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By Alameda County Environmental Health 11:37 am, Sep 12, 2017

Remediation Management Services Company

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charles.carmel @bp.com

Date: September 11, 2017

To: Ms. Karel Detterman
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, California 94602

Re: Site Investigation Work Plan – Snow Park
Arco Station No. 596-A
1900 Webster Street
Oakland, California

Dear Ms. Detterman:

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

If you have any questions or need additional information, please contact myself or Mr. Bill Patzelt (Antea Group) at (916) 389-6481.

Sincerely,

Chuck Carmel
Operations Project Manager
Remediation Management Services Company
An affiliate of Atlantic Richfield Company

Site Investigation Work Plan - Snow Park

Arco Station No. 596-A
1900 Webster Street
Oakland, California

Alameda County Environmental Health
LOP Site No. RO0003100
Regional Water Quality Control Board - San Francisco Bay Region (Region 2)

GeoTracker Global ID No. T10000004348

Antea Group Project No. 0596ADA171

September 11, 2017

Prepared for:
Ms. Karel Detterman
Alameda County Environmental Health
1131 Harbor Bay Pkwy
Alameda, CA 94602

Prepared by:
Antea® Group
11010 White Rock Road, Suite 140
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Site Investigation Work Plan - Snow Park

Arco Station No. 596-A
1900 Webster Street
Oakland, California

1.0 INTRODUCTION

Antea®Group is pleased to submit this *Site Investigation Work Plan – Snow Park* to conduct offsite assessment for the referenced site located at 1900 Webster Street in Oakland, CA (Site, **Figure 1**). The work plan was prepared as requested by the Alameda County Environmental Health (ACEH) in their email dated August 17, 2017. A copy of this letter is presented as **Appendix A**. Once the following items are addressed and if the results are favorable, the Site will be considered for closure by ACEH:

- Collect three grab groundwater samples from the Snow Park

The objective of this investigation is to confirm that the groundwater plume from the Site does not extend to the Snow Park.

Antea Group is proposing the advancement of one (3) off-site soil borings to determine the depth to groundwater and three (3) hydropunch borings at the Snow Park east of the Site.

This work plan has received a technical review by Mr. Bill Patzelt (Antea Group) California Professional Geologist No. 9465.

2.0 SITE DESCRIPTION

The Site was a former ARC-branded service station located at the northeastern corner of Webster Street and 19th Street in Oakland, California (**Figure 1**). A commercial building currently resides onsite and is occupied by Lake Merritt Dental. The Site, which was formerly an ARCO branded service station, is currently occupied by Lake Merritt Dental. A Site Plan that shows borings is provided as **Figure 2**.

Please refer to **Appendix B** for additional site information and for a history of the environmental investigations and remedial actions.

3.0 SUMMARY OF SITE HYDROGEOLOGIC CONDITIONS

3.1 Site Geology

Review of **Figure 1** shows that the topography at the site slopes to the north-northeast, and that Lake Merritt is located approximately 850 feet to the east of the site at a surface elevation that is approximately 25 feet lower than the subject site. The slope of the ground surface at the subject site is consistent with the groundwater flow direction identified at the 1721 Webster Street site located approximately 400 feet upgradient of the subject site.

The subsurface materials encountered at the Site from previously logged boreholes B4 through B14 consisted predominantly of silty or clayey sand and fine sand, with lesser amounts of silt and clay encountered in each borehole location shown on **Figure 2**.

3.2 Site Hydrogeology

Groundwater at the Site was encountered while drilling in each of boreholes B5, B6 and B8 at a depth of 18.0, 17.5 and 17.0 feet bgs, respectively. The measured depth to water in boreholes B5, B6 and B8 prior to groundwater sample collection was 16.7, 16.6 and 15.6 feet, respectively.

4.0 PROPOSED ACTIVITIES

4.1 Permitting, Utility Notification, and Borehole Clearance

Before commencing field activities, Antea Group will update the Health and Safety Plan in accordance with state and federal requirements. Antea Group will obtain drilling permits, for the advancement of three (3) soil boring and three (3) hydropunch borings from the ACEH. Prior to drilling, Underground Service Alert (USA) will be notified, as required by law, and a private utility locator will be employed to clear each boring location for underground utilities. In addition, each soil boring and hydropunch location will be cleared to 6.5 feet bgs using an air-knife or hand auger. Antea Group's Standard Operating Procedures are presented as **Appendix C**.

4.2 Borings

As requested by ACEH in the August 2017 letter, three soil borings (HP-1 through HP-3) will be advanced at Snow Park, which is between the Site and Lake Merritt in the estimated groundwater flow direction. Borings will be located inside the park boundary between 19th Street and 20th Street along Harrison Street in order to provide information that the contaminant plume from the Site has not migrated towards the lake (**Figure 3**). The boring will be advanced using direct push technology. Soil will be logged continuously from 6.5 feet bgs to total depth expected to be 20 feet bgs based on the estimated first encountered water from nearby sites and historical borings at the site. The soil will be screened for volatile organic compounds (VOC's) using a pre-calibrated photo-ionization detector (PID). Soil encountered during drilling will be closely evaluated for moisture content and lithology. The soil samples collected from the boring will be logged by a field geologist using the Unified Soil Classification System (USCS), working under the supervision of a California registered professional geologist. Soil samples will be selected for laboratory analysis based on field observations including color changes, PID measurements and moisture content. Upon completion of the soil boring, the boring will be backfilled with neat cement and topped with soil to match the existing surface grade.

The soil samples selected for analysis from the soil borings will be properly labeled and stored on ice for shipment to a California state-certified laboratory. The selected sample will be analyzed for the full suite of volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and total xylenes (BTEX), methyl-tert butyl ether (MTBE), tert-butyl alcohol (TBA), tert-amyl methyl ether (TAME), 1,2-dichloroethane (1,2-DCA), 1,2-dibromoethane

(EDB), and Naphthalene by Environmental Protection Agency (EPA) Method 8260B, total petroleum hydrocarbons (TPHg) by EPA Method 8260B, total petroleum hydrocarbons as diesel (TPHd) by GCFID with silica gel cleanup.

Subsequent to collecting soil samples a hydropunch boring will be advanced adjacent to each of the soil borings. One grab groundwater sample will be collected from each location with a five (5) foot open interval starting at first water.

The grab-groundwater samples collected will be properly labeled and stored on ice for shipment to a California state-certified laboratory. The grab-groundwater sample will be analyzed for the presence of TPHg, BTEX, MTBE, DIPE, ETBE, TAME, TBA, 1,2-DCA, EDB, and ethanol by EPA Method 8260B.

4.4 Disposal of Drill Cuttings and Wastewater

Wastewater and waste soil generated from utility clearance, purging, and/or equipment decontamination activities associated with the advancement of the soil borings, will be placed into appropriately labeled 55-gallon Department of Transportation (DOT) approved steel drums and temporarily stored on-site. Representative samples of the soil cuttings and the wastewater will be collected for waste characterization. The representative samples will be submitted to a California-certified laboratory and analyzed for TPHg, BTEX, and MTBE by EPA Method 8260B and CAM 17 metals by EPA Method 6010. Subsequent to receiving the laboratory analytical results, the drummed soil cuttings and drummed wastewater will be profiled, transported, and disposed of at an approved facility.

5.0 SCHEDULING AND REPORTING

Upon approval of this work plan by the ACEH, Antea Group will begin preparation for field activities such as submittal of permit applications, and borehole clearance. Once the permits, and borehole clearances have been received, Antea Group will commence field activities.

Upon completion of all site investigation activities and receipt of laboratory analytical results, a Site Investigation Report summarizing the details of the field activities, analytical results, findings, conclusions, and recommendations will be prepared and submitted to the ACEH. Reporting will include supporting documentation including but not limited to site data maps, boring logs, chain of custody documents, and interpretation of results.

The proposed activities outlined in this work plan and the corresponding reports, will be performed and prepared under the direction of a California registered professional geologist.

In accordance with State of California requirements for the GeoTracker database, the report, maps, and all analytical data will be uploaded to the GeoTracker database system as required.

6.0 REMARKS

The recommendations contained in this report represent Antea USA, Inc.'s professional opinions based upon the currently available information and are arrived at in accordance with currently accepted professional standards. This report is based upon a specific scope of work requested by the client. The contract between Antea USA, Inc. and its client outlines the scope of work, and only those tasks specifically authorized by that contract or outlined in this report were performed. This report is intended only for the use of Antea USA, Inc.'s client and anyone else specifically identified in writing by Antea USA, Inc. as a user of this report. Antea USA, Inc. will not and cannot be liable for unauthorized reliance by any other third party. Other than as contained in this paragraph, Antea USA, Inc. makes no express or implied warranty as to the contents of this report.

Prepared by:

Jonathan Fillingame Date: 9/11/17

Jonathan Fillingame
Project Professional

Information, conclusions, and recommendations provided by Antea Group in this document regarding the site have been prepared under the supervision of and reviewed by the licensed professional whose signature appears below.

Approver:

W R P Date: 9/11/17

Bill Patzelt, P.G. No. 9465
Project Manager

PROFESSIONAL GEOLOGIST
WILLIAM R PATZELT
NO. 9465
Exp 01/19
STATE OF CALIFORNIA

Figure

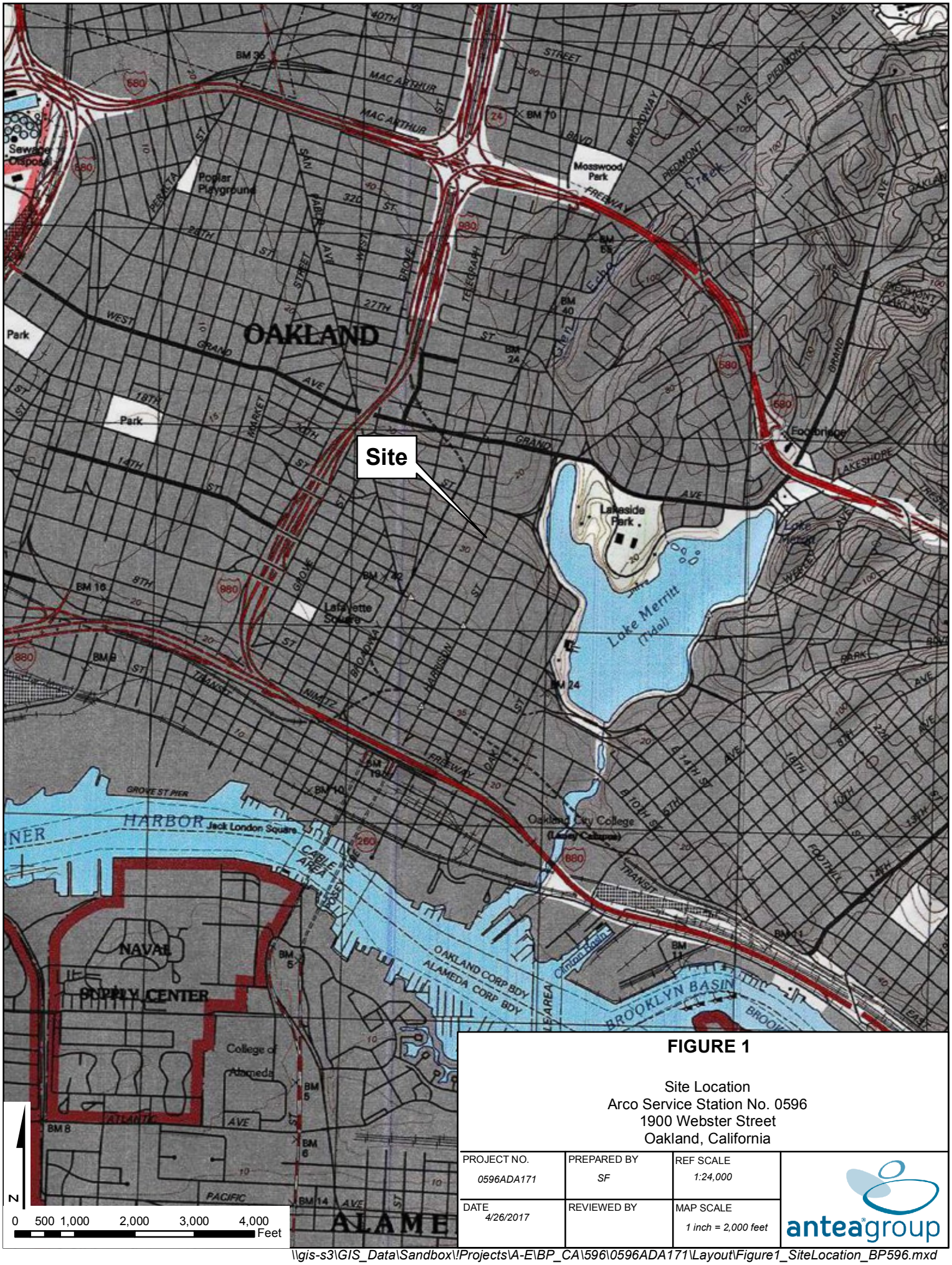

FIGURE 1

Site Location
Arco Service Station No. 0596
1900 Webster Street
Oakland, California

PROJECT NO.	PREPARED BY	REF SCALE	
0596ADA171	SF	1:24,000	
DATE	REVIEWED BY	MAP SCALE	
4/26/2017		1 inch = 2,000 feet	

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FIGURE 2
Detailed Site Plan
4/26/2017
Arco Service Station No. 596
1900 Webster Street
Oakland, California

PROJECT NO.	PREPARED BY	REF SCALE
0596ADA171	*SF*	*1:360*
DATE	REVIEWED BY	MAP SCALE
4/26/2017		*1 inch = 30 feet*

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FIGURE 3

Proposed Locations
Arco Station No. 596-A
1900 Webster Street
Oakland, California

PROJECT NO.	PREPARED BY	REF SCALE
0596ADA171	SF/SAA	1:1,080
DATE	REVIEWED BY	MAP SCALE
8/11/2017		1 inch = 90 feet

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Appendix A

CSEMD Letter

Bill Patzelt

From: Carmel, Charles <charles.carmel@bp.com>
Sent: Thursday, August 17, 2017 6:21 PM
To: Bryan Taylor; Dacre Bush; Bill Patzelt
Subject: Fwd: ARCO 596-A Buttner Property, 1900 Webster street Proposed Boring and grab samples- Fuel Leak Case RO3100; Geotracker Global IDT10000004348, Buttner Property, 1900 Webster Street, Oakland, CA
Attachments: image001.png; ATT00001.htm; Attachment_1_and_ftpUploadInstructions_2016-12-15.pdf; ATT00002.htm

Follow Up Flag: Follow up
Flag Status: Flagged

Begin forwarded message:

From: "Detterman, Karel, Env. Health" <Karel.Detterman@acgov.org>
Date: August 17, 2017 at 6:17:21 PM PDT
To: "'Carmel, Charles'" <charles.carmel@bp.com>
Cc: "Roe, Dilan, Env. Health" <Dilan.Roe@acgov.org>, "Lockwood, George@Waterboards" <George.Lockwood@waterboards.ca.gov>
Subject: RE: ARCO 596-A Buttner Property, 1900 Webster street Proposed Boring and grab samples- Fuel Leak Case RO3100; Geotracker Global IDT10000004348, Buttner Property, 1900 Webster Street, Oakland, CA

Hello Mr. Carmel:

We request submittal of a brief work plan describing the boring location rationale, permit acquisition, sample collection methods, proposed analytical suite, waste disposal, and a figure. Please include Standard Operating Procedures (SOPs) in an appendix.

TECHNICAL REPORT REQUEST

Please upload technical reports to the ACDEH ftp site (Attention: Karel Detterman), and to the State Water Resources Control Board's Geotracker website, according to Attachment 1 and the following specified file naming convention and schedule:

- October 20, 2017 - Work Plan
  File to be named: RO3100_WP_R_yyyy-mm-dd

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

Online case files are available for review at the following website: http://www.acgov.org/aceh/index.htm.

Thank you for your cooperation. Should you have any questions or concerns regarding this correspondence or your case, please send me an e-mail message at karel.detterman@acgov.org or call me at (510) 567-6708.

Karel Detterman, PG
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502
Direct: 510.567.6708
Fax: 510.337.9335
Email: karel.detterman@acgov.org

PDF copies of case files can be downloaded at:

http://www.acgov.org/aceh/lop/ust.htm

From: Carmel, Charles [mailto:charles.carmel@bp.com]
Sent: Friday, August 11, 2017 2:48 PM
To: Roe, Dilan, Env. Health <Dilan.Roe@acgov.org>; Detterman, Karel, Env. Health <Karel.Detterman@acgov.org>; Lockwood, George@Waterboards <George.Lockwood@waterboards.ca.gov>
Cc: Dacre Bush <Dacre.Bush@anteagroup.com>; Taylor, Bryan S (ANTEA USA INC) <Bryan.Taylor@anteagroup.com>; Patzelt, William (Antea Group) <bill.patzelt@anteagroup.com>
Subject: ARCO 596-A Buttner Property, 1900 Webster street Proposed Boring and grab samples

Hello Everyone:

I hope everyone is having a good week. I understand there is a suggested path to closure by obtaining a few additional grab water samples down gradient at the Snow Park boundaries. I believe this map shows where everyone would like to geoprobe/hydropunch locations at Snow Park. BP would like everyone's concurrence that by obtaining this additional data, this would satisfy any remaining data gaps, provided the results indicate both plume stability and length. We would propose to gain access and for these borings and submit the results to everyone.

The first soil boring would tell us water depth then we could go back in with a hydropunch to collect water or set a temporary well in the geoprobe boring. We may be able to hand auger these water samples too. Just need to get some additional information. The three locations should provide a good transect down gradient in order to protect Lake Merritt and other well in the SE corner of Snow Park.

My preference to not have to respond or make a separate work plan for the dispute resolution arguments. If this work resolves the issues of disagreement and allows everyone to close the case then I'm all for it. All work would be conducted as per prior work conducted at this and other sites within the agencies jurisdiction.

Please let us know if this proposal satisfies each party and I will schedule this work ASAP.

Thanks,

Appendix B

Previous Investigation and Site History Summary

SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATIONS

May 2, 2011 – AEI Consultants (AEI) conducted a Phase I Environmental Site Assessment and according to their review the Site was historically occupied by a gasoline service station from approximately 1940 to 1966. The former gasoline service station was demolished and cleared in 1966, but no records were on file with the Oakland Building Department, Alameda County Environmental Health Services Department or Oakland Fire Department regarding removal of the underground storage tanks (USTs). Additionally, no documentation was found whether soil samples were collected and analyzed for the presence of petroleum hydrocarbon contamination following demolition of the station (AEI, 2011).

July 20, 2011 – AEI advanced three soil borings (SB-1 through SB-3) and collected five soil and three groundwater samples from the three locations, which are depicted on Drawing 2. Total Petroleum Hydrocarbons as Gasoline (TPH-g) in soil were reported in samples SB-3-16 and SB-3-20 at concentrations of 8.3 milligrams per kilograms (mg/kg) and 42 mg/kg, respectively. Total Petroleum Hydrocarbons as Diesel (TPH-d) in soil were reported in samples SB-2-16, SB-3-16, SB-3-20 at concentrations of 7.7 mg/kg, 6.5 mg/kg and 8.7 mg/kg, respectively. Total Petroleum Hydrocarbons as Motor Oil (TPH-mo) in soil were reported above the laboratory reporting limit in sample SB-2-16 at a concentration of 25 mg/kg. TPH-g and TPH-d in groundwater samples were reported at 59,000 micrograms per liter (µg/L) and 200,000 µg/L, respectively, in SB-3. Historic soil and groundwater laboratory analytical results from this investigation are included in Appendix A (AEI, 2011).

August 22, 2012 – SCHUTZE & Associates, Inc. (SCHUTZE) performed a Limited Phase II Subsurface Investigation by advancing two soil borings (B-1 and B-2) to 16.5 and 18 ft bgs in the interior of the south tenant space. TPH-g was detected in groundwater samples B1-18-W and B2-16.5-W at concentrations of 400 µg/L and 6,000 µg/L, respectively. TPH-d was detected in groundwater samples B1-18-W and B-2-16.5-W at concentrations of 1,100 µg/L and 3,800 µg/L, respectively. Ethylbenzene and Xylenes were detected in the groundwater sample from B2-16.5-W at concentrations of 210 µg/L and 680 µg/L, respectively. Benzene, toluene and MTBE were not detected in soil and groundwater samples. The results from this Limited Phase II Subsurface Investigation can be found in Appendix A (SCHUTZE, 2012).

2013 – P&D Environmental, Inc. (P&D) conducted a subsurface investigation onsite which included the advancement of eight borings (B-4 through B-8, B-11, B-13, and B-14) to facilitate the collection of soil and groundwater samples. However, groundwater samples were only collected from borings B-5, B-6, and B-8 due to refusal or the absence of groundwater. Slightly elevated concentrations of TPH-G and TPH-D were observed in the groundwater sample collected from boring B-5. Minor petroleum hydrocarbon impacts to soil were observed in soil samples collected from several of the borings. Based on known hydrocarbon impacts to an upgradient property located at 1750 Webster Street and the lack of evidence of a historical release at the subject Site, P&D recommended no further investigation of the Site. Results from this investigation are provided in Appendix A (P&D, 2014).

2015 – Broadbent & Associates, Inc. (Broadbent) conducted additional Site assessment activities in order to further evaluate potential impacts to soil, groundwater, and soil vapor at the Site. Results of the investigation suggested that residual impacts reside primarily in the groundwater within the north-northeastern portion of the Site. The highest GRO concentrations were observed within the vicinity of boring SB-6 (11,000 µg/L) and further down-gradient boring SB-7 (3,100 µg/L). Up-gradient borings SB-4, SB-5, and SB-8 were non-detect for each constituent analyzed. Benzene was only detected in offsite, up-gradient boring SB-10 at a concentration of 140 µg/L. GRO was also observed in offsite, up-gradient borings SB-9 and SB-10. However, these concentrations are believed to be from offsite sources up-gradient of the Site and based on the absence of hydrocarbon impacts in samples collected from borings SB-4, SB-5, and SB-8, these impacts do not appear to be affecting the Site. Soil and soil vapor analytical results indicated that concentrations were below ESLs or applicable LTCP criteria. These data indicate minimal to no risk for the onsite building occupants from potential petroleum vapor intrusion to indoor air, outdoor air exposure or potential direct contact with soil. (Broadbent, 2015)

Current Consultant: **Antea Group**

References

AEI Consultants, Inc., August 8, 2011. Phase II Subsurface Investigation, 1900 Webster Street, Oakland, California.

SCHUTZE & Associates, Inc., September 21, 2012. Phase I Environmental Site Assessment and Limited Phase I Subsurface Investigation, 1900 Webster Street, Oakland, California.

P&D Environmental, Inc., June 11, 2013. Subsurface Investigation Report, 1900 Webster Street, Oakland, California.

Broadbent & Associates, Inc., 27 March 2015. Vapor Intrusion, Soil and Groundwater Investigation Report, Former Richfield Oil Company Station #596-A, 1900 Webster Street, Oakland, Alameda County, California.

Appendix C

Antea Group Standard Operating Procedures

STANDARD OPERATING PROCEDURES

Utility Locating

Prior to drilling, boring and excavation locations and an approximate 15-foot by 15-foot box are marked with white paint or other distinct marking and cleared for underground utilities through Underground Service Alert (USA). In addition, Antea Group will contract an independent locator services to clear boring or excavation locations of subsurface assets. The first five feet (or more in instances where utilities are suspected in close proximity) of each borehole are air-knifed, or carefully advanced with a hand auger if shallow soil samples are necessary, to help evaluate the borehole location for underground structures or utilities in accordance with Antea Group's subsurface hazard avoidance policy.

Subsurface Investigation Methods – GeoProbe®, Sonic, Hollow Stem Auger Drilling, Sampling, and Borehole Completion

Borehole Advancement using Single-Wall GeoProbe®

Pre-cleaned push rods (typically one to two inches in diameter) are advanced using a hydraulic direct push-type rig for the purpose of collecting samples and evaluating subsurface conditions. The sample barrel located at the leading end of the drill rod serves as a soil sampler, and an acetate liner is inserted into the sample barrel rod prior to advancement of the push rod. Once the sample is collected, the rods and sampler are retracted and the acetate sample tubes are removed from the sampler. The sample barrel is then cleaned, filled with clean sample tubes, inserted into the borehole and advanced to the next sampling point where the sample collection process is repeated.

Undisturbed soil samples selected for laboratory analysis are cut away from the acetate sample liner using a hacksaw, or equivalent tool, in sections approximately 6 inches in length. The 6 inch samples are lined at each end with Teflon® sheets and capped with plastic caps. Labels documenting project number, borehole identification, collection date, and depth are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California for analysis. The remaining collected soil that has not been selected for laboratory analysis is logged using the United Soil Classification System (USCS) under the direction of a State Registered Professional Geologist, and is field screened for organic vapors using a photo ionization detector (PID), or an equivalent tool.

Borehole Advancement using Sonic Drilling

Pre-cleaned heavy-walled down-hole casings (typically 6 to 8 inches in diameter) are advanced using a sonic head. A smaller diameter core barrel (typically 4 to 6 inches in diameter) is advanced through the inside of the down-hole casings to remove the soil cuttings from the borehole for sample collection and evaluation of subsurface conditions.

During drilling, soil samples are collected continuously using the sonic core barrel. A physical description of soil characteristics (i.e. moisture content, consistency or density, odor, color, and plasticity), drilling difficulty, and soil type as a function of depth are described on boring logs. The soil cuttings are classified in accordance with the USCS and field screened for organic vapors using a PID.

Borehole Advancement using Hollow Stem Auger

Pre-cleaned hollow stem augers (typically 8 to 10 inches in diameter) are advanced using a drill rig for the purpose of collecting samples and evaluating subsurface conditions. A pre-cleaned split spoon sampler is lined with three 6-inch long brass or stainless steel tubes and attached to the drill rods. The sampler is then driven 18 inches into the underlying soils at the target sample interval by repeatedly dropping a 140-pound hammer over a 30-inch free fall distance. The number of blow counts to drive the sampler each 6-inch interval of sampler advancement are recorded on the field logs. The sampler is driven 18 inches or until the sampler has met refusal (typically 50 blows per six inches), then the sampler is retrieved. Alternatively, soil samples are retrieved by driving the sampler using a pneumatic hammer, when using a limited access rig.

Generally the bottom sample tube is selected for laboratory analysis. The middle tube is extruded for logging and PID screening, and the top tube is considered slough caved off from the sides of the boring prior to sampling.

The retained sample is carefully packaged for chemical analysis by capping each end of the sample with a Teflon sheet followed by a tight-fitting plastic cap and stored in a zip-type plastic bag. A label is affixed to the sample indicating the sample identification number, borehole number, sampling depth, sample collection date, and job number. The sample is then annotated on a chain-of-custody form and placed in an ice-filled cooler for transport to the laboratory.

During the drilling process, a physical description of the encountered soil characteristics (i.e. moisture content, consistency or density, odor, color, and plasticity), drilling difficulty, and soil type as a function of depth are described on boring logs. The soil cuttings are classified in accordance with the USCS.

Grab Groundwater Sample Collection

Once the target groundwater sampling depth has been reached, a Hydropunch™ tip is placed on leading end of the sampling rods. The Hydropunch™ tip is advanced approximately 2 feet to place the sample port within the target groundwater sampling zone (effort is made to position the center of the Hydropunch™ screen across the water table surface, if appropriate), and retracted to expose the Hydropunch™ screen. Grab groundwater samples are collected by lowering a pre-cleaned, single-sample polypropylene, disposable bailer or pre-cleaned stainless steel bailer down the inside of the sampler rod. The groundwater sample is decanted from the bailer to the sample container through a bottom emptying flow control valve to minimize volatilization. Alternatively, groundwater samples are collected by lowering a disposable bailer through the sampler rod or into the borehole.

Collected water samples are decanted directly into laboratory provided, pre-cleaned, vials or containers and sealed with Teflon-lined septum, screw-on lids. Labels documenting sample number, well identification, collection date, and type of preservative (if applicable, i.e. HCl for GRO, BTEX, and fuel oxygenates) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests.

Borehole Completion

Upon completion of drilling and sampling, the inner casing rods are retracted. Neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, is introduced via a tremie pipe to displace standing water in the borehole, through the annulus of the outer casing rods. The outer rods are retracted as the grout is introduced to bottom of the boring to prevent the cross contamination of encountered water bearing zones. Displaced groundwater is collected at the surface and placed into DOT approved 55-gallon steel drums, or an equivalent storage container. In areas where the borehole penetrates asphalt or concrete, the borehole is capped with an equivalent thickness of asphalt or concrete patch to match finished grade.

Well Construction (typical)

Selected borings will be converted to groundwater monitoring wells by the installation of 2-inch or 4-inch diameter Schedule 40 polyvinyl chloride well casing with 0.020-inch factory slotted well screen as stated in the body of the work plan. A filter pack of Monterey #3 grade sand (or equivalent) will be placed in the annular space of the monitoring well borings, extending from the bottom of each well casing to approximately 2-feet above the top of the screened casing. A sanitary seal consisting of a 2-foot bentonite will be placed on above the filter sand and charged with water to create a seal. Neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, is introduced via a tremie pipe to displace standing water in the well annulus bentonite to within two feet of the ground surface. Antea Group will install a minimum of a 5-foot annual seal. A traffic-rated well box will be installed on each well to protect and finish the well to surface grade.

The groundwater monitoring wells will be allowed to stabilize for a minimum of 72 hours after installation prior to development. Following development, the wells will be allowed stabilize for a minimum of 48 hours prior to the collection of any groundwater samples.

Organic Vapor Procedures

Soil samples are collected for analysis in the field for ionizable organic compounds using a PID with a 10.2 eV lamp. The test procedure involves measuring approximately 30 grams from an undisturbed soil sample, placing this sub-sample in a Zip-type bag. The container is warmed for approximately 20 minutes in the sun; then the head-space within the container is tested for total organic vapor, measured in parts per million as benzene (ppm; volume/volume). The instrument is calibrated prior to drilling. The results of the field-testing are noted on the boring logs. PID readings are useful as a qualitative indication of relative levels of contamination, but cannot be used to quantify petroleum hydrocarbon concentrations with the confidence of laboratory analyses.

Equipment Decontamination

Equipment that could potentially come in contact subsurface media and compromise the integrity of the samples is carefully decontaminated prior to drilling and sampling. Drilling auger and other large pieces of equipment are decontaminated using high pressure hot water spray. Soil and groundwater sampling apparatus, groundwater pumps, liners and other equipment are decontaminated in an Alconox scrub solution and double rinsed in clean tap water rinse followed by a final distilled water rinse.

The rinsate and other wastewater are contained in 55-gallon DOT-approved drums, labeled (to identify the contents, generation date and project) and stored on-site pending waste profiling and disposal.

Waste Handling and Disposal *(Soil Cuttings and Rinsate/Purge Water)*

Soil cuttings and rinsate/purge water generated during drilling and sampling are stored on-site in DOT-approved 55-gallon steel drums pending characterization. A label is affixed to the drums indicating the contents of the drum, suspected contaminants, date of generation, and the boring number from which the waste is generated. The drums are removed from the site by a licensed waste disposal contractor to an appropriate facility for treatment/recycling.

SOIL VAPOR WELLS STANDARD FIELD AND SAMPLING PROCEDURES

Utility Locating

Prior to drilling, boring and excavation locations and an approximate 15-foot by 15-foot box are marked with white paint or other distinct marking and cleared for underground utilities through Underground Service Alert (USA). In addition, Antea Group will contract an independent locator services to clear boring or excavation locations of subsurface assets. Soil vapor wells are not air-knifed, and are instead carefully advanced using hand auger drilling techniques.

Borehole Advancement using Hand Auger

A pre-cleaned hand auger (typically three inches in diameter) is advanced by hand for the purpose of collecting samples and evaluating subsurface conditions. If required, soil samples are collected into one 6-inch brass or stainless steel tube inserted into the hand auger during advancement. Soil samples may also be collected into pre-cleaned certified laboratory-provided glass jars.

The retained sample is carefully packaged for chemical analysis by capping each end of the sample with a Teflon sheet followed by a tight-fitting plastic cap and stored in a zip-type plastic bag. A label is affixed to the sample indicating the sample identification number, borehole number, sampling depth, sample collection date, and job number. The sample is then annotated on a chain-of-custody form and placed in an ice-filled cooler for transport to the laboratory.

During the drilling process, a physical description of the encountered soil characteristics (i.e. moisture content, consistency or density, odor, color, and plasticity), drilling difficulty, and soil type as a function of depth are described on boring logs. The soil cuttings are classified in accordance with the USCS.

Soil Vapor Well Completion (Typical)

Shallow soil vapor well borings are typically advanced to 5.5 feet below ground surface (bgs), but may be completed deeper if necessary or shallower if groundwater is present. The borings will be completed into soil vapor wells by placing one foot of Monterey #3 or #30 sand into the borehole. A soil vapor probe connected to seven feet of 0.25-inch outside diameter Teflon® tubing and installed in center of the sand pack at a depth of five feet bgs. A one foot interval of dry granular bentonite transition seal is placed on top of the sand pack. A neat cement sanitary seal is placed on top of the transition seal to approximately one foot bgs. Concrete is placed from 1.0 feet bgs to approximately 4 inches below the

surface and a traffic-rated well box is installed at the surface. The well is completed by installing a Swagelok® valve on the terminating end of the Teflon® tubing.

Organic Vapor Procedures

Soil samples are collected for analysis in the field for ionizable organic compounds using a PID with a 10.2 eV lamp. The test procedure involves measuring approximately 30 grams from an undisturbed soil sample, placing this sub-sample in a Zip-type bag. The container is warmed for approximately 20 minutes in the sun; then the head-space within the container is tested for total organic vapor, measured in parts per million as benzene (ppm; volume/volume). The instrument is calibrated prior to drilling. The results of the field-testing are noted on the boring logs. PID readings are useful as a qualitative indication of relative levels of contamination, but cannot be used to quantify petroleum hydrocarbon concentrations with the confidence of laboratory analyses.

Equipment Decontamination

Equipment that could potentially come in contact subsurface media and compromise the integrity of the samples is carefully decontaminated prior to drilling and sampling. Drilling auger and other large pieces of equipment are decontaminated using high pressure hot water spray. Soil and groundwater sampling apparatus, groundwater pumps, liners and other equipment are decontaminated in an Alconox scrub solution and double rinsed in clean tap water rinse followed by a final distilled water rinse.

The rinsate and other wastewater are contained in 55-gallon DOT-approved drums, labeled (to identify the contents, generation date and project) and stored on-site pending waste profiling and disposal.

Waste Handling and Disposal (Soil Cuttings and Rinsate/Purge Water)

Soil cuttings and rinsate/purge water generated during drilling and sampling are stored on-site in DOT-approved 55-gallon steel drums pending characterization. A label is affixed to the drums indicating the contents of the drum, suspected contaminants, date of generation, and the boring number from which the waste is generated. The drums are removed from the site by a licensed waste disposal contractor to an appropriate facility for treatment/recycling.

Soil Vapor Well Sampling

Following installation, the soil vapor wells will be allowed to equilibrate for a minimum of three days and then sampled using the standard operating procedure described below:

1. One-foot sections of 0.25-inch outside diameter Teflon® tubing will be used to connect the Swagelok® wellhead valve to a Swagelok® T-union fitting, one 6-liter Summa canister (purge), and one 1-liter or 6-liter Summa canister (sample). Each Summa canister will be outfitted with its own particulate filter, vacuum gauge, and flow regulator calibrated to a flow rate of between 100 and 200 milliliters per minute (ml/min). With the exception of the 6-liter purge Summa canister, dedicated equipment and materials will be used at each well to avoid cross-contamination.
2. Once the sampling train is assembled, a vacuum test will be performed to ensure the integrity of the sampling train. With the Swagelok® wellhead valve closed, the 6-liter purge Summa canister will be opened for a minimum of 10

minutes. If a vacuum is not maintained for at least 10 minutes, the fittings will be tightened and the vacuum test repeated.

3. Once the integrity of the sampling train has been verified by the vacuum test, the well will be purged. The purge amount will be based on Department of Toxic Substances Control (DTSC) guidelines, which involves purging three dead space volumes (tubing volume + void space of the sand pack). Assuming a total well and sampling train tubing length of 10 feet and 35% porosity of the well's sand pack, the well will be purged approximately 1.4 liters (1,400 ml). Assuming a sustained flow rate of 150ml/min, a purging time of 9 minutes and 20 seconds should be anticipated. Total purge times may be adjusted based on actual flow rates observed in the field.
4. After purging activities are complete, Antea Group will construct a sampling shroud and place it over the well and wellhead valve. A paper towel with isopropyl alcohol applied to it will be placed underneath the shroud to be used as a leak check compound. The shroud will then be sealed to the ground surface with hydrated granular bentonite to ensure an air-tight connection. If 1,1-difluoroethane (1,1-DFA) is used as a leak check compound in lieu of isopropyl alcohol, it will be introduced underneath the sampling shroud prior to sealing with bentonite.
5. Upon completion of shroud construction, the sample Summa canister will be opened and sample collected. If isopropyl alcohol is used as a leak check compound, a PID will be used to monitor the concentration under the shroud at approximately 30-second intervals. Once the sample Summa canister is filled to -5 inches mercury (in Hg), the canister will be closed. All general sampling information, purge times, sample times, and PID readings will be recorded on field sampling forms.
6. After sampling, the Swagelok wellhead valve will be returned to the closed position. Collected samples will be given unique sample names and transported under chain of custody protocol to a California-certified analytical laboratory. Analyzed compounds will include the constituents of concern and the leak check compound used during sampling.