1244 2nd Ave, LLC

2655 Van Ness Ave Suite 2, San Francisco CA 94109
Phone: (415) 359.2400
Fax: (415) 359.2401

Mr. Dilan Roe
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Re: **Site Conceptual Model and Data Gap Workplan**
1244 2nd Avenue
Oakland, California

Dear Mr. Roe:

1244 2nd Avenue LLC, has retained Pangea Environmental Services, Inc. (Pangea) for environmental consulting matters at the project referenced above. Pangea is submitting the attached report on our behalf.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached report are true and correct to the best of my knowledge.

Sincerely,

Trent Moore
1244 2nd Avenue LLC

January 22, 2016

Mr. Dilan Roe
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502

Re: **Site Conceptual Model and Data Gap Workplan**
1244 2nd Avenue
Oakland, California 94606

Dear Mr. Roe:

On behalf of 1244 2nd Avenue LLC, Pangea Environmental Services, Inc. (Pangea) has prepared this *Site Conceptual Model and Data Gap Workplan* (Workplan) for the subject site. This Workplan was requested verbally by your agency in response to petroleum hydrocarbons discovered during removal of a 1,000-gallon heating oil underground storage tank (UST) and associated borings in December 2015.

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

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

Attachment: *Site Conceptual Model and Data Gap Workplan*

cc: Trent Moore, 1244 2nd Avenue LLC, 2655 Van Ness Avenue, Suite 2, San Francisco, CA 94109

SITE CONCEPTUAL MODEL AND DATA GAP WORKPLAN

1244 2ND Avenue
Oakland, CA

January 22, 2016

Prepared for:

1244 2nd Avenue LLC
2655 Van Ness Avenue, Suite 2
San Francisco, California 94109

Prepared by:

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

Written by:

Elizabeth Avery
Project Geologist

Bob Clark-Riddell, P.E.
Principal Engineer

INTRODUCTION

On behalf of 1244 2nd Avenue LLC, Pangea Environmental Services, Inc. (Pangea) has prepared this *Site Conceptual Model and Data Gap Workplan* (Workplan) for the subject site. This Workplan was requested verbally by your agency in response to petroleum hydrocarbons discovered during removal of a 1,000-gallon heating oil underground storage tank (UST) and associated borings in December 2015. The objective of the SCM preparation and data gap evaluation was to identify potential gaps for future corrective action. The proposed work based on the SCM and data gap evaluation is to evaluate potential threats to aquatic habitat given the site proximity to nearby surface water, shallow site groundwater, and nearby storm drain conduits. The ultimate goal is to sufficiently evaluate site conditions to satisfy criteria of the State Water Resources Control Board's *Low-Threat Closure Policy* to allow regulatory case closure.

SITE BACKGROUND

The subject site is occupied by a mixed use residential/commercial structure located on the southeast side of 2nd Avenue in Oakland, California.

UST Removal

On December 8, 2015, L&W Construction of Petaluma, California removed a 1,000-gallon UST apparently used to store heating oil. The UST was located beneath the sidewalk on International Boulevard on the southeast side of the site structure. The UST dimensions were four feet in diameter by ten feet in length, and the top of the UST was approximately eight feet below surface grade. During UST removal L&W removed approximately 50 tons of impacted soil and 2,800 gallons of groundwater for secondary source removal. The site and former UST location are shown on Figure 1. The UST excavation was backfilled in early January 2016. UST and secondary source removal activities were reported in the *Underground Storage Tank Removal Report* prepared by L&W and dated January 18, 2016.

Site Investigation

On December 23, 2015, Pangea coordinated soil and groundwater sampling to characterize subsurface impact near and downgradient of the UST. Site assessment results are described in the *Site Assessment Report* dated December 31, 2015. Pangea coordinated the drilling of six soil borings (B-1 through B-6) and sampling within the tank pit. Sampling locations are shown on Figures 1 and 2. Soil and groundwater analytic data are summarized on Tables 1 and 2, respectively. The only detected petroleum hydrocarbons were quantified as TPHd and TPHmo. Since the laboratory fuel fingerprint analysis characterized the sample chromatogram as 'significant aged diesel pattern between C10 and C23', the hydrocarbons quantified as TPHmo may represent the heavier range of TPHd hydrocarbons. No TPHg, BTEX, MTBE or other VOCs were reported in soil site

soil or groundwater. The TPHd and TPHmo impact in soil was below the final environmental screening levels (ESLs) for commercial site use. The limited TPHd and TPHmo impact detected in groundwater only slightly exceeded the applicable ESL (aquatic habitat) at two locations, adjacent and approximately 25 ft from the removed UST. The aquatic habitat ESL is applicable given the proximity to surface water and sewer/storm drain conduits, and the lack of anticipated groundwater use as a drinking water resource in the site vicinity. The observed impact will attenuate with time given the removal of the UST and secondary source material.

Underground Utility Location

The *Site Assessment Report* dated December 31, 2015 presents underground utility information. To identify nearby underground utilities that could act as preferential pathway for hydrocarbon migration, Pangea reviewed USA markings and obtained sanitary sewer and storm drain maps from the City of Oakland. The only utility identified nearby the UST was a shallow AT&T communication line about 2 feet from the site structure running parallel to the building and street. The sanitary sewer and storm drain conduits are located in the middle of 2nd Avenue and eastward, as shown on Figure 2. The sanitary sewer and storm drain conduits slope to the north toward Lake Merritt. Sanitary sewer and storm drain maps from the City of Oakland are included in Appendix B of the *Site Assessment Report*.

SITE CONCEPTUAL MODEL AND DATA GAP ASSESSMENT

Pangea prepared a site conceptual model (SCM) and data gap evaluation using the tabular format requested by your agency (Table 3). The SCM is a representation of site conditions based on available data, and summarizes important site issues and provides a guide for future assessment and/or remediation. As shown on Table 3, the data gaps for site data involve downgradient hydrocarbon plume delineation and evaluation of potential threats to aquatic habitat given the site proximity to nearby surface water, shallow site groundwater, and nearby storm drain conduits. A Conceptual Site Model Chart and Exposure Pathway Analysis (Figure 3) was prepared to illustrate incomplete and complete exposure pathways for this site.

PROPOSED INVESTIGATION

Based on the SCM and data gap assessment shown on Table 3, the objective of the proposed investigation is to further delineate the downgradient extent of hydrocarbon impact in groundwater and evaluate the potential for surface water impact for aquatic habitat protection. The proposed scope of work to accomplish the investigation objectives is detailed below. The proposed sampling locations are shown on Figure 2.

Task 1 - Pre-Field Activities

Prior to initiating field activities, Pangea will conduct the following tasks:

- Obtain drilling and encroachment permits from Alameda County Public Works (ACPWA) and City of Oakland as necessary;
- Pre-mark the boring locations with white paint, notify Underground Service Alert (USA) of the drilling and sampling activities at least 48 hours before work begins, and conduct private line locating as merited;
- Prepare a site-specific health and safety plan to educate personnel and minimize their exposure to potential hazards related to site activities; and
- Coordinate with drilling and laboratory subcontractors and other involved parties.

Task 2 – Groundwater Sampling

For additional plume characterization, Pangea proposes to advance four soil borings in accordance with the above discussion. The proposed boring locations are shown on Figure 2. All field activities will be conducted in general accordance with the Standard Operating Procedures (SOPs) provided in Appendix A.

Soil borings will be advanced to first encountered groundwater, which is anticipated to be present between 4 and 8 ft bgs. Grab groundwater samples will be collected from each sampling point using a temporary PVC casing and a disposable bailer, tubing with check valve, or a peristaltic pump. Completed borings will be tremmie-grouted from the bottom of the hole to the surface. Additional soil boring procedures are presented in our Standard Operating Procedures (Appendix A).

All site investigation activities will be performed under the supervision of a California Registered Civil Professional Engineer (P.E.).

Grab groundwater samples will be analyzed for total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and motor oil (TPHmo) with silica gel cleanup by EPA Method 8015.

Task 3 – Waste Management and Disposal

Soil cuttings and other investigation-derived waste will be stored onsite in Department of Transportation (DOT)-approved 55-gallon drums. The drums and their contents will be held onsite pending laboratory analytical results. Upon receipt of the analytical reports, the waste will be transported to an appropriate disposal/recycling facility.

Task 4 – Report Preparation

Upon completion of assessment activities, Pangea will prepare a technical report. The report will describe the investigation activities, present tabulated analytical data, and offer conclusions and recommendations.

ATTACHMENTS

Figure 1 – Soil Analytical Data
Figure 2 – Proposed Boring Locations
Figure 3 – Conceptual Site Model Chart and Exposure Pathway Analysis

Table 1 – Soil Analytical Data
Table 2 – Groundwater Analytical Data
Table 3 – Site Conceptual Model

Appendix A – Standard Operating Procedures

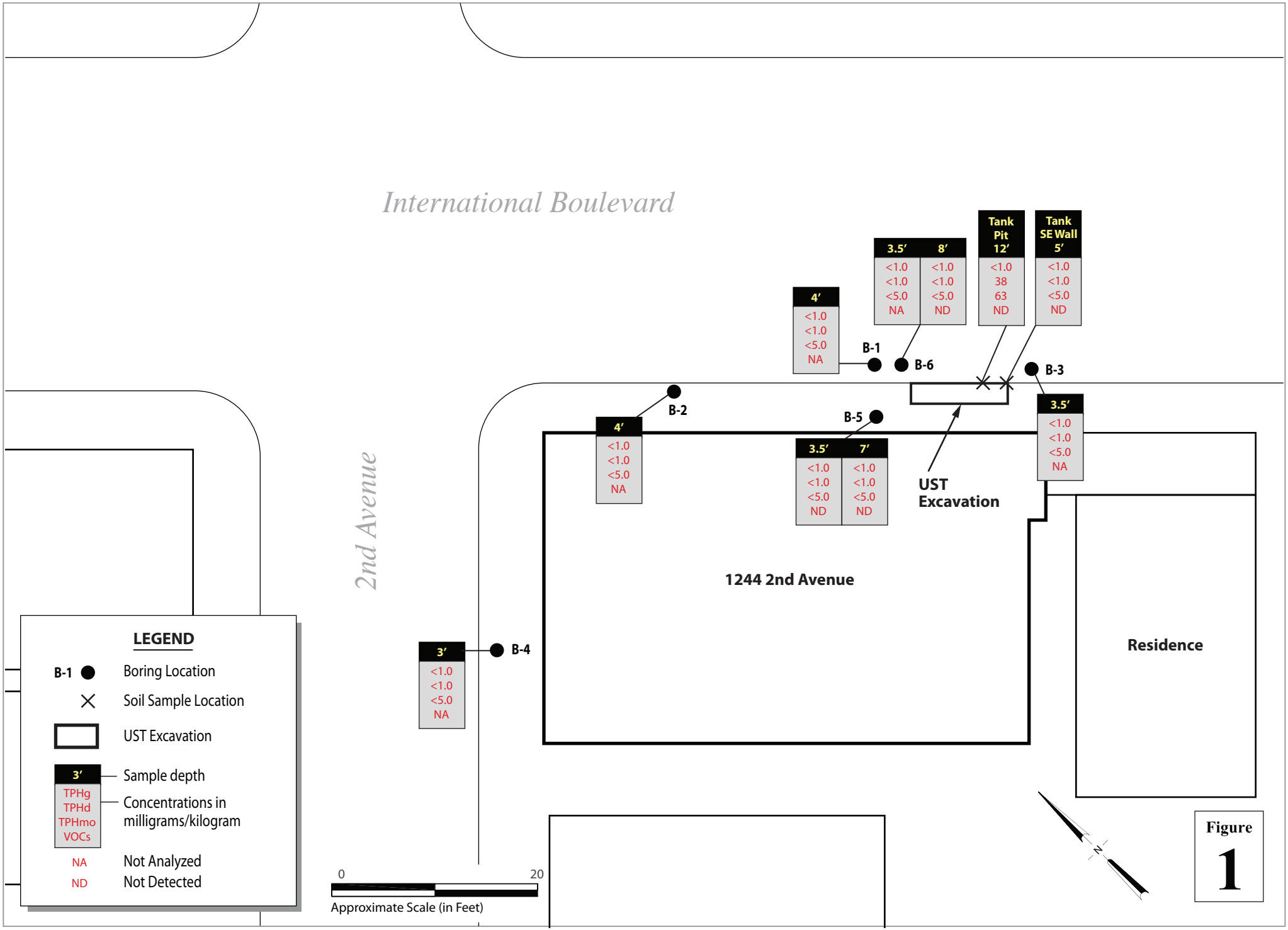
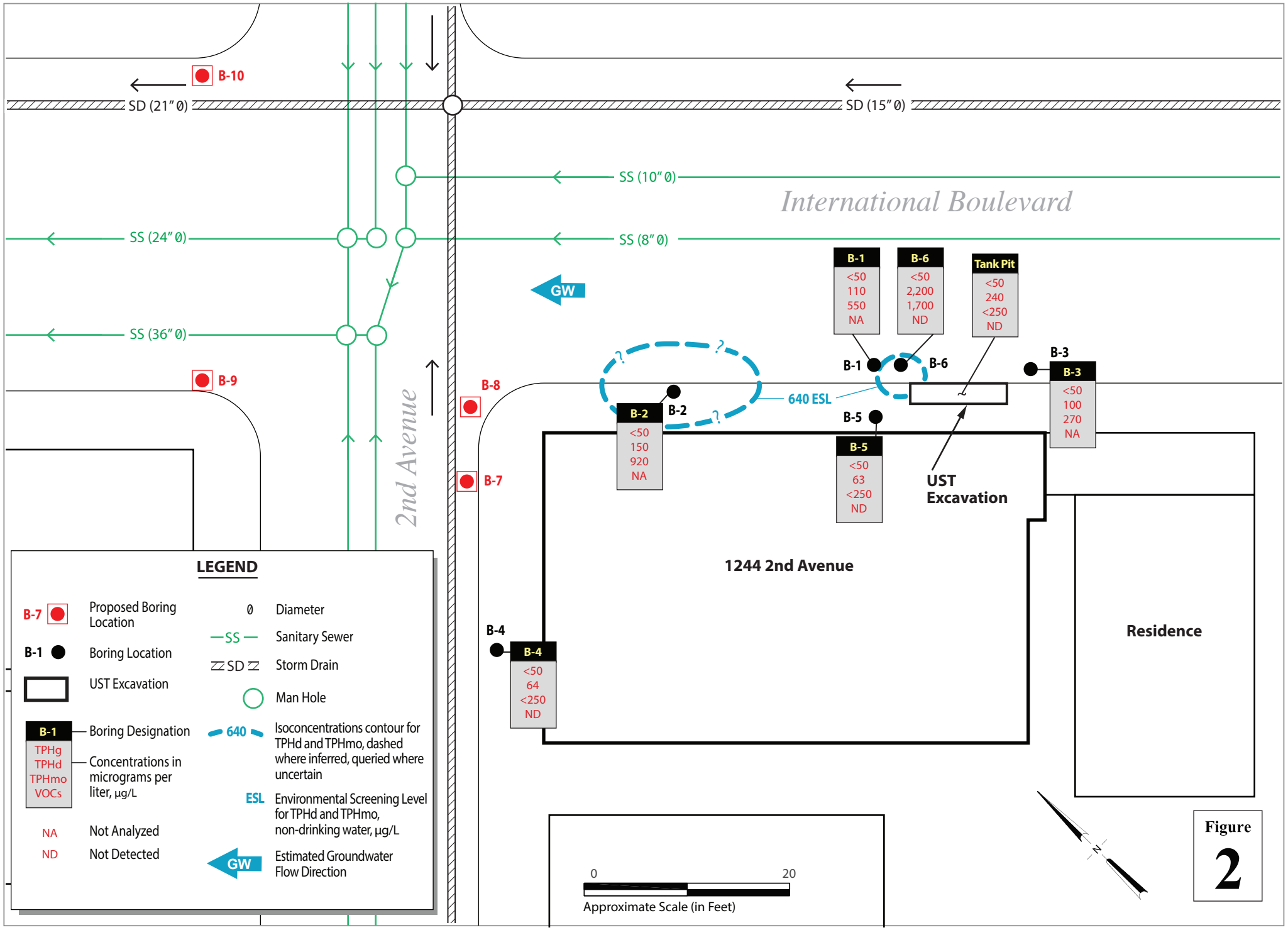


Figure 1

1244 2nd Avenue
Oakland, California

PANGEA

Soil Analytical Data



1244 2nd Avenue
Oakland, California

PANGEA

Proposed Boring Locations

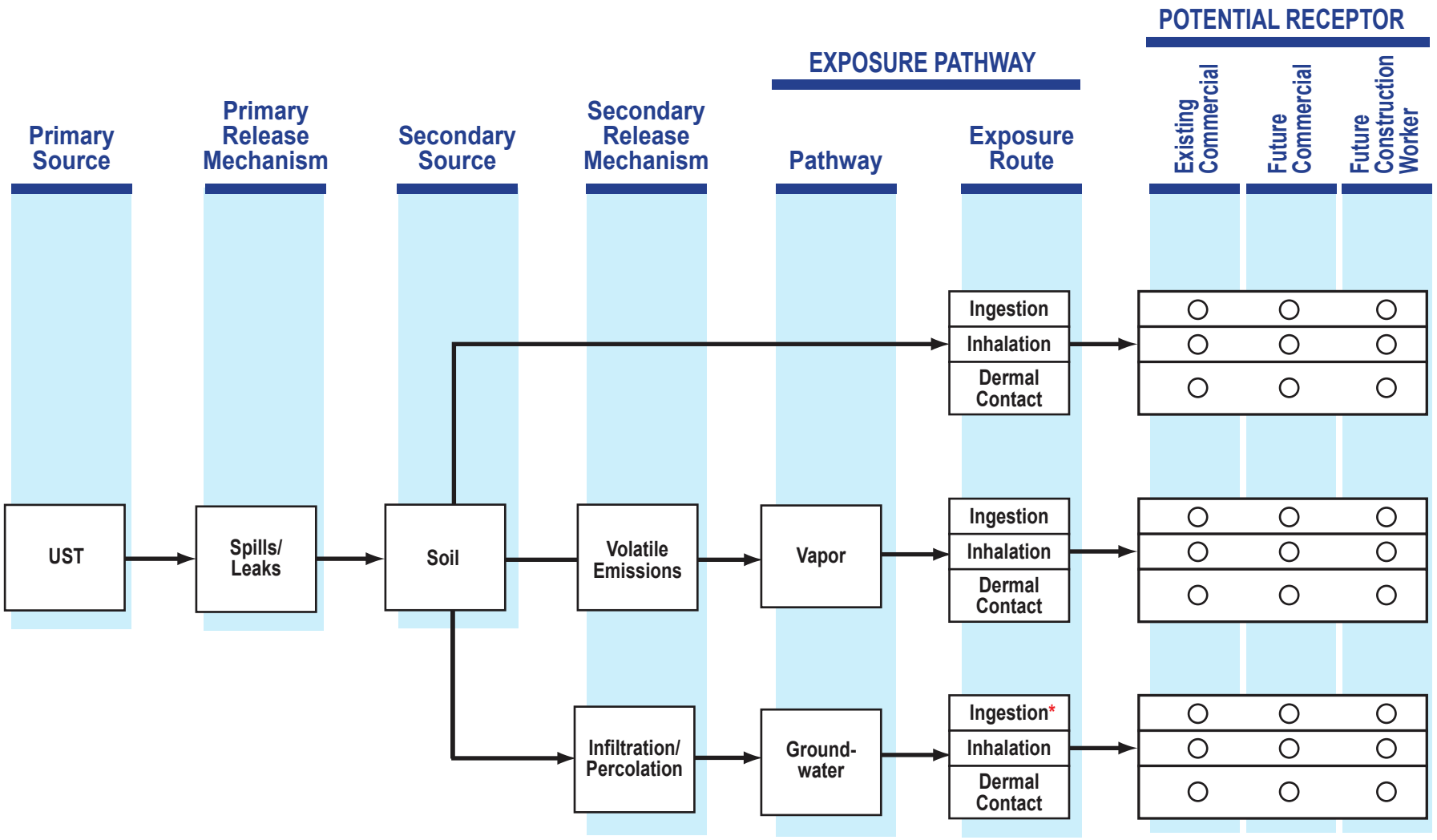


Figure 3

1244 2nd Avenue
Oakland, California

PANGEA

Conceptual Site Model Chart and Exposure Pathway Analysis

Table 1. Soil Analytical Data - 1244 2nd Avenue, Oakland, CA

Boring/Well ID	Date Sampled	Sample Depth (feet bgs)	TPHg	TPHd	TPHmo	Benzene	Ethylbenzene	Toluene	Xylenes	MTBE	Other VOCs	Notes
			←				mg/Kg				→	
Comm ESL for shallow soil (final, DW)[1]:			**500**	**110**	**500**	**0.044**	**3.3**	**2.9**	**2.3**	**0.023**	varies	
Comm ESL for shallow soil (ceiling value)[2]:			500	110	500	870	400	650	420	500	varies	
Comm ESL for shallow soil (ecotox flora/fauna)[2]:			---	---	---	25	---	---	---	---	varies	
Comm ESL for shallow soil (gw protection)[2]:			3,800	3,600	---	1.2	4.7	9.3	11	8.4	varies	
Comm ESL for shallow soil (human health)[3]:			4,000	1,100	100,000	3.7	24	4,900	2,600	190	varies	
December 2015 Assessment												
B-1	12/23/2015	4.0	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
B-2	12/23/2015	4.0	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
B-3	12/23/2015	3.5	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
B-4	12/23/2015	3.5	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
B-5-3.5	12/23/2015	3.5	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	ND	
B-5-7	12/23/2015	7.0	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	ND	
B-6-3.5	12/23/2015	3.5	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
B-6-8	12/23/2015	8.0	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	ND	
Tank Pit 12'	12/23/2015	12	<1.0	38	63	<0.0050	<0.0050	<0.0050	<0.015	<0.050	--	
Tank SE Wall 5'	12/23/2015	5.0	<1.0	<1.0	<5.0	<0.0050	<0.0050	<0.0050	<0.015	<0.050	ND	

ABBREVIATIONS AND NOTES:

mg/kg = milligrams per kilogram.

TPHg = Total petroleum hydrocarbons as gasoline by EPA Method 8015M.

TPHd = Total petroleum hydrocarbons as diesel by EPA Method 8015.

TPHmo = Total petroleum hydrocarbons as motor oil by EPA Method 8015.

VOCs = Volatile organic compounds by EPA Method 8260 (full list).

DW = Drinking water resource.

-- = Not analyzed.

< = Not detected at or above indicated detection limit.

ND = Not detected at various detection limits.

e2 = diesel range compounds are significant; no recognizable pattern (lab note). For fuel fingerprint on tank pit water, lab noted 'significant aged diesel pattern between C10 and C23.'

e7 = oil range compounds are significant (lab note).

ESL = Environmental Screening Levels for shallow soil, established by the SFBRWQCB, Interim Final - December 2013.

1 = Table A-2 of ESLs for shallow soil, commercial/industrial site use, groundwater is current or potential drinking water resource.

2 = Table B-2 of ESLs for shallow soil, commercial/industrial site use, groundwater is NOT current or potential drinking water resource.

3 = Table K-2 of ESLs for direct exposure soil screening level for commercial/industrial worker exposure scenario.

Bold = Concentration above final ESL for commercial/industrial worker exposure scenario.

Table 2. Groundwater Analytical Data - 1244 2nd Avenue, Oakland, CA

Boring/Well ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	BTEX	MTBE	VOCs	Notes
			← µg/L →						
Final ESL for groundwater, dw[1]:			100	100	100	varies	5	varies	
Final ESL for groundwater, non-dw[2]:			**500**	**640**	**640**	**varies**	**1,800**	**varies**	
ESL for aquatic habitat goal[3]:			500	640	640	varies	8,000	varies	
ESL for potential vapor intrusion, commercial[4]:			---	---	---	varies	9,900	varies	
ESL for groundwater ceiling value, non-dw[2]:			5,000	2,500	2,500	varies	1,800	varies	
December 2015 Assessment									
B-1	12/23/2015	4.5-8.5	<50	110	550	ND	<5.0	--	
B-2	12/23/2015	5.0-7.0	<50	150	920	ND	<5.0	--	
B-3	12/23/2015	4.0-7.5	<50	100	270	ND	<5.0	--	
B-4	12/23/2015	5.0-8.5	<50	64	<250	ND	<5.0	ND	
B-5	12/23/2015	5.0-7.5	<50	63	<250	ND	<5.0	ND	
B-6	12/23/2015	4.0-8.5	<50	2,200	1,700	ND	<5.0	ND	
Tank Pit	12/23/2015	5.0-12	<50	240	<250	ND	<5.0	ND	

ABBREVIATIONS AND NOTES:

µg/L = micrograms per liter.

TPHg = Total petroleum hydrocarbons as gasoline by EPA Method 8015M.

TPHd = Total petroleum hydrocarbons as diesel by EPA Method 8015.

TPHmo = Total petroleum hydrocarbons as motor oil by EPA Method 8015.

VOCs = Volatile organic compounds by EPA Method 8260.

DW = Drinking water resource.

ESL = Environmental Screening Levels for groundwater, established by the SFBRWQCB, Interim Final - December 2013.

Bold = Concentration above Final ESL for sites where groundwater is Not a current or potential drinking water resource.

-- = Not analyzed.

< = Not detected at or above indicated detection limit.

ND = Not detected at various detection limits.

e2 = diesel range compounds are significant; no recognizable pattern (lab note).

e7 = oil range compounds are significant (lab note).

1 = Table F-1a of ESLs; Final ESL where groundwater is a current or potential source of drinking water.

2 = Table F-1b of ESLs: Final ESL were groundwater is NOT a current or potential source of drinking water.

3 = Table F-4a of ESLs: Summary of Selected Aquatic Habitat Goals.

4 = Table E-1 of ESLs: Groundwater Screening Levels for Evaluation of Potential Vapor Intrusion, Commerial/Industrial land use, fine-coarse soil mix.

Table 3 - SITE CONCEPTUAL MODEL AND DATA GAP EVALUATION

The following table presents the site conceptual model (SCM) and data gap evaluation in tabular format. This table summarizes the risk summary for petroleum hydrocarbon impact (TPHd and TPHmo) at this site, providing detailed media-specific numerical concentration goals and a numerical assessment of progress in achieving those goals. Since hydrocarbons are the primary risk driver, assessment of the hydrocarbon goals alone provides a valid assessment of human health risks at the site.

.

Site Address:	1244 2nd Avenue		**ACEH Case No.**		TBD
City:	Oakland		**Regulator:**		Dilan Roe
SCM Element/ *Sub-Element*	**Description**		**Data Gap No. and Description**	**Proposed Investigation**	**Rationale**
	Site Description				
Land Use and Site History	The subject site is occupied by a mixed use residential/ commercial structure located on the southeast side of 2nd Avenue in Oakland, California. A 1,000-gallon UST used to store heating oil was located beneath the sidewalk on International Boulevard on the southeast side of the site structure.		None	NA	NA
Nearby Sites	The subject property is located in a mixed commercial and residential area of Oakland, CA.		None	NA	NA
Building Characteristics	The building was constructed in the 1910's. The UST that was removed appears to have been abandoned for a very long time. The vent pipe had been removed and natural gas was made available to the neighborhood in the 1950's. It is therefore assumed that the UST has not been used for over 50 years. No known prior investigations have been conducted pertaining to the site UST.		None	NA	NA
	Geology and Hydrogeology				
Regional	According to reports from a nearby site, the local area is underlain by Quaternary-age dune sand deposits referred to as the Merritt Sand. The Merritt Sand is typically described as loose, well-sorted fine-to medium-grained sand with a large silt component. The sand is reported to reach a maximum depth of 50-feet bgs in the area.		None	NA	NA

Local Geology	Based on soil logging during hand augering of borings B-1 to B-6, soil consisted primarily of light brown clay.		None.	NA	NA
Local Hydrogeology	Groundwater was encountered between approximately 4 and 7 ft bgs in site borings. Groundwater flow is presumed to flow in the northwest direction based on local topography and flow direction of the nearby sanitary sewer and storm drain conduits shown on Figure 2.		None**.**	NA	NA
Surface Water	The nearest mapped surface water is Lake Merritt, located approximately 850 feet to the north-northwest of the subject property.		None	NA	NA
	Contaminant Source and Release Information				
Source/ Release Information	The 1,000-gallon heating oil UST was located beneath the sidewalk on International Boulevard on the southeast side of the site structure. The UST dimensions were four feet in diameter by ten feet in length. The top of the UST was approximately eight feet below surface grade. UST removal in December 2015 is documented in the December 30, 2015 UST Removal Report by L&W Environmental of Petaluma, California. Installation date of this UST is unknown. The building was constructed in the 1910's. The UST that was removed appears to have been abandoned for a very long time. The vent pipe had been removed and natural gas was made available to the neighborhood in the 1950's. It is therefore assumed that the UST has not been used for over 50 years. No known prior investigations have been conducted pertaining to the site UST.		None	NA	NA
Chemicals of Concern	The primary chemical of concern (COC) at the site is TPH as diesel. Since the laboratory fuel fingerprint analysis characterized the sample chromatogram as 'significant aged diesel pattern between C10 and C23', the hydrocarbons quantified as TPHmo may represent the heavier range of TPHd hydrocarbons. No TPHg, BTEX, MTBE or other VOCs were reported in soil site soil or groundwater.		None	NA	NA
Scope	Subsurface assessment performed on December 23, 2015 by Pangea Environmental included soil and grab groundwater sampling from six borings near and downgradient of the removed UST. These borings were advanced to 7 to 8.5 ft bgs,		None	NA	NA

	and groundwater sampling from approximately 4 ft to 5 ft depth within six borings. To assess soil within the tank cavity, soil samples were collected from the southeastern sidewall at 5 ft bgs and from the excavation floor at 12 ft bgs. A grab water sample was also collected from the tank cavity when groundwater was present at approximately 5 ft bgs. The results were presented in the *Site Assessment Report* dated December 31, 2015.				
Soil	A summary of soil sampling data is shown on Figure 1. Soil sampling data are tabulated in Table 1. The TPHd and TPHmo impact in soil was below the final environmental screening levels (ESLs) for commercial site use.		None	NA	NA
Groundwater	Groundwater sampling data are tabulated in Table 2. A summary of current groundwater data is shown on Figure 2. Limited TPHd and TPHmo impact detected in groundwater only slightly exceeded the applicable ESL (aquatic habitat) at two locations, adjacent and approximately 25 from the removed UST. The aquatic habitat ESL is applicable given the proximity to surface water and sewer/storm drain conduits, and the lack of anticipated groundwater use as a drinking water resource in the site vicinity.		**Data Gap 1 –** The TPHd impact in groundwater is not fully defined to the aquatic habitat ESL.	Grab groundwater sampling from 4 borings is proposed to delineate this impact to this ESL.	Proposed borings will evaluate TPH impact adjacent nearby conduits.
	Risk Pathways				
Prior Risk Evaluation	No known prior investigations have been conducted pertaining to the site UST.		None	NA	NA
Risk Pathway Summary	A chart illustrating a risk pathway analysis in included as Figure 3. Based on the characterization data provided under the Contaminant Source and Release Information SCM Elements above, the following risk pathway **IS** considered to be potentially complete for the site: **Groundwater:** • Impacts to aquatic biota in surface water bodies Concentrations of TPHd and TPHmo in groundwater are above the commercial ESL protective of aquatic habitat. This ESL is applicable given the site proximity to nearby surface		**See Data Gap 1 above**.our borings are proposed – two adjacent to the property on 2nd Avenue, one northwest of the property on International Boulevard, and one north of the property on International Boulevard (Figure 2).	**See Data Gap 1 above**.	**See Data Gap 1 above**.

	water, shallow site groundwater, and nearby storm drain conduits. To identify nearby underground utilities that could act as preferential pathway for hydrocarbon migration, Pangea reviewed USA markings and obtained sanitary sewer and storm drain maps from the City of Oakland. The only utility identified nearby the UST was a shallow AT&T communication line about 2 feet from the site structure running parallel to the building and street. The sanitary sewer and storm drain conduits are located in the middle of 2nd Avenue and eastward, as shown on Figure 2. The sanitary sewer and storm drain conduits slope to the north toward Lake Merritt. Based on the characterization data provided under the Contaminant Source and Release Information SCM Elements above, the following risk pathways are **NOT** considered to be potentially complete for the Site: **Soil:** • Vapor intrusion to indoor air • Migration of contaminants to groundwater through leaching and vapor flow. • Direct exposure to construction workers or to potential future residents and biota. • Gross contamination concerns (primarily odors) Direct exposure for other human receptors or biota is NOT considered a concern for the current land use (commercial) because soil contamination is below applicable ESLs. Based on the characterization data provided under the Contaminant Source and Release Information SCM Elements above, the following risk pathways are **NOT** considered to be potentially complete for the Site: **Groundwater:** • Vapor intrusion to indoor air Ingestion of groundwater impacting wells, sumps or basements at nearby properties.The potential risk				

	pathways identified above are addressed in the CSM Sub-Elements below.				
Soil	Soil analytical results are summarized on Figure 1 and Table 1. No TPHg or VOCs (including BTEX, MTBE, and naphthalene) were detected in soil above reporting limits. The only TPHd and TPHmo concentrations detected were 38 and 63 mg/kg, respectively, in the tank pit bottom sample from 12 ft bgs. These TPHd and TPHmo concentrations are *below* final Environmental Screening Levels (ESLs) established by the San Francisco Bay - Regional Water Quality Control Board's (RWQCB) of 110 and 500 mg/kg, respectively. Soil analytical results are also below media-specific criteria of the *Low Threat UST Closure Policy* (LTCP) adopted by the State Water Board in 2012. The vapor intrusion pathway is discussed below under the soil gas SCM sub-element.		None	NA	NA
Groundwater	Groundwater analytical results are summarized on Figure 2 and Table 2. As shown on Table 2, no VOCs, BTEX, MTBE, or TPHg were detected above reporting limits for groundwater in these borings. TPHd and TPHmo concentrations were detected at maximum concentrations of 2,200 and 1,700 µg/L, respectively. These concentrations slightly exceed the commercial ESL of 640 µg/L, protective of aquatic habitat. This ESL is applicable given the site proximity to nearby surface water, shallow site groundwater, and nearby storm drain conduits. Given the laboratory fuel fingerprint analysis, the hydrocarbon concentrations reported as TPHmo may represent the heavier range of TPHd-range hydrocarbons. Since the groundwater plume is likely <100 ft in length, site groundwater likely satisfies groundwater specific criteria of the LTCP. The nearest mapped surface water is Lake Merritt, located approximately 850 feet to the north-northwest of the subject property.		**See Data Gap 1 above**.	**See Data Gap 1 above**.	**See Data Gap 1 above**.
Subslab and Soil Vapor	No VOCs were reporting in soil or groundwater.		None.	NA	NA
Indoor Air	No VOCs were reporting in soil or groundwater.		None.	NA	NA

APPENDIX A

Standard Operating Procedures

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

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

Objectives

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

Soil Classification/Logging

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

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

Soil Boring and Sampling

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

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

Sample Storage, Handling and Transport

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

Field Screening

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

Water Sampling

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

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

Duplicates and Blanks

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

Grouting

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

Waste Handling and Disposal

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

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