to soil boring SB-26 to monitor the north edge of hydrocarbon plume.
MW-10	Center of down gradient groundwater plume to evaluate and monitor hydrocarbon concentrations in the central portion of the groundwater plume and as observation well during testing of sparge well IW-2.
IW-2	Center of down gradient groundwater plume to evaluate air sparging as method for remediation.

8.2.1 Well Installation

Well construction permits will be obtained from Alameda County Public Works Agency. Groundwater monitoring wells MW-8 through MW-10 will be installed at a depth of approximately 17 feet bgs with a hollow stem drilling rig using nominal 8¼" outside diameter hollow stem augers. The wells will be constructed with 2-inch diameter Schedule 40 PVC well casing. The screened interval will extend from total depth to a depth of 7 feet bgs. A sand pack will be installed in the annulus of each well to approximately 1 foot above the screen interval. A bentonite seal will be placed above the sand and the remainder of the boring will be sealed with cement grout. A traffic rated flush mounted well box will be installed at the surface.

Air sparge well IW-2 will be constructed using 2-inch diameter schedule 80 PVC, flush-threaded casing with Viton® o-rings with a 2-inch diameter by 2-foot long 0.010 wire wound stainless steel screen. The screened interval will placed across the base of the impacted water bearing sand/gravel which is expected to be encountered at a depth between 9.5-feet and 12-feet bgs. An annular sand pack (2/12) will be installed in 1-foot lifts to a depth approximately 1 foot above the screen interval. A two (2) foot bentonite seal will be placed above the sand and hydrated with tap water.

During drilling of groundwater monitoring wells, soil samples will be collected at a maximum of 5' intervals with a California modified split spoon sampler advanced ahead of the bit. Additional samples may be collected across the water bearing sand/gravel to facilitate placement of the sparge point. Samples will be utilized to characterize the sediments beneath the site and for possible chemical analyses.

The wells will be developed no sooner than 3 days after sealing the wells by surging, bailing, and purging to remove accumulated fines from the casing and sand pack.

A minimum of three soil samples will be collected from each boring at depths between 8.0 and 17 feet bgs. The purpose of the analyses is to gather data, which will allow evaluation of various remedial options.

8.3 Soil Gas Probe Installation

Three (3) permanent soil gas probes (SG-1 to SG-3) will be installed to collect baseline soil gas data and to monitor the changes in soil gas pressure and composition before, during, and after the pilot study.

8.3.1 Soil Gas Probe Construction

The six (6) soil gas probes (SG-1 to SG-6) will be installed in soil borings 7.0 feet deep. Borings will be advanced with a nominal 8-inch diameter borings advanced by a C-57 contractor. Each probe will consist of nested soil gas implants placed at centered at 6.0 feet bgs and 3.0-feet bgs. The soil gas probes will be constructed with 6-inch long stainless steel implants attached to a section of 1/4-inch outside diameter by 3/16-inch inside diameter semi-flexible nylon tubing.

Each soil gas implant will be centered in approximately 18-inches of #2/16 Monterey sand with 6-inches of sand extending above and below each implant. The annulus between the implants and the reminder of the borehole above the upper sand pack will be sealed to approximately 6-inches bgs with hydrated bentonite chips. The tubes will be capped with a 1/4-inch Swagelok ball valve to prevent the infiltration of water and ambient air. The ball valves will be labeled with the corresponding probe location and depth using the following convention: [SG]-[Location]-[Depth]. The wellhead will be completed to grade with a 4-inch diameter traffic-rated well box. The proposed soil gas probe locations are presented in Figure 14 and the construction details are presented in Figure 15.

8.4 Soil Description, Sampling & Analyses

Soil samples will not be collected during the soil gas probes installation. However, the soil from the auger returns will be characterized according to the Unified Soil Classification System (USCS) using the visual-manual procedure as described in ASTM Standard D2488 and by noting color, moisture content, texture, and grain-size and distribution.

8.5 Decontamination

Sampling equipment will be decontaminated between samples using a triple rinse system containing Alconox™ or similar detergent. Augers will be steam cleaned on-site between boreholes. Rinse water will be contained in sealed labeled DOT approved 55-gallon drums in a secure location onsite pending proper disposal.

8.6 Waste Storage

Pending the results of the soil sample analyses, drill cuttings will be stored in Department of Transportation (DOT) approved 55-gallon drums in a secure location onsite. Upon receipt of analytical data, drill cutting and waste liquid disposal will be arranged with a properly licensed waste hauler and disposal facility(s).

8.7 Well Survey

Each monitoring well will be surveyed relative to each other, mean sea level, and a known datum by a California licensed land surveyor. Soil vapor probe locations will be surveyed relative to each other, monitoring wells and a known datum. As required, survey data will be obtained utilizing global positioning system (GPS) technology, and will be reported in a format acceptable for submission to the California GeoTracker database, and hydrologic evaluation.

8.8 Aquifer Testing

AEI will perform aquifer testing for the purpose of estimating hydraulic parameters for the aquifer at the site. Using the results of these aquifer tests, hydraulic parameters and capture zones have been developed for the shallow groundwater aquifer at this site. Based on the low recharge rates seen in soil borings, monitoring wells and during the source excavation, a conventional sustainable pumping test is unlikely to yield usable data. Based on these observations, a slug test will be used to determine aquifer transmissivity. A solid cylinder of known volume will be introduced into the well to displace and raise the water level. Once the water level has re-stabilized, the cylinder will be removed. Changes in depth / water pressure will be recorded using pressure transducers placed in the bottom of the well.

8.9 SVE and Bioventing Test

AEI will perform a short-term in situ air sparging (IAS), soil vapor extraction (SVE), and bioventing pilot study. The purpose of these tests will be to evaluate IAS, SVE, and bioventing for removal of gasoline-range petroleum hydrocarbons from the subsurface soil and groundwater water using stripping, volatilization, and enhancing aerobic biodegradation and natural attenuation. The main objectives of this pilot study will include the following:

- Conduct baseline soil gas survey to measure the concentrations of total volatile hydrocarbons (TVH), methane (CH4), oxygen (O2), and carbon dioxide (CO2) to determine if the subsurface is oxygen-limited and the feasibility of bioventing
- Determine feasibility of removal and recovery of volatile petroleum hydrocarbons from the soil and groundwater using soil vapor extraction and air sparging technologies
- Collect data on the concentration of total petroleum hydrocarbons as gasoline (TPH-g) in the extracted soil gas
- Collect data for equipment sizing and selection of a blower (i.e., required flow rate and vacuum pressure) in the event soil vapor extraction is selected
- Determine the feasibility of air injection into the vadose zone and saturated zone to increase the supply of oxygen to enhance aerobic biodegradation and natural attenuation in the vadose zone, capillary fringe, and shallow saturated zone
- Estimate the average soil gas permeability (in darcies) for air injection using the steady-state method and constant rate test data
- Conduct a helium tracer test to evaluate the recovery of the air sparging off gas by the soil vapor extraction wells, estimate air sparging radius of influence, and evaluation the extent and magnitude of the lateral air channel distribution
- Conduct a transient pressure response test to measure groundwater pressure changes during the startup, operation, and shutdown of air sparging to help characterize and estimate the lateral air distribution in the subsurface

8.9.1 Pilot Test

8.10.1.1 Permits & Clearances

A permit will not be required from the Bay Area Air Quality Management District (BAAQMD) for the short-term SVE pilot test. However, as required, the engineering division of the BAAQMD will be notified of the SVE test by.

8.10.1.2 Test Wells & Equipment

A mobile vapor extraction and thermal oxidizer package system with an air sparging compressor will be rented from a reputable equipment vendor. The vapor extraction system consisted of a positive displacement blower capable of flows up to 250 cfm and vacuums up to 12 inches of mercury (inches Hg). The vapor treatment system consisted of a standard thermal oxidizer with temperature and process controllers, combustion air blower, and an auxiliary propane supply. The flow rate and oxidizer temperatures were continuously measured and recorded using an onboard data logging system. The system included automated controls, data logging instrumentation, and safety shut downs. The vapor extraction wells were connected to the system using camlock-style couplings and 1-inch diameter clear suction hose. A small reciprocating air compressor will be used for the air sparging and vadose zone air injection tests.

8.10.1.3 Soil Gas Probes and Monitoring Wells

During sparge testing of with well IW-1 monitoring wells MW-1, MW-7 and BF-1 to MW-4 will be used for collecting pressure and vacuum measurements and soil gas samples before, during, and after the pilot test. Additionally, pressure transducers were installed in wells MW-1, MW-7 and BF-1 to measure the transient groundwater pressure changes during the startup and shutdown of air sparging in IW-1.

8.10.1.3 Field Instruments & Measurement

Monitoring points, including soil gas probes, monitoring wells, and vapor extraction wells, will be purged and soil gas samples collected with a 0.56 cfm Gast (Model MOA) oilless diaphragm vacuum/pressure pump capable of up to 24 inches of Hg. All monitoring points will be purged and sampled following the procedures in Downey, et al., 2004.

The vapor extraction well influent process lines will be purged and sampled with an oilless diaphragm or a peristaltic vacuum/pressure pump capable of up to 25.5 inches of Hg using the slip-stream method. Once the concentrations of TVH, CH4, O2, and CO2 stabilized and recorded, influent samples will be collected into 1-liter tedlar bags for laboratory analyses. The vapor samples will be analyzed for TPH-g by SW8015Cm and MBTEX by SW8021B by McCampbell Analytical, Inc. (DHS #1644) of Pittsburg, California.

TVH, CH4, O2, and CO2 will be measured in the field using a RKI Instruments Eagle multi-gas detector. The hydrocarbon detector will be calibrated daily against a 40% LEL hexane calibration gas standard. The methane, oxygen, and carbon dioxide detectors will be also calibrated daily with the appropriate gas standards. A 1:1 or 3:1 dilution fitting will be used as needed to measure hydrocarbon concentrations greater than 11,000 parts per million by volume (ppmv) or when the oxygen concentration falls below 5%.

Helium will be measured with a Marks Products Model 9821 helium detector (0.01 to 100%). Helium will be bled into the air stream using a two-stage regulator and small acrylic rotameter (1/8-inch diameter, 0 to 50 cfh) to achieve the desired injection concentration.

Changes in soil gas pressure (vacuum) will be measured at monitoring points using Magnehelic® differential pressure gauges. 3/16-inch vinyl or equivalent tubing will be used to connect the Magnehelic® gage to the top of each monitoring point. The following pressure ranges in inches of water will be available for the tests: 0-0.2", 0-1", 0-5", 0-10", 0-20", 0-50", 0-100", and 0-150".

The depth to water in monitoring wells will be measured with an electronic water level indicator. The groundwater pressure will be continuously measured in monitoring well MW-10 using pressure transducers suspended approximately 6 to 12-inches from the bottom of the wells.

8.10.1.4 Baseline Measurements

Baseline measurements collected at the start of each test day included the following: concentrations of TPH-g, TPH-d, and MBTEX in the groundwater, concentrations of TVH, CH4, O2, and CO2 in the soil gas, initial soil gas pressure readings, and depth to groundwater at select monitoring points. Additionally, ambient soil and atmospheric temperature, and weather conditions will be noted.

8.10.1.5 Vacuum Step Test

A vacuum step tests will be conducted on SG-1 through SG-6. A step-up test, where vacuum will be gradually applied to the wellhead in steps of 2, 4, 6, 8, 10, and 12 inches of mercury (12-inches Hg) will be conducted on the soil vapor probes and a step-down test will be conducted on one selected soil probe. These tests will be designed to determine the flow rates at various vacuum levels and the vacuum radius of influence (ROIv). The steady-state measured flow rate will be recorded and soil gas samples will be collected for laboratory and field analysis at the end of each step. Soil gas pressure (i.e., vacuum) readings will be collected a regular intervals during the step tests.

8.10.1.6 Vadose Air Injection Test

A vadose air injection and steady-state flow rate test will be conducted on the vapor points. This test is designed to determine the feasibility of injecting air into the vadose to stimulate aerobic biodegradation and to measure the vadose air injection backpressure, flow rate, and radius of pressure influence (ROIp). The test will be conducted by introducing air from the sparging compressor at up to 12 cfm and recording the injection back pressure, measured flow rate, and soil gas pressure at monitoring points once the flow rate and backpressure reach steady-state operation.

8.10.1.7 Soil Gas Permeability / Radius of Influence

Pressure measurements and soil gas samples will be collected from soil gas probes, monitoring wells, and offline vapor extraction wells to estimate the vacuum, pressure, short-term oxygen radius of influence, and in situ soil gas permeability. The Bioventing Design Tool™ available for public release and developed by the Battelle Memorial Institute to accompany the "Principles and Practices of Bioventing" (Hinchee and Leeson, et al., 1996) will be used to estimate the vacuum and pressure radius of influence. The oxygen radius of influence, or zone where oxygen eventually diffuses and occupies during long-term bioventing, will be evaluated using the soil gas data and pressure radius of influence estimates.

Data will be collected frequently for the first 20 minutes of the test. After the first 20 minutes, data will be collected less frequently, depending on the rate of pressure change at the soil gas monitoring points. Soil gas pressure continued to be monitored at 5-minute intervals throughout the test. Soil gas samples will be collected and analyzed for TVH, CH4, O2, and CO2 beginning 1 hour after the air permeability test will be started.

The soil gas permeability will be estimated using either the steady-state method or dynamic method based on the observed subsurface response. For example, the dynamic method will be used if the pressure response at monitoring points changes slowly during the test (i.e., >1-hour to reach a steady pressure) and the steady-state method will be used if the pressure response at monitoring points will be rapid during the test (i.e., <1-hour to reach a steady pressure).

8.9.2 Air Sparging

8.10.2.1 Injection Pressure / Flow Rate

Air will be injected into wells IW-1 and IW-2 to determine the initial breakthrough pressure, changes in the injection pressure over time, and the time to reach a steady-state injection pressure at a flow rate of approximately 10 acfm.

A helium tracer recovery test will be conducted in conjunction with the traditional air sparging test to evaluate the helium recovery in adjacent wells and soil vapor probes. Helium will be injected at a concentration ranging from 5 to 10% by volume.

8.10.2.2 Transient Pressure Response

A transient pressure response test will be conducted in conjunction with the traditional air sparging and supplemental helium tracer recovery tests. Pressure transducers will be installed in in adjacent wells to measure the groundwater pressure during the startup and shutdown of air sparging. This data will be used to evaluate and provide insight on the air channel distribution, breakthrough to the vadose zone, time to reach near steady-state air distributions, and for estimating the air sparging radius of influence. The data can also be used to select cycle times for pulsed air sparging operation.

8.10.2.2 In Situ Respiration Test

An *in situ* respiration test (ISRT) will be conducted at the discretion of an AEI field engineer or geologist or as time permits to quantify the degree of in situ microbial activity occurring after oxygenating the subsurface soils to at least 10%. The oxygen utilization and carbon dioxide generation rates will be used to estimate the rate of biodegradation at the site in milligrams per kilogram of soil per day (mg/kg-day). At a minimum, soil gas probes with the highest concentrations of total volatile hydrocarbons and one background location will be used. Optimal conditions are greater than 1,000 mg/kg TPH in the soil and greater 10,000 ppmv in the soil gas for gasoline sites or 1,000 ppmv for diesel sites (Place, et al., 2001). The respiration test is a simple field test for determining oxygen uptake by microorganism and for estimating in situ biodegradation rates. At ideal bioventing sites, actives microorganisms consume large quantities of oxygen and generate large amounts of carbon dioxide. Respiration testing will be performed every 6 to 12 months of operation and evaluated in conjunction with other lines of evidence, such as hydrocarbon influent concentrations, to monitor remedial progress and determine when the system should be shutdown or switch the system to injection mode.

The respiration test will be conducted according to the procedures outlined in AFCEE, 2004, pp. 4-10 to 4-12. A three (3) monitoring points located in contaminated soil are required for this test. Three soil gas probes will be installed and constructed identical to the other soil gas probes as described in Section 8.4.1 and shown on Figure 15.

The monitoring points used for respiration test must also meet the following minimum criteria:

- Be located in contaminated soil (except for the background well)
- Have baseline oxygen readings of less than 2%
- Be aerated to at least 10% oxygen

The pilot-scale bioventing system will first be operated in extraction mode for at least 24 hours. With the blower still running, a final round of vacuum influence and soil gas measurements will be collected. The blower will be turned off to stop the supply of oxygen to the soil and soil gas measurements will be collected every 2 to 3 hours for the next 12 to 24 hours depending upon the rate of oxygen uptake. The Bioventing Design Tool™ (BVDT) will be used to analyze the respiration test data and calculate the oxygen utilization, carbon dioxide generation, and corresponding biodegradation rates (Vogel, et al, 1996).

9.0 SITE SAFETY.

AEI will prepare a site specific Health and Safety Plan (HASP) conforming to Part 1910.120 (i) (2) of 29 CFR. Prior to commencement of field activities, a site safety meeting will be held at a designated command post near the working area. The HASP will be discussed and emergency procedures will be reviewed at this meeting, including an explanation of the hazards of the known or suspected chemicals of interest. All site personnel will be in Level D personal protection equipment, which is the anticipated maximum amount of protection needed. A working area will be established with bright orange cones, barricades and/or warning tape to delineate the zone where hard hats, steel-toed shoes and safety glasses must be worn at all times, and where unauthorized personnel will not be allowed. The site HASP will be onsite and available at all times during the project.

10.0 REPORTING

Following receipt of all laboratory analytical and well survey data, a technical report will be prepared. The report will detail the results of soil analyses, the installation and sampling of the wells. The final report will include figures, data tables, logs of borings and well construction details, and interpretation of the contaminant distributions. In addition, the well survey will be included. Recommendations may be made for further assessment as deemed appropriate. The investigation reports will be submitted within approximately 2 months of receipt of the results of soil and groundwater sampling activities.

The final report will include a feasibility study which will include evaluations and comparison of the above referenced remedial options and a proposal for installation of a pilot or complete remediation system, as deemed appropriate.

AEI requests your comments and approval to proceed with this project. Please contact either of the undersigned at (925) 944-2899, if you have any questions or need any additional information.

Sincerely,
AEI Consultants

Harmony Tomsun
Project Geologist

Richard J. Bradford
Project Engineer

Robert F. Flory, PG
Senior Geologist/Project Manager

PROFESSIONAL GEOLOGIST
ROBERT F. FLORY
No. 5825
10/31/10
STATE OF CALIFORNIA

DISTRIBUTION

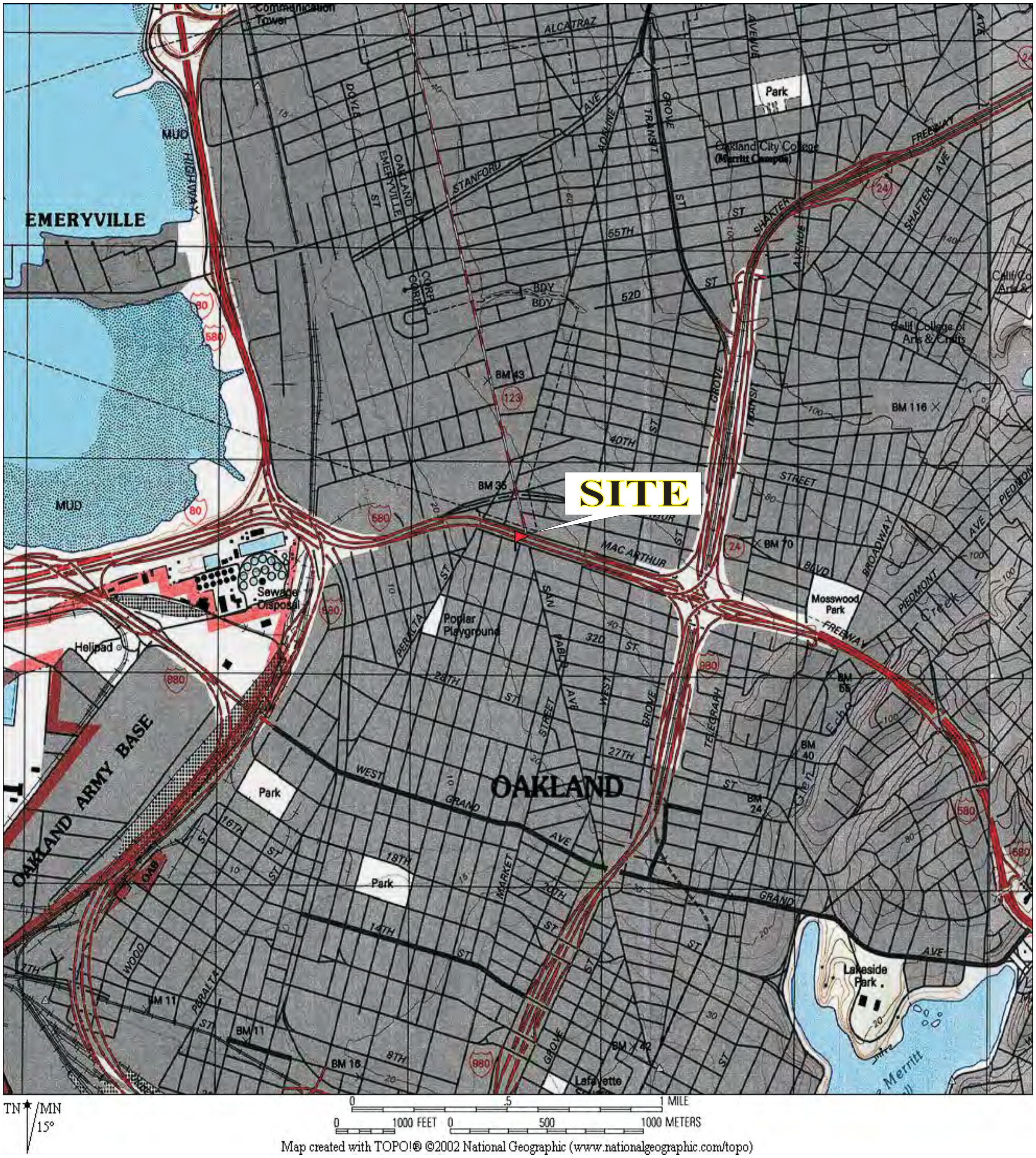
Ms. Steffi Zimmerman
6330 Swainland Road
Oakland, CA 94611

Ms. Barbara Jakub
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

GeoTracker

File

FIGURES



AEI Consultants

2500 Camino Diablo, Suite 200, Walnut Creek, CA 94597

Site Location Map

3442 Adeline Street Oakland, CA 94608	**FIGURE 1** Job No: 281939

Property Boundary

Former UST Area

Approximate Scale:
1 inch = 55 feet

0' 55'

N

AEI CONSULTANTS
2500 Camino Diablo, Suite 200, Walnut Creek, CA 94597

Site Vicinity Map

3442 Adeline Street Oakland, CA 94608	**FIGURE 2** Job No: 281939

AEI CONSULTANTS
2500 CAMINO DIABLO, WALNUT CREEK

SITE PLAN

FIGURE 3
PROJECT NO. 281939

3442 ADELINE STREET
OAKLAND, CALIFORNIA

DRAFTED BY RFF

LEGEND

- Soil Boring - 2006
- Soil Boring - 2007
- Monitoring Well
- Former UST
- Soil vapor Sample Point
- Source Removal Excavation

DRAFTED BY RFF

AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK

TPH-g in Soil (6 - 8ft bgs)

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE 4
PROJECT NO. 281939

LEGEND

- Soil Boring - 2006
- Soil Boring - 2007
- Monitoring Well
- Excavation Sidewall Sample 6-8 feet bgs
- Former UST
- Source Removal Excavation
- TPH-g concentration isopleth
- 1,200 - TPH-g Concentration (µg/L) 6-8 feet bgs

AEI CONSULTANTS
2500 CAMINO DIABLO, WALNUT CREEK
TPH-g in Soil (11.5 -12 ft bgs)
FIGURE 5
PROJECT NO. 281939
3442 ADELINE STREET
OAKLAND, CALIFORNIA
DRAFTED BY RFF
LEGEND
Soil Boring - 2006
Soil Boring - 2007
Monitoring Well
Former UST
Source Removal Excavation
Excavation Sidewall Sample 11.5 - 12 feet bgs
TPH-g concentration isopleth
1,200 - TPH-g Concentration (µg/L) 11.5 -12 feet bgs
ADELINE STREET
CHESTNUT STREET
RESIDENCE
FENCE
GATE
DRIVE
CANOPY
BUILDING
SHED
CUT CONCRETE
EXCAVATION
TANK EXCAVATION
SB-29 <1.0
SB-30 <1.0
SB-26 <1.0
SB-25 48
SB-27 27
SB-28 19
SB-6 <1.0
SB-31 1.9
MW-6 23
SB-24 15
MW-4 1,100
SB-14 910
SB-15 390
SB-22 310
SB-13 170
MW-3 27
SB-20 99
SB-16 NS
SB-11 39
SB-21 26
SB-12 82
MW-5 61
SB-23 310
SB-10 750
SB-5 130
SB-4 340
MW-2 140
SB-3 <1.0
SB-2 53
MW-1 30
SB-1 640
S1 67
S2 61
S3 490
S4 500
IW-1 220
MW-7 13
SB-9 <1.0
SB-8 99
SB-17 <1.0
SB-7 120
SB-18 NS
SB-19 6.7
750
83
<1.0
1,200
5.0
12
100
24
N
S
E
W
0 15 30 60 90
SCALE IN FEET
1"=30'

AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK

TPH-g in Soil 16 feet bgs

FIGURE 6

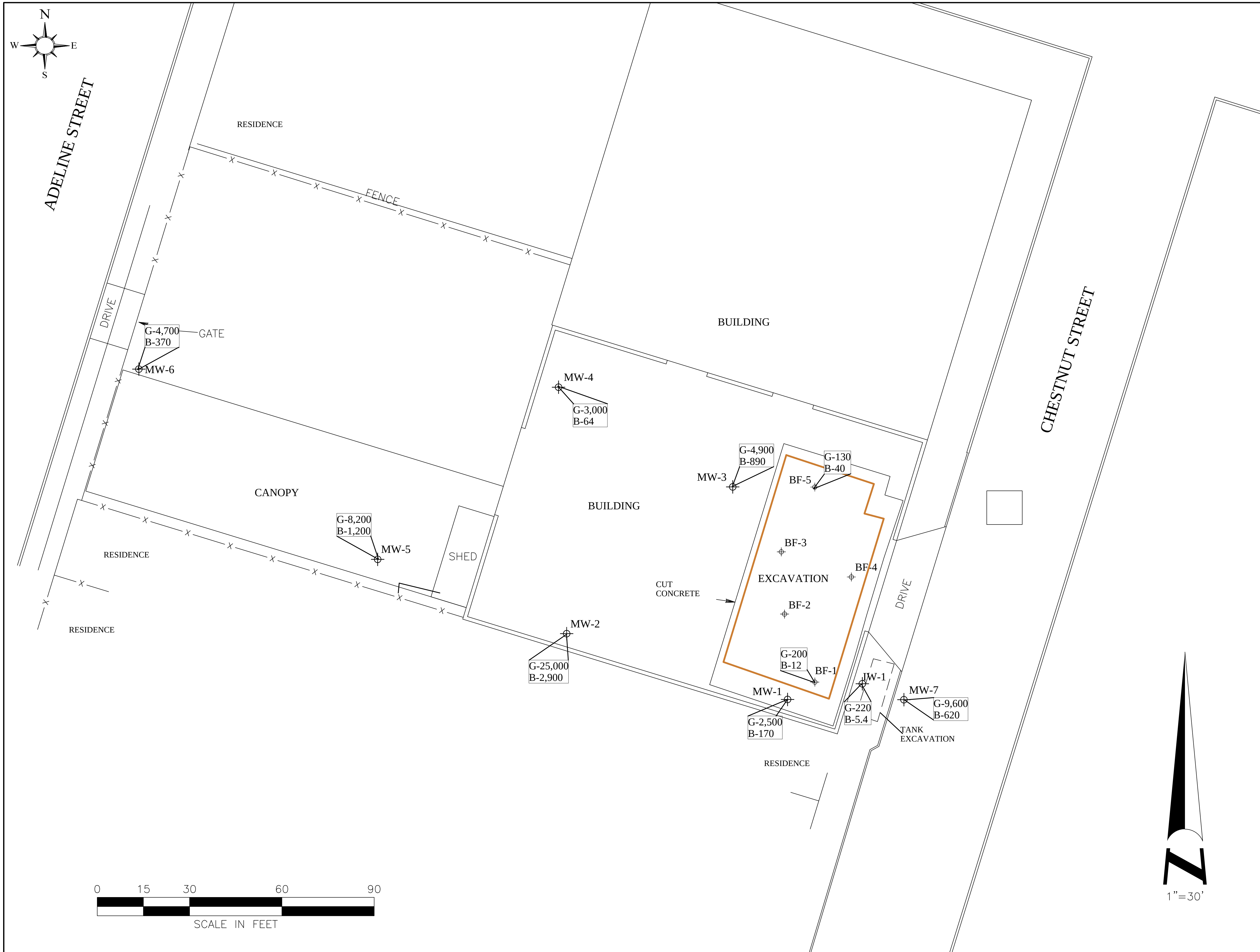
PROJECT NO. 281939

3442 ADELINE STREET
OAKLAND, CALIFORNIA

DRAFTED BY RFF

LEGEND

- Soil Boring - 2006
- Soil Boring - 2007
- Monitoring Well
- Former UST
- Source Removal Excavation
- TPH-g concentration isopleth
- 1,200 - TPH-g Concentration (µg/L) 16 feet bgs



AEI CONSULTANTS
2500 CAMINO DIABLO, WALNUT CREEK

Groundwater Analytical Data (12/15/09)

FIGURE 7
PROJECT NO. 281939

3442 ADELINE STREET
OAKLAND, CALIFORNIA

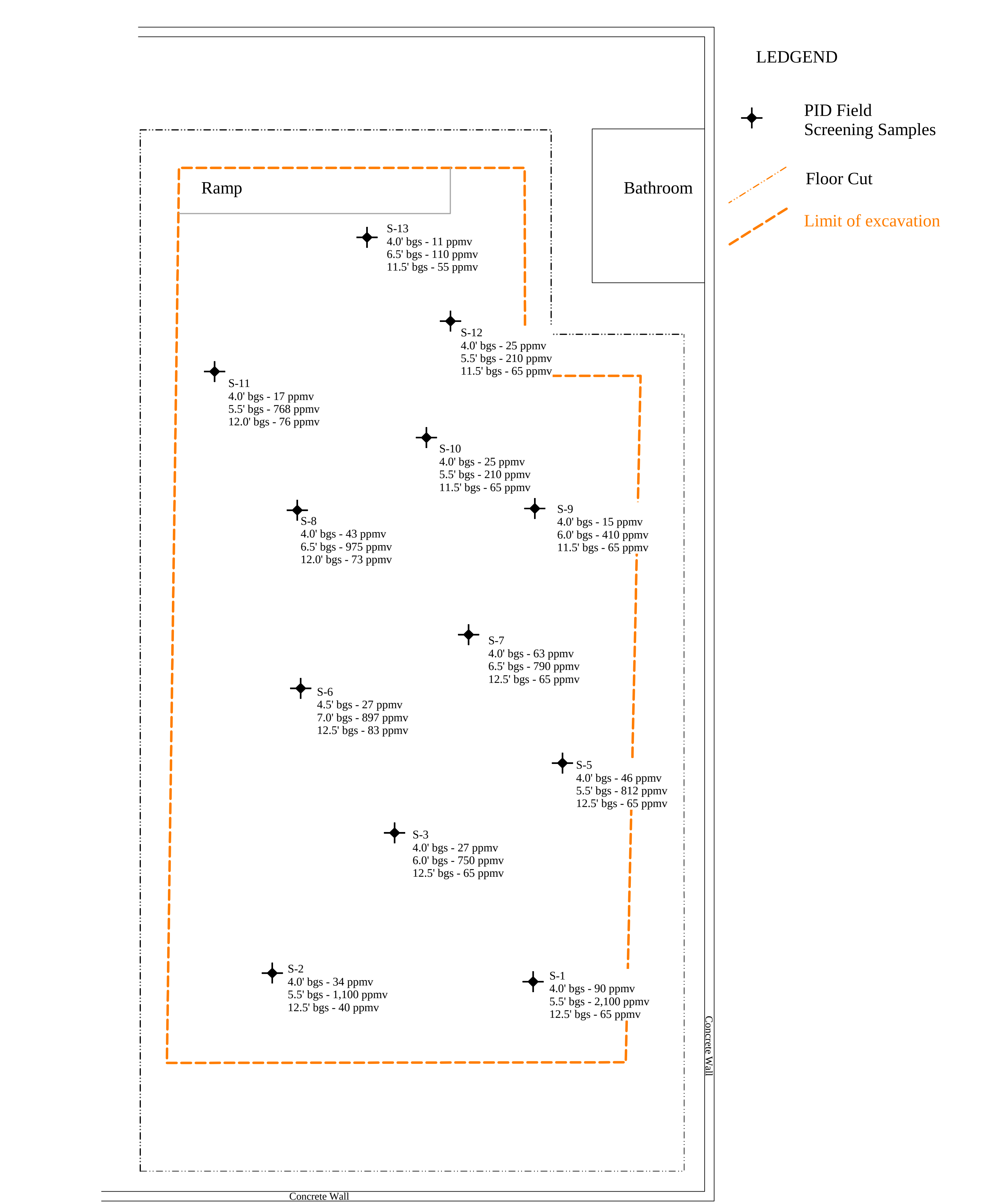
DRAFTED BY RFF

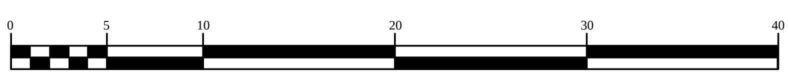
LEGEND

Monitoring Well
Former UST
Source Removal Excavation

G - Total Petroleum Hydrocarbons as Gasoline (μg/L)
B - Benzene (μg/L)

G-7,000
B-850
Monitoring Well Data





AEI CONSULTANTS

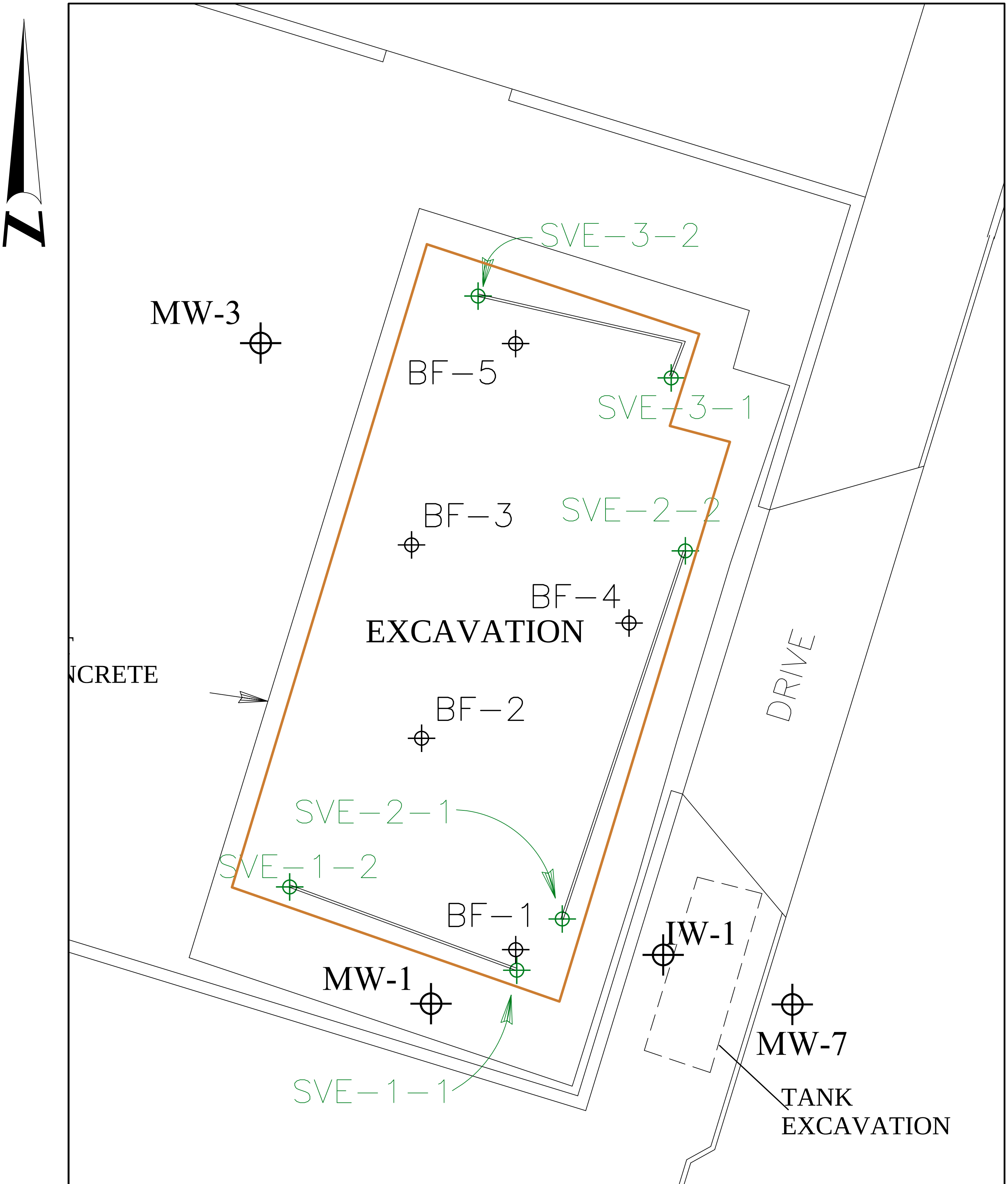
2500 CAMINO DIABLO, WALNUT CREEK

Excavation Field Screening Data
5 - 7 feet bgs

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE # 8

PROJECT NO. 281939



LEGEND

DRAFTED BY RFF

- Soil Boring
- Proposed Monitoring Well
- Former UST
- Surrounding Property Boundaries

0 15 30 60 90

SCALE IN FEET

AEI CONSULTANTS

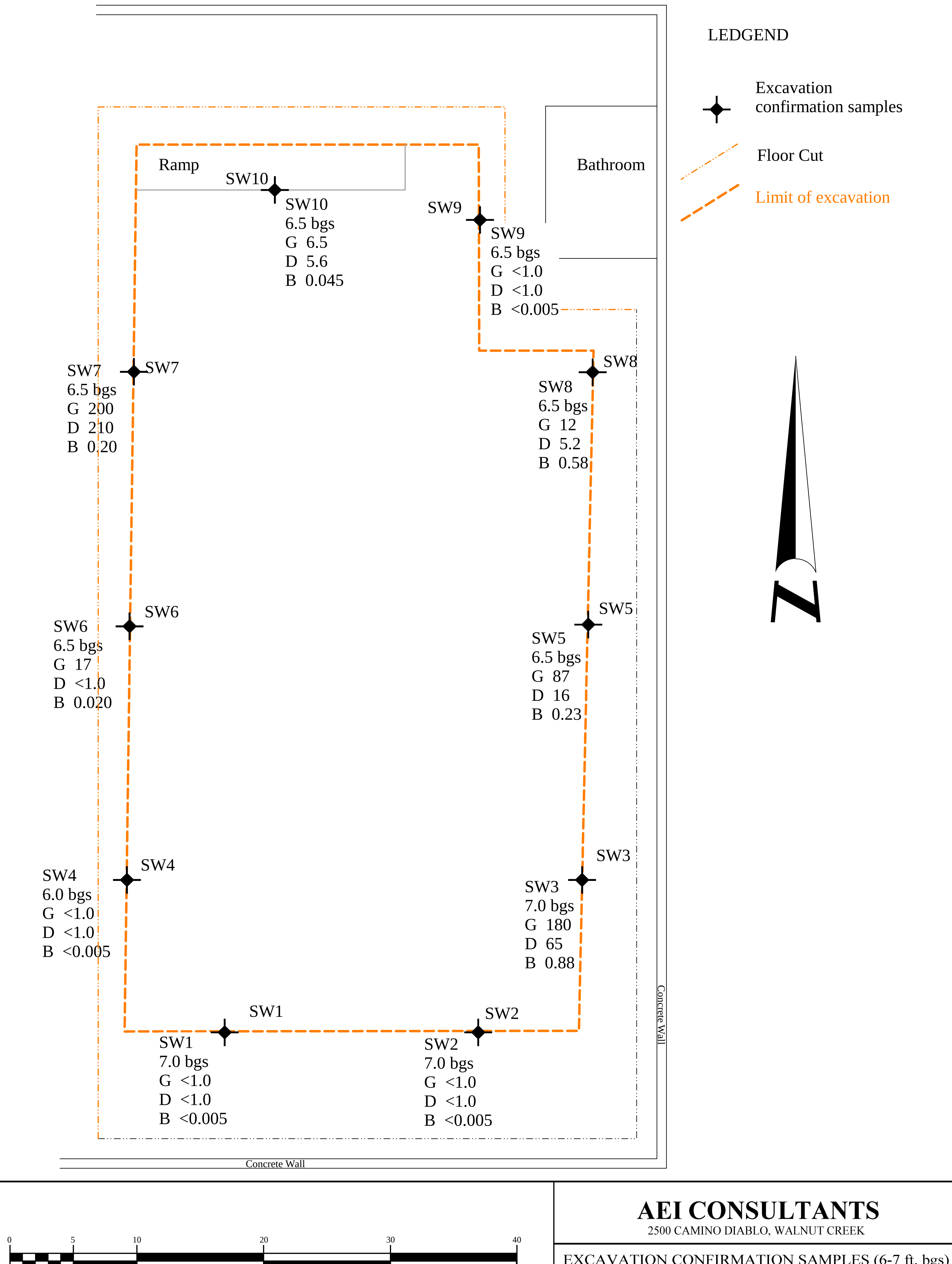
2500 CAMINO DIABLO, WALNUT CREEK

Excavation Casings

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE 9

PROJECT NO. 281939

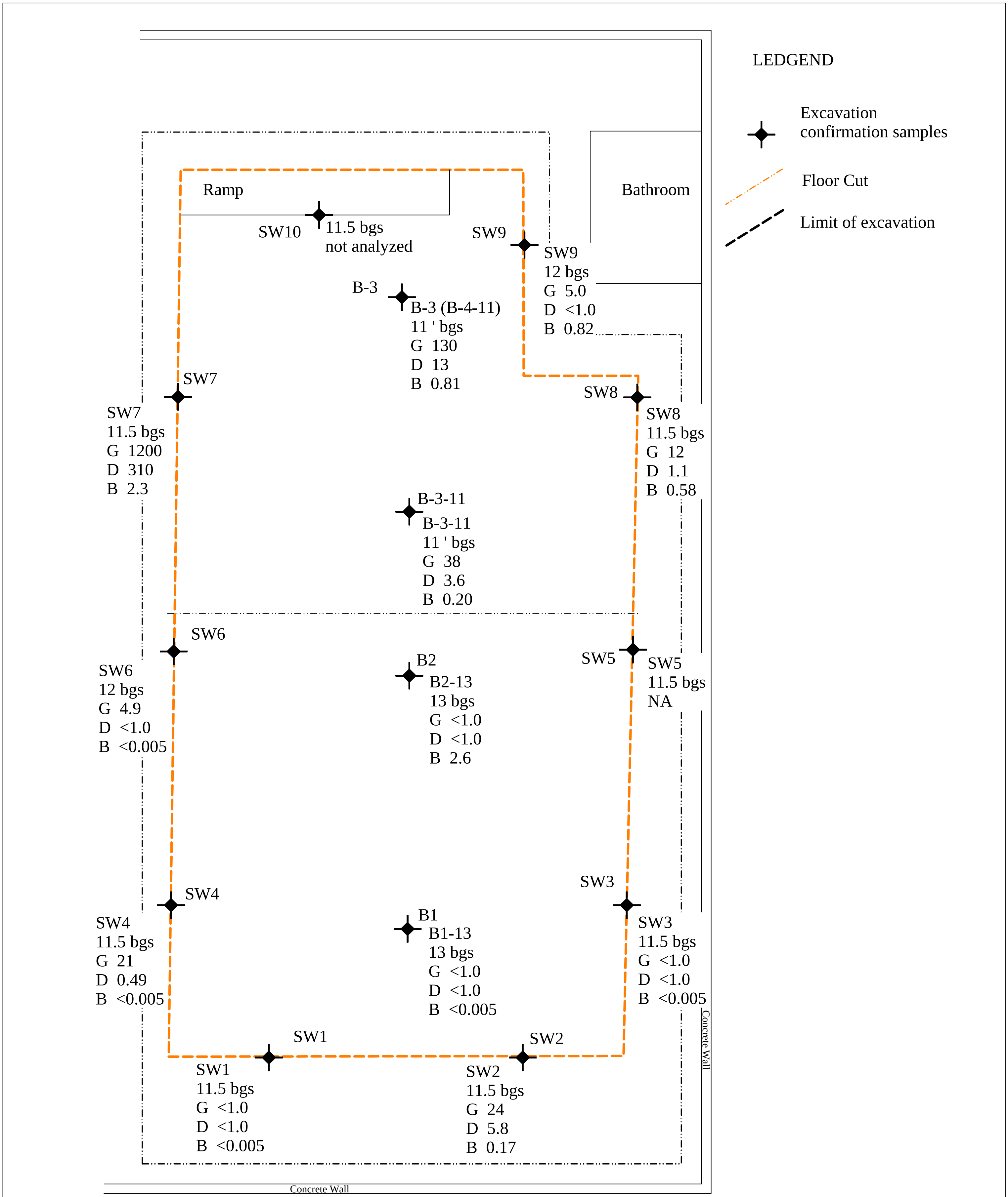


AEI CONSULTANTS
2500 CAMINO DIABLO, WALNUT CREEK

EXCAVATION CONFIRMATION SAMPLES (6-7 ft. bgs)

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE # 10
PROJECT NO. 281939

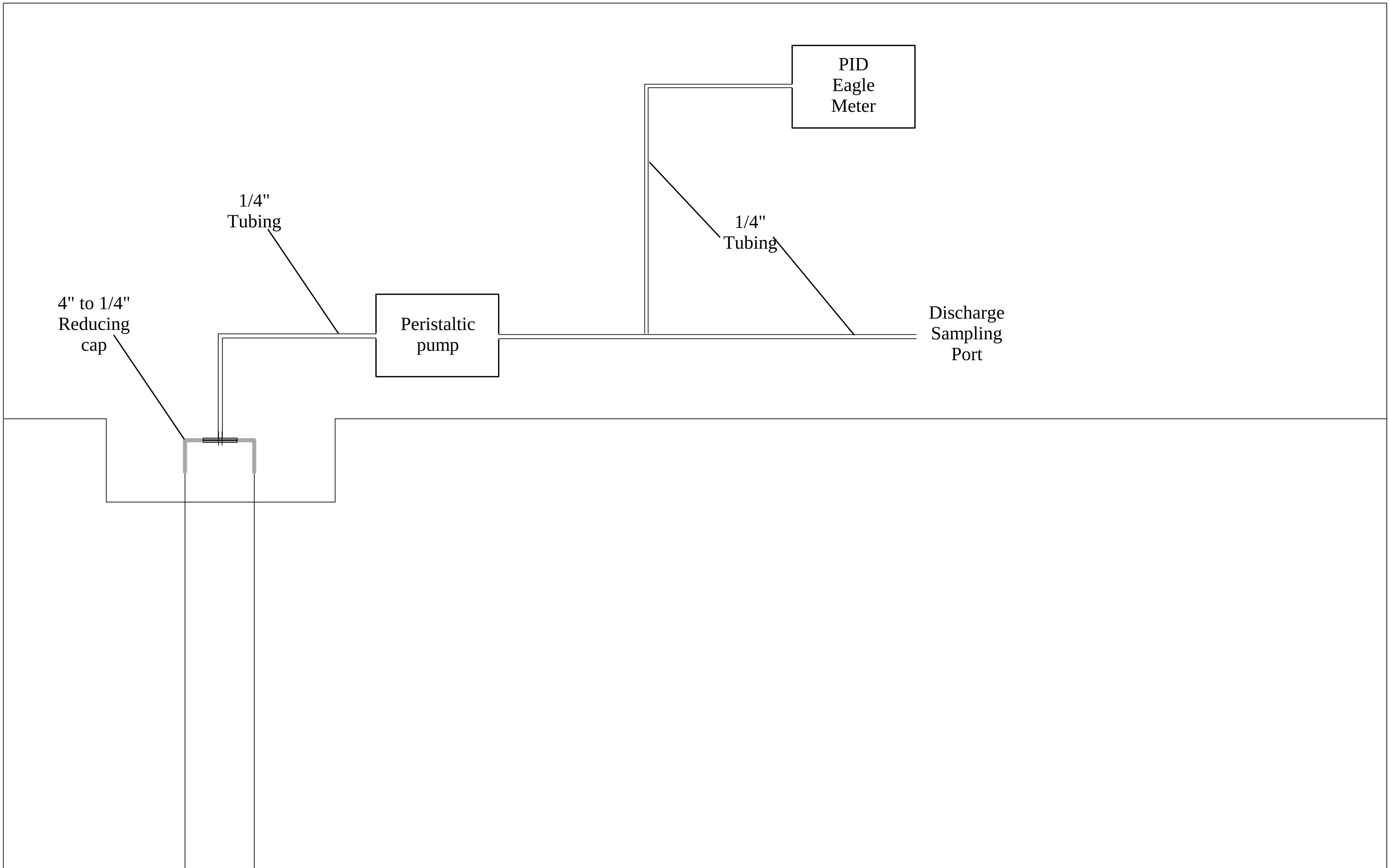


AEI CONSULTANTS
2500 CAMINO DIABLO, WALNUT CREEK

EXCAVATION CONFIRMATION SAMPLES (11.5 - 12.0 ft)

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE # 11
PROJECT NO. 281939



AEI CONSULTANTS

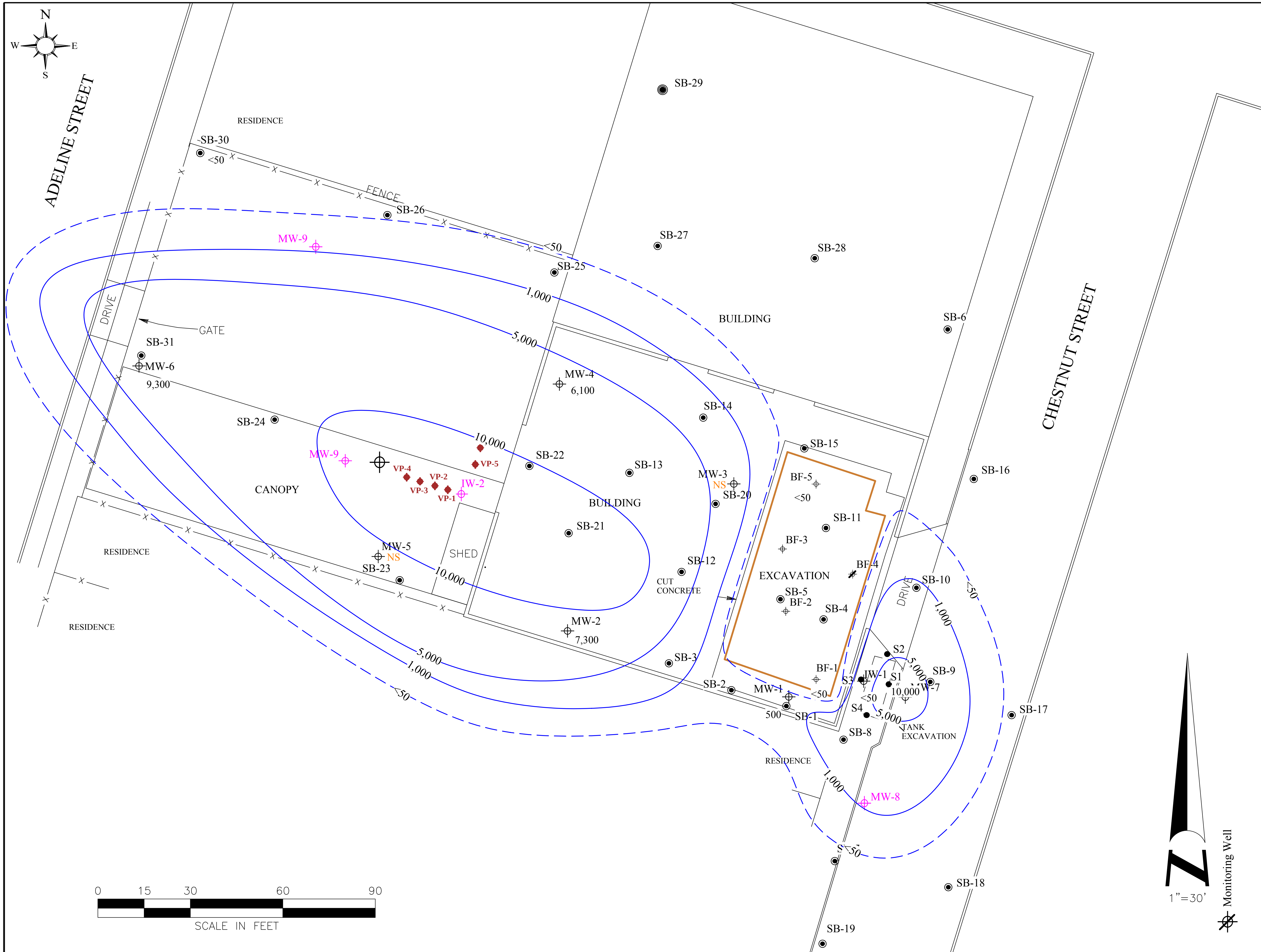
2500 CAMINO DIABLO, WALNUT CREEK

SVE Well Sampling Flow Diagram

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE # 12

PROJECT NO. 281939



AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK

Proposed Groundwater Monitoring Wells

FIGURE 13

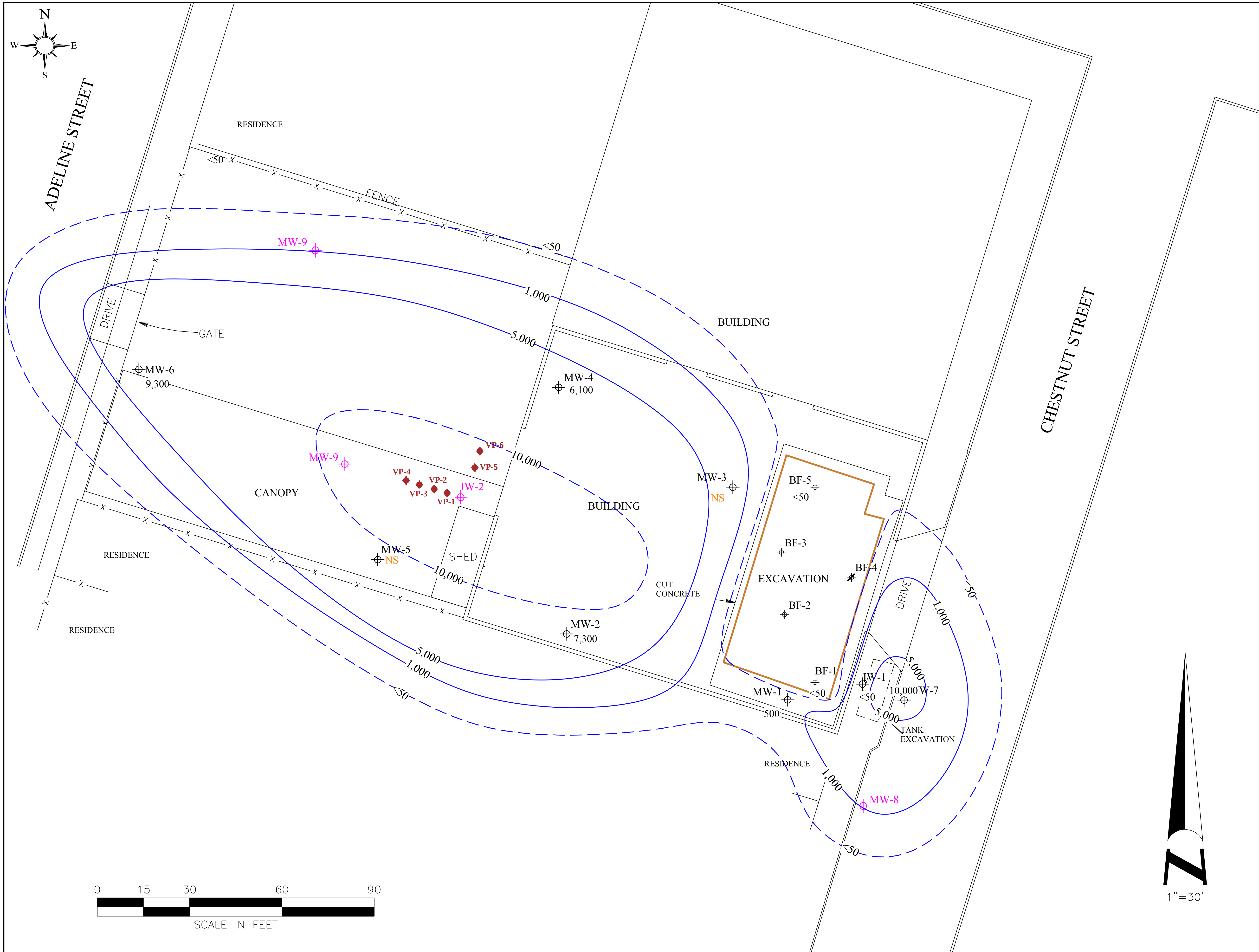
PROJECT NO. 281939

3442 ADELINE STREET
OAKLAND, CALIFORNIA

DRAFTED BY RFF

LEGEND

Monitoring Well
Proposed Monitoring Well
Abandoned Well
Former UST
Source Removal Excavation
TPH-g concentration isopleth
890 TPH-g Concentration (µg/L) 3/12/2010
Soil Boring
Monitoring Well



AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK

Proposed Soil Vapor Points

3442 ADELINE STREET
OAKLAND, CALIFORNIA

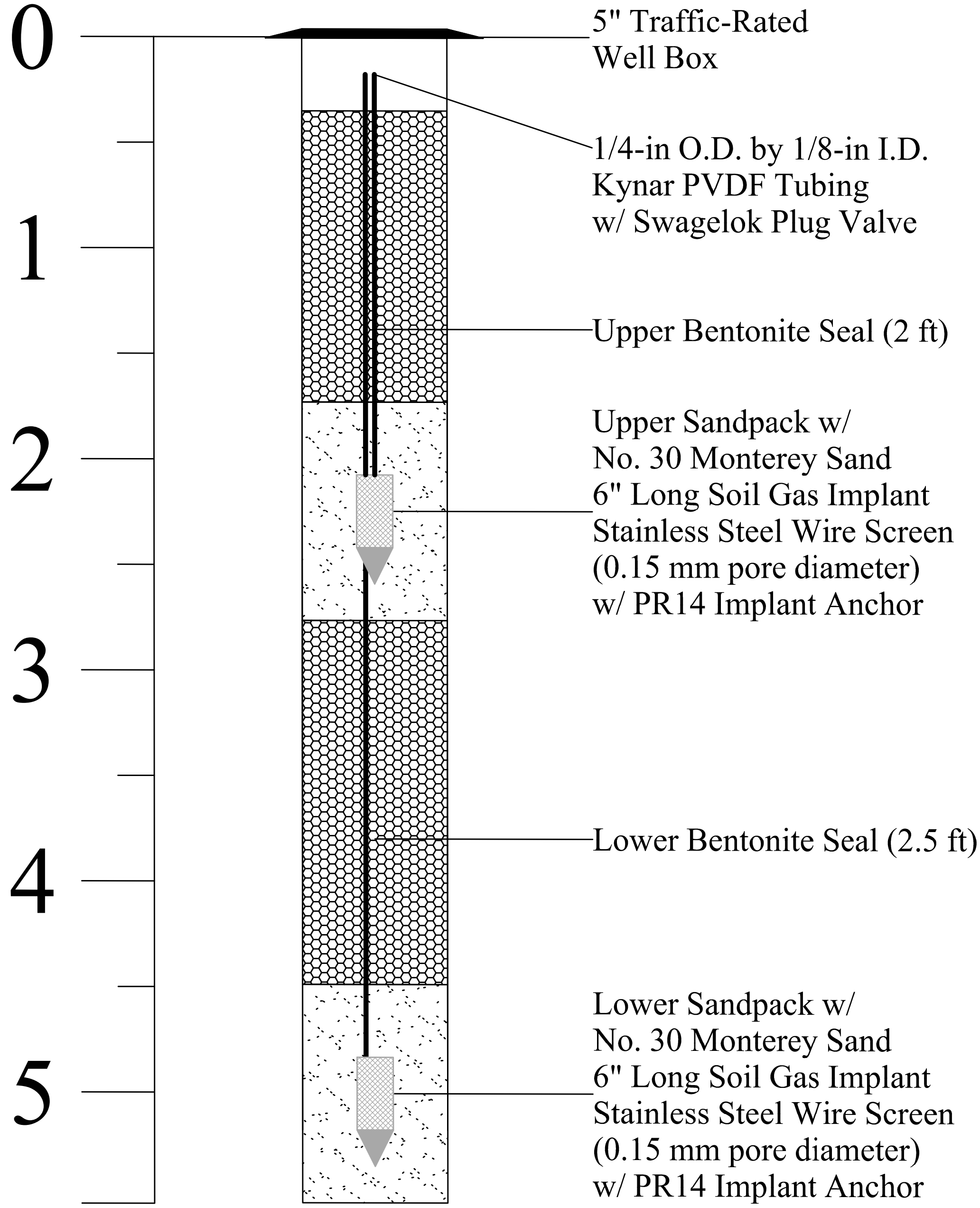
FIGURE 14

PROJECT NO. 281939

DRAFTED BY RFF

LEGEND

- Monitoring Well
- Proposed Monitoring Well
- Abandoned Well
- Former UST
- Source Removal Excavation
- TPH-g concentration isopleth
- 890 TPH-g Concentration (µg/L) 3/12/2010
- Proposed Nested Soil Vapor Probe
- Soil Boring



*NOTE: SOIL GAS PROBES WERE INSTALLED WITH A 3-INCH SOIL RECOVERY AUGER

LEGEND

DRAFTED BY RJB 02-20-08
REVISED BY RJB 06-27-08

BENTONITE PELLETS

MOTEREY SAND (NO.2/16)

AEI CONSULTANTS

2500 CAMINO DIABLO, WALNUT CREEK, CA

TYPICAL SOIL GAS PROBE
CONSTRUCTION DETAIL

3442 ADELINE STREET
OAKLAND, CALIFORNIA

FIGURE 15
PROJECT NO. 281915

TABLES

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Depth	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	TBA	DIPE	ETBE	MTBE
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NW	*6.5*	2/22/00	130	130	---	0.16	0.26	0.73	6.3	---	---	---	---	---
SW	*6.5*	2/22/00	850	920	---	0.3	0.37	5.3	22	---	---	---	---	---
S-1	*5*	6/23/06	5.6	<1.0	---	0.011	<0.0050	<0.0050	<0.0050	---	---	---	---	---
	8		26	100	---	1.3	0.22	2.0	7.2	---	---	---	---	---
	12		45	67	---	0.098	<0.025	0.73	0.39	---	---	---	---	---
	14.5		1.2	<1.0	---	<0.0050	<0.0050	<0.0050	0.01	---	---	---	---	---
S-2	*4*	6/23/06	4.7	<1.0	---	0.016	<0.0050	<0.0050	<0.0050	---	---	---	---	---
	7.5		84	460	---	1.2	0.36	9.4	24	---	---	---	---	---
	12		49	61	---	0.33	0.055	0.84	2.4	---	---	---	---	---
	14		<1.0	<1.0	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---
S-3	*3.5*	6/23/06	3.1	<1.0	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---
	7.5		250	1,200	---	0.47	0.52	18	100	---	---	---	---	---
	10		76	220	---	0.26	<0.040	6.2	7.2	---	---	---	---	---
	14.5		1.3	<1.0	---	<0.0050	<0.0050	0.0056	0.016	---	---	---	---	---
S-4	*3.5*	6/23/06	3.5	<1.0	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---
	7.5		240	820	---	<0.20	<0.20	6.7	4.4	---	---	---	---	---
	11.5		120	500	---	0.079	<0.040	3.5	4.8	---	---	---	---	---
	14.5		1.3	<1.0	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---
SB-1	4	10/1/07	---	2.9	<0.05	0.016	0.0079	<0.005	0.0094	---	---	---	---	---
	7.5		450	1,200	<5.0	3.1	2.5	24	110	---	---	---	---	---
	11.5		90	640	<2.5	0.40	1.5	9.3	23	<0.33	<3.3	<0.33	<0.33	<0.33
	15.5		---	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	**Depth**	**Date**	**TPH-d**	**TPH-g**	**MTBE**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes**	**TAME**	**TBA**	**DIPE**	**ETBE**	**MTBE**
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-2	7.5	10/1/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	11		6.1	53	<0.05	<0.005	0.24	0.0084	0.19	<0.005	<0.05	<0.005	<0.005	<0.005
SB-3	7.5	10/1/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	11.5		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005
SB-4	3.5	10/1/07	---	1.2	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	7.5		170	430	<1.0	1.2	0.99	3.6	1.2	---	---	---	---	---
	11.5		25	340	<1.0	2.4	0.92	7.1	9.7	<0.005	<0.05	<0.005	<0.005	<0.005
	15.5		---	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-5	3.5	10/1/07	---	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	7.5		54	420	<1.5	4.0	1.1	9.5	18	---	---	---	---	---
	11.5		22	130	<1.0	0.43	0.10	1.2	0.77	<0.005	<0.05	<0.005	<0.005	<0.005
	15.5		---	<1.0	<0.05	0.017	<0.005	<0.005	<0.005	---	---	---	---	---
SB-6	7.5	10/1/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	11.5		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005
SB-7	7.5	10/3/07	90	310	<1.0	<0.10	0.48	0.28	0.38	---	---	---	---	---
	11.5		37	120	<0.50	0.21	0.069	0.39	0.22	<0.020	<0.20	<0.020	<0.020	<0.020
SB-8	7.5	10/3/07	23	53	<0.10	<0.010	0.030	0.034	0.13	---	---	---	---	---
	11.5		13	99	<0.17	0.24	0.070	0.66	0.46	<0.010	<0.10	<0.010	<0.010	<0.010
SB-9	4	10/3/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	11.5		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Depth	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	TBA	DIPE	ETBE	MTBE
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-10	7.5	10/3/07	5.1	35	<0.10	0.72	0.024	0.47	0.079	---	---	---	---	---
	11.5		74	750	<10	6.9	1.6	13	33	<0.10	<1.0	<0.10	<0.10	<0.10
	15.5		---	<1.0	<0.05	0.012	<0.005	<0.005	0.0052	---	---	---	---	---
SB-11	11.5	10/3/07	13	39	<0.3	0.68	0.086	0.76	2.3	---	---	---	---	---
	15.5		10	41	0.14	1.1	0.071	0.55	1.5	---	---	---	---	---
SB-12	8	12/20/07	1.8	25	<0.10	0.097	0.024	0.81	1.3	---	---	---	---	---
	12		23	82	<0.50	0.74	0.14	1.5	2.9	---	---	---	---	---
	16		---	20	<0.25	0.51	0.083	0.48	1.8	---	---	---	---	---
SB-13	8	12/20/07	66	180	<0.50	0.46	0.10	2.5	2.7	---	---	---	---	---
	12		74	170	<0.50	1.1	0.21	2.4	6.7	---	---	---	---	---
	16		<50	5.7	<0.05	0.87	0.017	0.12	0.10	---	---	---	---	---
SB-14	8	12/20/07	<1.0	<1.0	<0.05	0.0092	<0.005	<0.005	<0.005	---	---	---	---	---
	12		83	910	<2.5	3.3	0.43	10	16	---	---	---	---	---
	16		---	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-15	8	12/20/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		61	390	<2.5	2.7	0.47	6.7	13	---	---	---	---	---
	16		---	40	<0.1	0.26	0.047	0.37	1.3	---	---	---	---	---
SB-16	8	12/20/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-17	8	12/20/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Depth	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	TBA	DIPE	ETBE	MTBE
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-18	8	12/20/07	18	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-19	8	12/20/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	6.7	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-20	8	12/20/07	9.7	89	<0.25	0.070	0.14	0.050	0.14	---	---	---	---	---
	12		32	99	<0.17	0.61	0.061	1.6	1.4	---	---	---	---	---
	16		---	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-21	8	12/21/07	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		5.8	26	<0.05	0.28	0.048	0.31	0.30	---	---	---	---	---
SB-22	8	12/21/07	<1.0	24	<0.05	<0.005	0.070	0.016	0.059	---	---	---	---	---
	12		150	310	<1.7	0.17	<0.17	4.1	3.2	---	---	---	---	---
	16		---	9.2	<0.05	0.021	0.032	0.0052	0.0083	---	---	---	---	---
SB-23	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		73	310	<3.0	1.3	0.31	4.3	0.11	---	---	---	---	---
SB-24	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		3.4	15	<0.15	0.011	0.023	0.020	0.044	---	---	---	---	---
	16		<1.0	41	<0.50	<0.050	<0.050	0.11	0.11	---	---	---	---	---
SB-25	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		12	48	<0.50	0.027	0.079	0.029	0.11	---	---	---	---	---
SB-26	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Depth	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	TBA	DIPE	ETBE	MTBE
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB-27	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		4.2	27	<0.05	<0.005	0.10	<0.005	0.061	---	---	---	---	---
	16		1.5	4.8	<0.05	0.0053	0.020	<0.005	0.0074	---	---	---	---	---
SB-28	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		1.6	19	<0.05	0.24	0.034	0.031	0.036	---	---	---	---	---
SB-29	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-30	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
SB-31	8	5/7/08	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	12		<1.0	1.9	<0.05	<0.005	0.016	<0.005	<0.005	---	---	---	---	---
MW-1	12	4/1/09	1.5	30	<0.05	0.034	0.26	0.042	0.11	---	---	---	---	---
	15	4/1/09	<1.0	<1.0	<1.0	<0.05	<0.05	<0.05	<0.05	---	---	---	---	---
MW-2	12	4/1/09	21	140	<1.0	0.81	<0.10	1.9	2.6	---	---	---	---	---
	16	4/1/09	<1.0	2.3	<1.0	0.62	<0.005	0.016	0.0091	---	---	---	---	---
	19	4/1/09	<1.0	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
MW-3	12	4/1/09	4.3	27	<1.0	0.57	0.049	0.69	0.62	---	---	---	---	---
	16	4/1/09	<1.0	<1.0	<0.05	0.018	0.0059	0.0061	0.023	---	---	---	---	---
MW-4	12	4/1/09	99	1100	<10	<1.0	2.9	1.1	1.3	---	---	---	---	---
	16	4/1/09	<1.0	<1.0	<0.05	0.018	0.0059	1.0061	0.023	---	---	---	---	---

Table 1: Soil Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Depth	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	TBA	DIPE	ETBE	MTBE
			Method 8015C		*Method 8021B*					*Method 8260B*				
	ft		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MW-5	12	5/12/09	31	61	<1.0	0.27	0.12	0.66	0.92	---	---	---	---	---
	16	5/12/09	1.9	18	<0.05	0.15	0.0055	0.23	0.33	---	---	---	---	---
MW-6	12	4/2/09	2.3	23	<0.05	0.12	0.018	0.15	0.34	---	---	---	---	---
	16	4/2/09	29	270	<2.5	<0.25	0.67	0.43	0.81	---	---	---	---	---
	19	4/2/09	5	1.8	0.12	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
	25	4/2/09	<1.0	<1.0	0.029	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
MW-7	12	5/13/09	<1.0	13	<0.05	0.067	0.03	0.042	0.02	---	---	---	---	---
	16		<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
IW-1	10.5	5/12/09	86	490	<1.0	0.19	0.69	6.7	3.5	---	---	---	---	---
	15	5/12/09	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---
ESL			83	83	0.023	0.044	2.9	3.3	2.3	---		---	---	---

Notes:

mg/kg = milligrams per kilogram
ESL = Environmental Screening Level
NW = Soil Sample Collected from northwest sidewall during excavation
SW = Soil Sample Collected from southwest sidewall during excavation
TPH-g = total petroleum hydrocarbons as gasoline
TPH-d = total petroleum hydrocarbons as diesel

E-Benzene = ethyl benzene
TAME = tert-amyl methyl ether
ETBE = ethyl tert-butyl ether
TBA = tertiary butyl alcohol
DIPE = Di-isopropyl Ether
MTBE = methyl tert-butyl ether

Table 2: Soil Boring Groundwater Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	ETBE	TBA	DIPE	MTBE
		Method 8015		*Method 8021B*					*Method 8260B*				
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Pit Water	02/22/00	34,000	7,400	---	3,300	930	400	6,200	---	---	---	---	---
S-1	6/23/06	<10,000	20,000	---	980	70	1,500	1,100	---	---	---	---	---
S-2	6/23/06	<4,000	31,000	---	7,000	260	920	2,800	---	---	---	---	---
S-3	6/23/06	<1,500	23,000	---	490	67	1,200	3,300	---	---	---	---	---
S-4	6/23/06	<40,000	120,000	---	200	<15	3,500	2,900	---	---	---	---	---
SB-1	10/1/2007	6,100	28,000	<170	2,000	77	1,600	4,100	<25	<25	<250	<25	<25
SB-2	10/1/2007	300	640	<5.0	1.8	2.2	1.1	4.9	<0.5	<0.5.	<5.0	<0.5	<0.5
SB-3	10/1/2007	<50	84	<5.0	2.4	<0.5	4.2	11	<0.5	<0.5.	<5.0	<0.5	<0.5
SB-4	10/1/2007	2,200	20,000	<600	6,600	110	390	430	<17	<17	430	<17	<17
SB-5	10/1/2007	7,400	22,000	<250	1,900	86	1,200	2,100	<5.0	<5.0	120	<5.0	<5.0
SB-6	10/1/2007	---	440	---	17	<0.5	0.99	2.2	<0.5	<0.5	18	<0.5	2.0
SB-7	10/3/2007	1,000	2,000	<25	30	5.1	56	82	<0.5	<0.5.	<5.0	<0.5	6.1
SB-8	10/3/2007	1,600	6,700	---	110	6.3	160	140	<0.5	<0.5	12	<0.5	<0.5
SB-9	10/3/2007	5,700	11,000	<50	440	14	720	1,000	<1.7	<1.7	37	<1.7	<1.7
SB-10	10/3/2007	1,700	17,000	<100	3,800	55	420	830	<10	<10	510	11	<10

Table 2: Soil Boring Groundwater Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	ETBE	TBA	DIPE	MTBE
		Method 8015		*Method 8021B*					*Method 8260B*				
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
SB-11	10/3/2007	4,300	83,000	---	10,000	640	2,700	7,900	<25	<25	840	<25	<25
SB-12	12/20/2007	4,900	35,000	<450	5,200	110	1,000	1,800	---	---	---	---	---
SB-13	12/20/2007	5,100	29,000	<250	5,300	80	1,400	3,900	---	---	---	---	---
SB-14	12/20/2007	12,000	23,000	<240	2,600	15	1,500	1,800	---	---	---	---	---
SB-15	12/20/2007	3,000	36,000	<350	7,700	190	1,600	4,700	---	---	---	---	---
SB-16	12/20/2007	480	88	<5.0	0.60	<0.5	<0.5	0.83	---	---	---	---	---
SB-17	12/20/2007	320	1,100	<5.0	<0.5	6.2	<0.5	4.2	---	---	---	---	---
SB-18	12/20/2007	1,800	<50	<5.0	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---
SB-19	12/20/2007	280	<50	<5.0	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---
SB-20	12/20/2007	3,900	28,000	<160	3,400	22	1,200	930	---	---	---	---	---
SB-21	12/21/2007	1,200	8,100	<50	1,600	<5.0	160	84	---	---	---	---	---
SB-22	12/21/2007	620	2,600	<10	110	0.90	150	55	---	---	---	---	---
SB-23	5/14/2008	4,800	46,000	<450	9,000	40	2,300	5,200	---	---	---	---	---
SB-24	5/14/2008	2,900	11,000	<50	80	<5.0	440	290	---	---	---	---	---
SB-25	5/9/2008	1,300	3,600	<5.0	42	1.90	65	36	---	---	---	---	---

Table 2: Soil Boring Groundwater Analytical Data
3433 Chestnut St. Oakland, CA 94608
AEI Project #274761

Sample ID	Date	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TAME	ETBE	TBA	DIPE	MTBE
		Method 8015		*Method 8021B*					*Method 8260B*				
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
SB-26	5/14/2008	770	2,300	<10	22	2.1	<1.0	2.4	---	---	---	---	---
SB-27	5/14/2008	180	740	<5.0	7.4	3.70	<0.5	1.0	---	---	---	---	---
SB-28	5/16/2008	72	290	<5.0	1.3	0.93	2.7	4.0	---	---	---	---	---
SB-29	5/16/2008	<50	<50	<5.0	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---
SB-30	5/14/2008	<50	<50	<5.0	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---
SB-31	5/14/2008	770	5,100	<110	270	6.3	79	7	---	---	---	---	---
ESL	---	100	100	5.0	1.0	40	30	20	---	---	50,000	---	---

Notes:
µg/L = micrograms per liter
ESL = Environmental Screening Level
TPH-g = total petroleum hydrocarbons as gasoline
TPH-d = total petroleum hydrocarbons as diesel
MTBE = methyl tert-butyl ether
E-Benzene = ethyl benzene
TAME = tert-amyl methyl ether
ETBE = ethyl tert-butyl ether
TBA = tertiary butyl alcohol
DIPE = Di-isopropyl Ether

Table 3: Soil Vapor Analytical Data

3433 Chestnut St. Oakland, CA 94608

AEI Project #274761

Boring	Date	Isopropyl Alcohol	TPH-g	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes
		Method TO15						
		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
VB-1	10/1/2007	<25	1,900	<48	130	35	<8.8	<27
VB-2	10/1/2007	<25	3,100	<48	32	42	11	50
VB-3	10/1/2007	<25	2,500	<48	40	42	16	49
ESL		---	26,000	9,400	85	63,000	420,000	150,000

$\mu g/m^3$ = micrograms per cubic meter
ESL = Environmental Screening Level
TPH-g = total petroleum hydrocarbons as gasoline
MTBE = methyl tert-butyl ether

Table 4: Excavation Confirmation Sampling
3442 Adeline Street St. Oakland, CA 94608
AEI Project 281939

Sample Number	Date Collected	Depth	TPHg	TPHd	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes
			8015		8021B				
			mg/kg						
Sidewall Samples									
SW1-7.0	3/4/2009	7.0	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW1-11.5	3/4/2009	11.5	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW2-8.0	3/4/2009	8.0	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW2-11.5	3/4/2009	11.5	24	5.8	<0.05	0.17	<0.005	0.26	0.19
SW3-7.5	3/4/2009	7.5	180	65	<1.0	0.88	0.28	2.9	4.2
SW3-11.5	3/4/2009	11.5	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW4-6	3/5/2009	6.0	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW4-11.5	3/5/2009	11.5	100	21	<1.0	0.49	0.10	1.5	4.2
SW5-6.5	3/5/2009	6.5	87	16	<0.50	0.23	0.11	0.62	0.49
SW5-11.5	3/10/2009	11.5	----	Sample not analyzed by error			----	----	----
SW6-6.5	3/5/2009	6.5	17	<1.0	<0.10	0.020	<0.010	<0.010	0.032
SW6-12	3/11/2009	11.5	4.9	<1.0	<0.05	0.54	<0.005	0.15	0.16
SW7-6.5	3/5/2009	6.5	200	210	<1.0	0.20	<0.10	0.49	0.71
SW7-11.5	3/9/2009	11.5	1200	310	<2.5	2.3	1.4	18	41
SW8-6.5	3/11/2009	6.5	12	5.2	<0.05	0.085	0.0084	0.027	0.070
SW8-11.5	3/11/2009	11.5	12	1.1	<0.05	0.58	0.0091	0.15	0.19
SW9-6.5	3/11/2009	6.5	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
SW9-12	3/11/2009	11.5	5.0	<1.0	<0.05	0.82	<0.005	0.2	0.2
SW10-6.5	3/11/2009	6.5	5.6	<1.0	<0.05	0.045	0.0062	0.0089	0.012
SW10-11.5	3/11/2009	11.5			Mislabeled not analyzed				
Bottom Samples									
B1-13	3/4/2009	13	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
B2-13	3/4/2009	13	<1.0	<1.0	<0.05	<0.005	<0.005	<0.005	<0.005
B-3-11	3/9/2009	11	38	3.6	<0.50	2.6	<0.050	0.49	0.58
B-3 (B-4-11	3/11/2009	12	130	13	<0.50	0.81	0.12	1.5	2.5

mg/kg = milligrams per kilogram
TPH-g = total petroleum hydrocarbons as gasoline
TPH-d = total petroleum hydrocarbons as diesel
< = not detected at or above laboratory reporting limit
MTBE = methyl tertiary butyl ether

Table 5: Horizontal SVE Casing Tests
3442 Adeline Street St. Oakland, CA 94608
AEI Project 281939

Sample Number	Date Collected	Purge Vacuum	PID	CH_4	O_2	CO_2	TPHg	MTBE	Benzene	Toluene	Ethyl	Xylenes
			Eagle meter				8015	8021B				
		(in. H_20)	(ppmv)	(%)	(%)	(%)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
SVE-1	4/27/2009	13.5	60	0	10.7	7.7	51	<2.5	<0.25	<0.25	<0.25	<0.25
	6/24/2009	20.0	0	0	14.4	6.1	----	----	----	----	----	----
SVE-2	4/27/2009	13.0	60	0	9.0	8.1	48	<2.5	0.29	<0.25	0.26	1.1
	6/24/2009	20.0	0	0	14.2	6.0	----	----	----	----	----	----
SVE-3	4/27/2009	12.5	55	0	8.9	8.5	<25	<2.5	<0.25	<0.25	<0.25	<0.25
	6/24/2009	20.0	0	0	13.9	6.0	----	----	----	----	----	----

ppmv
mg/kg milligrams per kilogram
TPH-g total petroleum hydrocarbons as gasoline
MTBE methyl tertiary butyl ether
< not detected at or above laboratory reporting limit

Table 6
Monitoring Well Construction Details
3442 Adeline Street St. Oakland, CA 94608

Well ID	Date Installed	Top of Casing Elevation (ft amsl)	Well Box Rim Elevation (ft amsl)	Depth to Water 12/15/2009 (ft btc)	Well Depth (ft)	Casing Diameter (in)	Slotted Casing (ft)	Slot Size (in)	Sand Interval (ft)	Sand Size	Bentonite Interval (ft)	Grout Interval (ft)
MW-1	04/01/09	31.12	32.13	5.96	17	4	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-2	04/01/09	31.19	31.43	8.68	17	4	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-3	04/01/09	32.07	32.39	7.66	17	4	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-4	04/02/09	31.68	31.98	8.19	17	2	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-5	05/12/09	30.39	30.82	8.33	17	2	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-6	04/02/09	29.34	29.96	8.59	17	2	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
MW-7	05/13/09	31.04	31.45	5.71	17	2	7-17	0.020	6-17	# 2/12	5-6	0.75 - 5
IW-1	05/12/09	31.66	31.90	10.99	15	2	13-15	0.010	12-15	# 2/12	11-12	0.75-12

Notes:
ft amsl = feet above mean sea level

ft btc = feet below top of casing

Table 7: Monitoring Well Groundwater Analytical Data
3442 Adeline Street St. Oakland, CA 94608

Sample ID	Date	Depth to Water	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl benzene	Xylenes
			Method 8015C		*Method 8021B*				
		(ft)	(µg/L)						
ESL - current or potenital DW			100	100	5.0	1.0	40	30	20
ESL - not potenital DW			210	210	1,800	46	130	43	100
MW-1	04/17/09	7.01	97	220	<5.0	10	<0.5	3.0	5.4
	08/27/09	6.96	----	7,000	<180	610	10	320	220
	09/17/09	----	----	92	<15	0.91	0.70	<0.5	<0.5
	10/14/09	----	----	380	<30	25	0.83	7.2	12
	12/15/09	5.96	----	2500	<50	170	6.4	66	120
	03/12/10	**5.06**	----	**500**	**<5.0**	**4.0**	**1.1**	**0.6**	**0.7**
MW-2	04/17/09	9.50	2,200	7,000	<100	850	19	93	470
	08/27/09	10.50	----	26,000	<1,200	3,600	<25	1,200	3,000
	12/15/09	8.68	----	25,000	<250	2,900	70	1,500	2,400
	03/12/10	**5.69**	----	**7,300**	**<350**	**590**	**7.0**	**6.4**	**680**
MW-3	04/17/09	8.44	2,200	10,000	<110	930	5.6	270	920
	08/27/09	8.59	----	17,000	<250	3800	38	730	710
	09/17/09	----	----	260	<15	1.8	1.0	<0.5	2.1
	10/14/09	----	----	1,800	<30	220	13	37	130
	12/15/09	7.66	----	4,900	<50	890	13	160	130
	03/12/10	**Well inaccessible**							
MW-4	04/17/09	9.45	1,200	4,700	<30	140	2.0	28	18
	08/27/09	10.29	----	4,300	<25	75	11	8.6	3.4
	12/15/09	8.19	----	3,000	<15	64	11	5.6	3.3
	03/12/10	**5.45**	----	**6,100**	**<35**	**1200**	**14**	**170**	**6.2**
MW-5	05/22/09	9.13	2,800	14,000	<100	3,000	12	340	420
	08/27/09	9.54	----	25,000	<400	3,300	36	110	160
	12/15/09	8.33	----	8,200	<250	1,200	6.9	300	610
	03/12/10	**Well inaccessible**							
MW-6	04/17/09	9.98	1,000	5,600	<300	210	3.0	180	160
	08/27/09	11.84	----	2,200	<120	98	7.9	20	1.1
	12/15/09	8.59	----	4,700	<250	370	6.9	260	300
	03/12/10	**4.66**	----	**9,300**	**<90**	**210**	**12**	**250**	**110**
MW-7	04/17/09	6.53	3,700	12,000	<120	1,000	37	100	36
	08/27/09	6.19	----	12,000	<100	550	30	130	33
	12/15/09	5.71	----	9,600	<100	620	26	140	20
	03/12/10	**5.34**	----	**10,000**	**<25**	**850**	**33**	**87**	**28**
IW-1	05/22/09	7.65	680	1,200	<15	58	2.7	2.3	18
	08/27/09	7.70	----	160	<5.0	4.1	0.5	0.8	1.6
	09/17/09	----	----	300	<5.0	8.0	1.5	1.4	0.85
	12/15/09	10.99	**----**	**220**	**<5.0**	**5.4**	**1.4**	**0.65**	**0.7**
	03/12/10	**10.00**	----	**<50**	**<5.0**	**1.9**	**<0.5**	**<0.5**	**<0.5**

Table 7: Monitoring Well Groundwater Analytical Data
3442 Adeline Street St. Oakland, CA 94608

Sample ID	Date	Depth to Water	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl benzene	Xylenes
			Method 8015C		*Method 8021B*				
		(ft)	(µg/L)						
ESL - current or potenital DW			100	100	5.0	1.0	40	30	20
ESL - not potenital DW			210	210	1,800	46	130	43	100
BF-1	03/27/09	----	----	19,000	<250	890	27	460	1,200
post H_2O_2	06/17/09	----	----	6,700	<150	840	19	170	150
pre-aeration	08/10/09	----	----	11,000	<120	710	14	440	290
post aeration	08/27/09	----	----	9,600	<90	590	14	350	220
	09/13/09	----	----	<50	<5.0	1.2	<0.5	<0.5	<0.5
	10/14/09	----	----	2,400	<10	83	1.9	5.0	120
	12/11/09	6.70	----	200	<5.0	12	<0.5	2.2	9.6
	03/12/10	**5.61**	----	**<50**	**<0.5**	**2.9**	**<0.5**	**<0.5**	**<0.5**
BF-3	10/14/09	----	----	<50	<5.0	<0.5	<0.5	<0.5	<0.5
BF-5	08/27/09	----	----	170	<25	32	0.55	4.2	220
	10/14/09	----	----	<50	<5.0	<0.5	<0.5	<0.5	<0.5
	12/11/09	7.25	----	130	<5.0	40	<0.5	0.91	<0.5
	03/12/10	**6.09**		**<50**	**<5.0**	**4.3**	**<0.5**	**0.91**	**<0.5**

Notes:
µg/L = micrograms per liter
ESL = Environmental Screening Level
TPH-g = total petroleum hydrocarbons as gasoline
680 = Current concentration above ESL
TPH-d = total petroleum hydrocarbons as diesel
MTBE = methyl tert-butyl ether
680 = most recent sample

Table 8
Groundwater Elevation Data
3442 Adeline Street St. Oakland, CA 94608

Well ID (Screen Interval)	Date Collected	Top of Casing Elevation *(ft amsl)*	Depth to Water *(ft)*	Groundwater Elevation *(ft amsl)*	Elevation Change *(ft)*
MW-1	6/10/2009	31.12	7.01	24.11	----
(7-17)	8/27/2009	31.12	6.96	24.16	0.05
	12/15/2009	31.12	5.96	25.16	1.00
	3/12/2010	31.12	5.06	26.06	0.90
MW-2	6/10/2009	31.19	9.50	21.69	----
(7-17)	8/27/2009	31.19	10.50	20.69	-1.00
	12/15/2009	31.19	8.68	22.51	1.82
	3/12/2010	31.19	5.09	26.10	3.59
MW-3	6/10/2009	32.07	8.44	23.63	----
(7-17)	8/27/2009	32.07	8.59	23.48	-0.15
	12/15/2009	32.07	7.66	24.41	0.93
	3/12/2010	**Well inaccessible**	----	----	----
MW-4	6/10/2009	31.68	9.45	22.23	----
(7-17)	8/27/2009	31.68	10.29	21.39	-0.84
	12/15/2009	31.68	8.19	23.49	2.10
	3/12/2010	31.68	5.45	26.23	2.74
MW-5	6/10/2009	30.39	9.13	21.26	----
(7-17)	8/27/2009	30.39	9.54	20.85	-0.41
	12/15/2009	30.39	8.33	22.06	1.21
	3/12/2010	**Well inaccessible**	----	----	----
MW-6	6/10/2009	29.34	9.98	19.36	
(7-17)	8/27/2009	29.34	11.84	17.50	-1.86
	12/15/2009	30.39	8.33	22.06	4.56
	3/12/2010	30.39	4.66	25.73	3.67
MW-7	6/10/2009	31.04	6.53	24.51	----
(7-17)	8/27/2009	31.04	6.19	24.85	0.34
	12/15/2009	31.04	5.71	25.33	0.48
	3/12/2010	31.04	5.34	25.70	0.37
IW-1	6/10/2009	31.66	7.65	24.01	----
(13-15)	8/27/2009	31.66	7.70	23.96	-0.05
	12/15/2009	31.66	10.99	20.67	-3.29
	3/12/2010	31.66	10.00	21.66	0.99

Table 8
Groundwater Elevation Data
3442 Adeline Street St. Oakland, CA 94608
Groundwater Gradient Data

Event	**Date**	**Average Water Table Elevation** (ft amsl)	**Change from Previous Episode** (ft)	**Flow Direction (gradient)** (ft/ft)
1	6/10/2009	22.40	----	West (0.0186)
2	8/27/2009	21.85	-0.55	West (0.0186)
3	12/15/2009	23.57	1.73	West (0.0181)
	3/12/2010	25.96	2.39	**West (0.0181)**

Table 7: Monitoring Well Groundwater Analytical Data
3442 Adeline Street St. Oakland, CA 94608

Sample ID	Date	Depth to Water	TPH-d	TPH-g	MTBE	Benzene	Toluene	Ethyl benzene	Xylenes
			Method 8015C		*Method 8021B*				
		(ft)	(µg/L)						
ESL - current or potenital DW			100	100	5.0	1.0	40	30	20
ESL - not potenital DW			210	210	1,800	46	130	43	100
BF-1	03/27/09	----	----	19,000	<250	890	27	460	1,200
post H_2O_2	06/17/09	----	----	6,700	<150	840	19	170	150
pre-aeration	08/10/09	----	----	11,000	<120	710	14	440	290
post aeration	08/27/09	----	----	9,600	<90	590	14	350	220
	09/13/09	----	----	<50	<5.0	1.2	<0.5	<0.5	<0.5
	10/14/09	----	----	2,400	<10	83	1.9	5.0	120
	12/11/09	6.70	----	200	<5.0	12	<0.5	2.2	9.6
	03/12/10	**5.61**	----	**<50**	**<0.5**	**2.9**	**<0.5**	**<0.5**	**<0.5**
BF-3	10/14/09	----	----	<50	<5.0	<0.5	<0.5	<0.5	<0.5
BF-5	08/27/09	----	----	170	<25	32	0.55	4.2	220
	10/14/09	----	----	<50	<5.0	<0.5	<0.5	<0.5	<0.5
	12/11/09	7.25	----	130	<5.0	40	<0.5	0.91	<0.5
	03/12/10	**6.09**		**<50**	**<5.0**	**4.3**	**<0.5**	**0.91**	**<0.5**

Notes:
µg/L = micrograms per liter
ESL = Environmental Screening Level
TPH-g = total petroleum hydrocarbons as gasoline
680 = Current concentration above ESL
TPH-d = total petroleum hydrocarbons as diesel
MTBE = methyl tert-butyl ether
680 = most recent sample

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

APPENDIX F