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ARCADIS
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Revised Work Plan for Separate Phase Hydrocarbon Characterization and Dissolved Phase Plume Delineation
UPS Oakland Hub
8400 Pardee Drive, Oakland, CA 94621
Global ID T0600100939; State ID # 583; EPA ID # CAD 09707509

ENVIRONMENT

"I declare that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct."

Date:
September 5, 2013

Submitted by:

ARCADIS U.S., Inc

Hollis E. Phillips, PG
Project Manager

Contact:
Hollis E. Phillips

Phone:
415.432.6903

Email:
Hollis.phillips@arcadis-us.com

Our ref:
B0038398.017

Imagine the result

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Ms. Barbara Jakub
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502

ENVIRONMENT

Subject:

Revised Work Plan for Separate Phase Hydrocarbon Characterization and Dissolved Phase Plume Delineation
UPS Oakland Hub
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Date:
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Contact:
Hollis Phillips

Phone:
415.432.6903

Email:
Hollis.Phillips@arcadis-us.com

Dear Ms. Jakub:

On behalf of United Parcel Service (UPS), U.S., Inc. (ARCADIS) is presenting this Revised Work Plan for a proposed site investigation to characterize and delineate separate phase hydrocarbon (SPH) at the UPS Oakland Hub (the Site), as well as delineate the dissolved phase plume to the south of the Site. The Work Plan was requested in a meeting between ARCADIS and Alameda County Department of Environmental Health (ACDEH) on March 14, 2013. The Work Plan for Separate Phase Hydrocarbon Characterization and Dissolved Phase Plume Delineation (Work Plan) was submitted on April 26, 2013. In a letter dated July 3, 2013, ACDEH requested additional sample locations be included to evaluate potential SPH in areas where historical soil and groundwater samples contained total petroleum hydrocarbons diesel range organics (TPH-DRO) above the State Water Resources Control Board (SWRCB) “rule of thumb” concentrations (groundwater greater than 5,000 microgram/liter (µg/L) and soil greater than 66 milligram/kilogram [mg/kg]). Because historical groundwater data had not been analyzed with silica gel cleanup (SGC), on July 23, 2013 ARCADIS collected samples from onsite monitoring wells and analyzed them for TPH-DRO with SGC. Based on the newly collected data ARCADIS is proposing four additional sampling locations as part of the SPH delineation investigation. The site location is presented in **Figure 1.**

Site Background

The following sections provide a summary of the Site description, previous Site investigations, and the most recent groundwater monitoring and high vacuum extraction (HVE) events.

Site Description

A review of historical aerial photographs from 1937 to present indicated the property that UPS leases from the Port of Oakland was originally a tidal marsh until 1968. The Site was backfilled and graded in 1968 with suspect imported fill material. Artificial fill has been documented on both the northern and southern fueling areas, at depths ranging from 2 to 10 feet in thickness. No structures were observed on the property until 1975, when the current UPS facility was constructed. The southern fueling area (current release area), was visible in the photographs in 1985.

The Site includes an office building and a parking lot. The area around the Site is characterized by medium to heavy industrial use and includes the nearby Oakland International Airport.

Currently, the Site is approximately 10 feet above sea level (ft amsl) and is located on a narrow peninsula south of San Leandro Bay.

Previous Site Investigations

Enhanced fluid recovery (EFR), a preferential pathway study, a well survey, and a soil and groundwater sampling event occurred in 2010. The investigation activities were summarized in the *Summary of Soil and Groundwater Investigation Activities report* (ARCADIS 2011). A *Revised Summary of Soil and Groundwater Investigation Activities report* (ARCADIS 2012a) was submitted to ADCEH which included information on the newly installed monitoring and injection wells at the UPS Oakland Hub.

ARCADIS submitted a Corrective Action Plan (CAP) in December 2011 which proposed remedial strategies to reduce residual soil and groundwater impacts from the area near the former diesel USTs. Additionally a work plan for SPH delineation was submitted to the ACDEH in September 2012, which proposed installation of additional monitoring wells in the area surrounding MW-12 and IW-1. At the March 14, 2013 meeting it was decided that using the ultraviolet optical screening tool (UVOST) would be a better approach to delineate the SPH than the installation of monitoring wells. This report serves as the revised work plan incorporating the changed approach.

August 2012 Groundwater Monitoring

Semi-annual groundwater monitoring was conducted on August 1, 2012, refer to **Figure 2** for well locations. Groundwater elevations during the August 2012 monitoring event ranged from 1.34 ft amsl in monitoring well MW-10 to 8.52 ft amsl in monitoring well MW-9. The groundwater flow direction was generally to the south-southeast on August 1, 2012, which is consistent with historical records (ARCADIS 2012b).

Benzene, toluene, ethylbenzene, and total xylenes (BTEX) and methyl tertiary butyl ether (MTBE) were not detected above their respective Regional Water Quality Control Board (RWQCB) environmental screening levels (ESLs) in the sampled monitoring wells during this monitoring event, which is consistent with previous events. TPH-GRO was detected at or above the ESL for drinking water in monitoring and injection wells MW-1, MW-2, MW-3, OW-1, IW-2, IW-4, IW-5 and IW-6. Wells MW-2, IW-2 and IW-4 had concentrations equal to or above the drinking water ESL but below the non-drinking water ESL. TPH-DRO was detected equal to or above the drinking water ESL in monitoring and injection wells MW-1, MW-2, MW-3, MW-4, MW-8, MW-9, MW-10, MW-11, MW-13, MW-14, OW-1, IW-2, IW-3, IW-4, IW-5, and IW-6. Wells MW-8 and MW-9 had concentrations above the drinking water ESL but equal to or below the non-drinking water ESL.

Historical groundwater analytical data is presented in **Attachment A**.

July 2013 Groundwater Monitoring

In a letter dated July 2, 2013 ACDEH indicated there may be additional areas of SPH that were not proposed for evaluation in ARCADIS' Work Plan based on the SWRCB "rule of thumb" concentrations. Therefore, additional groundwater samples were collected on July 23, 2013 and analyzed using SGC to attempt to exclude some of the locations which contained elevated TPH-DRO. Wells with TPH-DRO above the "rule of thumb" of greater than 5,000 µg/L included: MW-1, MW-2, MW-3, MW-4, MW-8, MW-10, MW-11, MW-12, OW-1, IW-1, IW-2, IW-3, IW-4, IW-5, and IW-6. Samples were collected from all site MWs for analyses of TPH-DRO with SGC.

Significant decreases in concentrations were noted in all wells with the exception of IW-5 which was re-sampled on August 12, 2013. Both the July and August samples from IW-5 indicated similar results as historical concentrations and are likely indicative of SPH. Results of the July 23, 2013 sampling event indicated wells MW-4, MW-8, MW-11, and IW-6 yielded concentrations below the SPH indicator of 5,000 µg/L with SGC.

Historical groundwater analytical data is presented in **Attachment A** and the past five years of TPH-DRO data is posted on **Figure 2.**

2013 High Vacuum Extraction Event

A HVE event was conducted on February 25, 2013 to remove SPH from IW-1 and MW-12 (field notes and forms are included as **Attachment B**). There were 0.91 feet and 1.05 feet of SPH in IW-1 and MW-12, respectively, prior to extraction. Following the HVE event, no SPH was observed in either of these wells. Qualitative assessment of the first HVE test results suggests moderate SPH transmissivity in IW-1 and limited transmissivity in MW-12.

A second HVE event was conducted on April 4, 20132, initial evaluation of the data indicated the SPH is potentially mobile. The data need to be further evaluated and additional field information collected (described herein) before determining a remedial path forward

Proposed Scope of Work

The 2013 HVE event was completed as an interim SPH recovery strategy. The purpose of this work plan is to determine the most efficient way to recover drainable SPH from the aquifer.

Due to the presence of SPH in MW-12 and IW-1, and the recent groundwater monitoring data ARCADIS is proposing the following activities to delineate and characterize the SPH. The proposed activities also include delineation of the dissolved phase plume in the vicinity of monitoring well OW-1 on the southern portion of the Site.

All activities proposed in this work plan will be conducted under the supervision of a California registered civil engineer or a California registered professional geologist.

Task 1: Pre-Field Activities

This section discussed the activities that will precede the field activities including revisions to the Health and Safety Plan (HASP), relevant permitting, and clearing underground utility locations.

Site Health and Safety Plan

Prior to initiating drilling activities, the site-specific HASP will be updated in accordance with state and federal requirements for use during the proposed field activities.

Permitting

Following approval of this work plan, ARCADIS will complete and submit applications for drilling permits related to the approved scope of work.

Underground Utility Survey

Underground utilities at the Site have already been located (**Figure 2**). Utilities in the vicinity of the proposed investigation locations will be marked with white paint prior to drilling. Underground Service Alert (USA-North) will be alerted at least 48 hours prior to drilling activities. Additionally, a private third-party utility locator will screen all proposed boring locations to determine the location of nearby underground utilities.The approximate depths of utilities at the Site are shown on **Figure 2**. During

the third-party utility location, depths of utilities that are not known will be investigated in the field to evaluate the depths. If unknown utility depths can be determined, **Figure 2** will be updated.

Task 2: SPH Delineation using Cone Penetration Testing with Ultraviolet Optical Screening Tool

A cone penetration test with UVOST (CPT/UVOST) system will be utilized to screen for petroleum hydrocarbons in subsurface soils to assist in lateral and vertical delineation of SPH in the vicinity of IW-1 and MW-12 and the former tank pit area. Petroleum hydrocarbons contain compounds that fluoresce when excited by ultraviolet light (light at a specific wavelength generated from a laser). The UVOST system uses a pulsed laser mounted internally within a probe that is pushed into the ground with a CPT rig. The laser causes certain aromatic petroleum hydrocarbons to fluoresce, the intensity of which is measured with an optical detector that is also located internal to the CPT probe. The TPHg and TPHd at the Site is compatible with the UVOST technology, and soils impacted with petroleum hydrocarbons will exhibit fluorescence intensity that is proportional to the contaminant concentration, thus allowing the presence of SPH to be inferred. CPT is performed simultaneously with the UVOST system, and provides physical/electrical measurements of parameters from which lithology is inferred via an automated interpretation program. The CPT cone measures cone tip resistance and sleeve friction from which the corresponding lithologic profile (e.g., clay, sand, and silt) is interpreted CPT/UVOST technology allows for the “real-time” collection of lithologic data as well as indicators for hydrocarbon affected sediments.

Eight CPT/LIFs are proposed as shown on **Figure 2**. The four proposed borings adjacent to IW-1 and MW-12 will assess the extent of free product in the area northeast of the tank pit in addition to elevated TPH-DRO soil concentrations in the vicinity of soil borings SB-06 and SB-07. The four proposed borings adjacent to the former tank pit area will assess the extent of free product to the north of the pit and in the vicinity of MW-1 and MW-2.

CPT/LIFs will be advanced to 15 feet below ground surface (bgs) or to refusal. Prior to drilling, each boring will be manually cleared of underground utilities by advancing a hand auger to 5 feet bgs. The current depth to water at the Site is between 4 to 8 feet bgs. The CPT/LIFs will be advanced during a drier season so water table is at its lowest and the soil/groundwater interface is below the hand auger depth. Locations of the CPTs/LIFs will be adjusted in the field if obstructions or underground utilities are encountered. After withdrawal of the CPT/LIF rods, the boring will be backfilled with a neat cement grout, and a completed to match the existing surface.

Task 3: SPH mobility evaluation at MW-12 and IW-1

SPH mobility will be measured by conducting bail-down testing of the SPH at MW-12 and IW-1. Bail-down testing consists of SPH removal and monitoring of SPH recovery in the test well over time immediately following removal, similar to a traditional aquifer slug test. The rate of SPH flow into the well during the recovery period of a bail-down test is a function of SPH saturation, permeability of the surrounding formation to SPH, SPH physical properties, and the magnitude of the initial hydraulic gradient toward the well developed during SPH removal. SPH bail-down testing will be conducted in accordance with the attached ARCADIS Standard Operation Procedure (**Attachment C**).

Pre-test depth to SPH and groundwater will be recorded using an oil/water interface probe prior to starting the bail-down test, such that a baseline SPH thickness may be calculated as the difference between these two measurements.

- For the SPH bail-down test procedure to yield meaningful data, a thickness greater than a few tenths of a foot is generally required.

- If the apparent thickness of SPH is approximately 1 foot, SPH will be evacuated from the well manually using a 2-inch diameter bailer.

- If the apparent thickness of SPH is significantly greater than 1 foot, SPH will be evacuated from the well using a peristaltic pump.

The SPH removed from the well will be collected in a separate bucket, and the total volume of SPH and groundwater will be documented. After SPH has been purged from the well to the extent practical, routine depth the SPH and groundwater measurements will be taken using the oil/water interface probe.

- Fluid level data will be initially collected in short intervals, typically on the order of every minute, at test initiation and adjusted thereafter based on the test specific rate of SPH recovery.

- The bail-down test will be repeated again the following day of test initiation to ensure repeatability of results, and to assess the aquifer response versus SPH that could be draining from the filter pack that is present around the screened interval of both wells.

- If the SPH recovery is greater than 80-percent on the second day of the bail-down tests, a HVE event will be conducted on both wells.

- If the SPH recovery is less than 80-percent on the second day of the bail-down tests, a hydraulic recovery test consisting of extracting a minimum of 10 casing volumes at the maximum well yield will be performed the following

day to assess if SPH recovery can be enhanced by pumping the well. An electric powered submersible pump will be used to extract the groundwater. If aquifer recharge limits the volume of water extracted from the well, the maximum amount practicable will be removed.

- After confirming that the SPH has been completely removed, both wells will be gauged daily for a week to confirm SPH recovery. Based on the observed recharge, the gauging frequency will be adjusted accordingly. The frequency of subsequent HVE events will be based on the results of the gauging.

- If SPH does not recover within 24 hours of the first pumping event, SPH monitoring will be conducted once per week for a month to evaluate the rate of recovery.

- If the SPH does not recover within the one month of the bail-down test monitoring period, monitoring will be conducted monthly for a period of 3 months.

Observations concerning the SPH thickness, quantity of SPH removed, and color of the SPH withdrawn will be recorded during the bail-down and hydraulic recovery testing process. The bail-down test data (e.g., water level and SPH thickness recovery over time) will be analyzed using American Petroleum Institute's (API's) bail-down test evaluation spreadsheet to obtain estimates of SPH transmissivity. The API spreadsheet makes the necessary correction for SPH density and calculates transmissivity using guidelines developed by both the Huntley (2000) and Lundy and Zimmerman (1996) methods for adapting groundwater slug test analysis methods to SPH bail-down testing. Prior to importing data into the spreadsheet, each dataset will be carefully reviewed to determine the appropriate method for analysis.

Task 4: Delineation of the plume in the southern area

ARCADIS will conduct a Geoprobe and grab groundwater investigation south of OW-1 (**Figure 2**). The GeoProbe locations are proposed to evaluate the southern extent of SPH and delineate the plume. Three Geoprobes will be advanced 5 feet below the water table (approximately 15 feet bgs) (**Figure 2**). One soil sample will be collected from the vadose zone based on either 1) highest photo ionization detector (PID) reading for volatile organic compounds (VOCs) or 2) location immediately above the water table. The soil samples will be analyzed for the following constituents:

- BTEX by EPA Method 8260
- methyl tertiary butyl ether (MTBE) by EPA Method 8260
- TPH-GRO by EPA Method 8015B
- TPH-DRO by EPA Method 8015B [with silica gel cleanup (SGC) using a 10-gram column cleanup based on EPA Method 3630C]
- Ethylene dibromide (EDB) by EPA Method 8260

- 1,2-dichloroethane (1,2-DCA) by EPA Method 8260
- Polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8270

One grab groundwater sample will be collected from each location by inserting a temporary well screen in the borehole. The groundwater samples will be analyzed for the following constituents:

- BTEX by EPA Method 8260
- methyl tertiary butyl ether (MTBE) by EPA Method 8260
- TPH-GRO by EPA Method 8015B
- TPH-DRO by EPA Method 8015B [with SGC using a 10-gram column cleanup based on EPA Method 3630C]
- Ethylene dibromide (EDB) by EPA Method 8260
- 1,2-dichloroethane (1,2-DCA) by EPA Method 8260
- Polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8270
- Dissolved total iron (Fe) and manganese (Mn) by EPA Method 200.7/SW846 610
- Nitrate by EPA Method 353.2/SM 4500NO2B
- Sulfate by EPA Method 300/SW846 9056
- Sulfide by EPA Method 376.1
- Methane by Method AM20GAX
- Field parameters collected in situ or through a sealed flow-through chamber including pH, dissolved-oxygen (DO), temperature, and specific conductivity.

Analyses will be conducted by TestAmerica Laboratories, Inc. (TestAmerica) in Pleasanton, California, a California-certified laboratory.

Task 5: Investigation Derived Waste (IDW)

The extracted product and other investigation-derived waste generated during the field activities, including soil cuttings, decontamination or rinse water, and personal protective equipment, will be stored temporarily at the Site in labeled, Department of Transportation-approved 55 gallon drums or similar, until waste disposal is arranged.

Report

Results of this investigation will be summarized and presented in a report submitted 45 days after receipt of all of the laboratory data.

Schedule

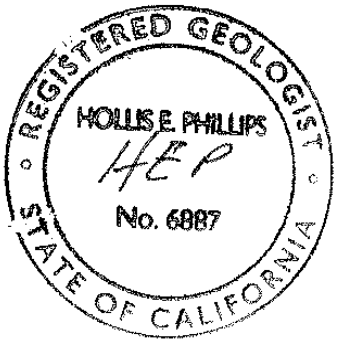
ARCADIS is prepared to initiate field activities immediately upon approval of this work plan.

If you have any questions, or require additional information, please feel free to contact Hollis Phillips at 415.432.6903. Send any correspondence regarding this project to Mr. Paul Harper of UPS at the address provided below. Please copy ARCADIS on any such correspondence as well.

Sincerely,

ARCADIS U.S., Inc.

Hollis Phillips, P.G.
Project Manager
California P.G. No. 6887



Enclosures:

Figure 1	Site Location Map
Figure 2	Proposed CPT/LIF and GeoProbe Locations
Attachment A	Historical Groundwater Analytical Data
Attachment B	February 2013 HVE Event Field Notes and Forms
Attachment C	Standard Operating Procedure for LNAPL Baildown Test

References

ARCADIS US Inc. (ARCADIS). 2011. Summary of Soil and Groundwater Investigation Activities, UPS Oakland Hub, 8400 Pardee Drive, Oakland, CA 94621, Global ID # T0600100939, State ID # 583, EPA ID # CAD 09707509. February 15.

ARCADIS. 2012a. Revised Summary of Soil and Groundwater Investigation Activities, UPS Oakland Hub, 8400 Pardee Drive, Oakland, CA 94621, Global ID # T0600100939, State ID # 583, EPA ID # CAD 09707509. August 17.

ARCADIS. 2012b. Second Semiannual Groundwater Monitoring and Baseline Sampling Report, UPS Oakland Hub, 8400 Pardee Drive, Oakland, CA 94621, Global ID # T0600100939, State ID # 583, EPA ID # CAD 09707509. September 17.

Huntley, D. 2000. Analytic Determination of Hydrocarbon Transmissivity from Baildown Tests. Ground Water, 38(1), 46-54.

Lundy, D.A., and L.M. Zimmerman. 1996. Assessing the Recoverability of LNAPL Plumes for Recovery System Conceptual Design. Proceedings of the 10th annual National Outdoor Action Conference and Exposition, National Ground Water Association, Las Vegas, NV. May 13-15, 1996.

California State Water Resources Control Board (State Water Board). 2012. Leaking Underground Fuel Tank Guidance Manual. September.

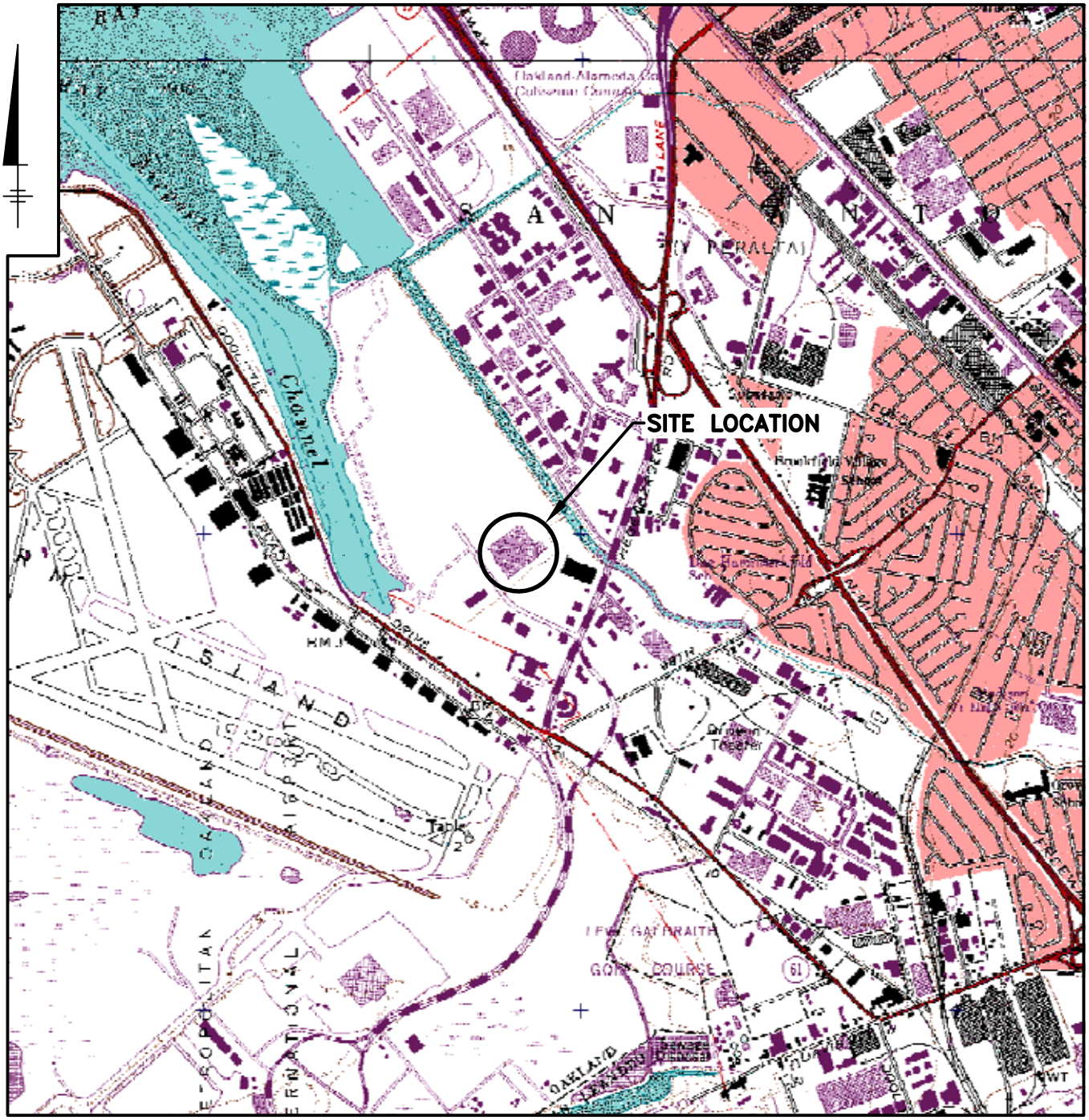
Copies:

Mr. Paul Harper – UPS Corporate Plant Engineering, 55 Glenlake Parkway NE, Atlanta, GA 30328

Mr. Douglas Herman – Port of Oakland

File

Figures



NOTES:

1. Base Map Source: USGS 7.5 Min. Topo. Quad., San Leandra, Calif.(1993)
2. Property Location is Approximate Only.

0 2000' 4000'

APPROXIMATE SCALE: 1"=2000'

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY:TMAPA,FL DIV/GROUP:85 DB:JAR LD:(Opt) PIC:(Opt) PM:(Read) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\TAMPA\ACTIVE\00138398 UPS Oakland\0009\B00138398N01.dwg LAYOUT:1 SAVED: 8/30/2012 2:10 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/9/2013 8:51 AM BY: RICHARDS, JIM
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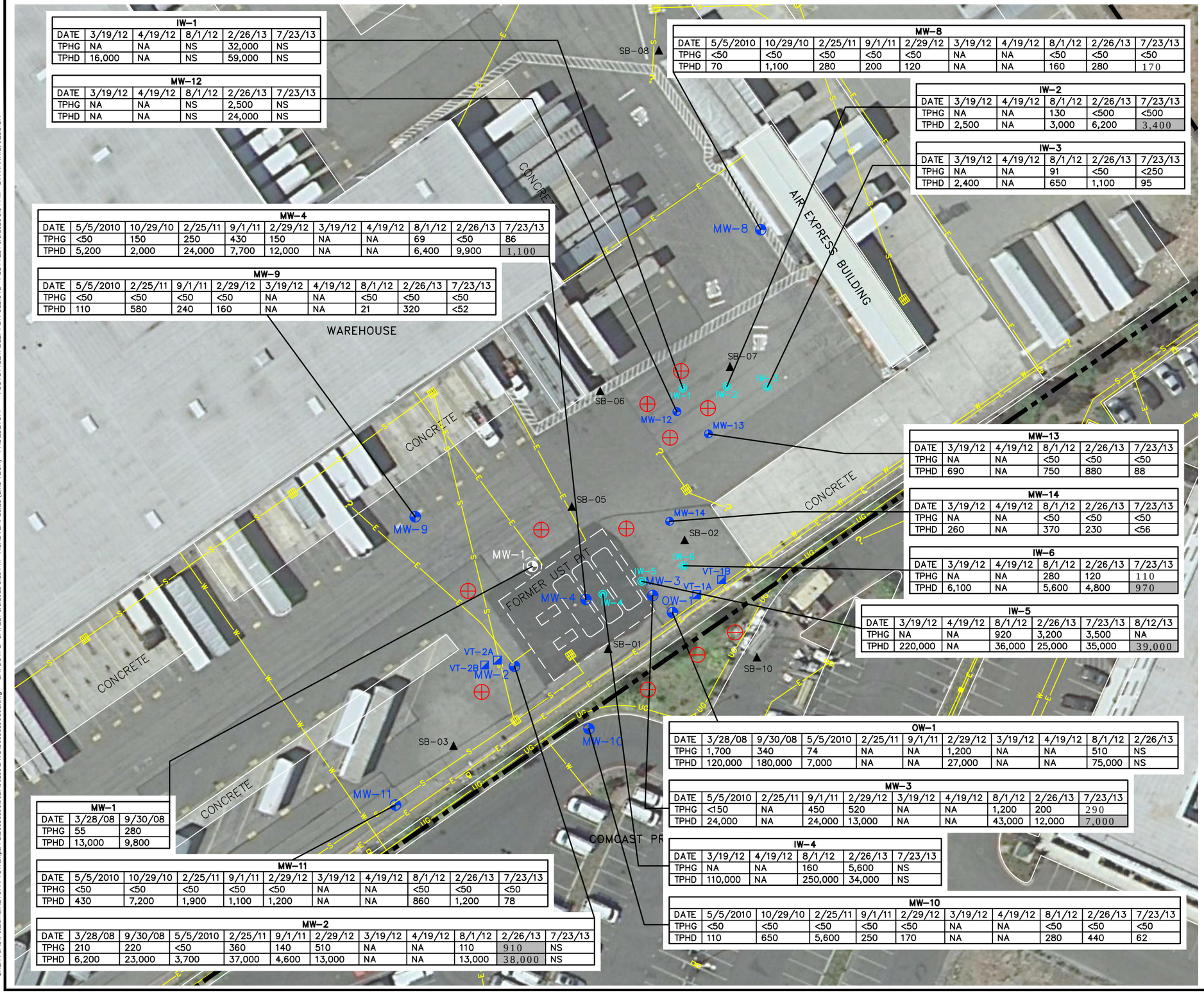

IW-1

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	NS	32,000	NS
TPHD	16,000	NA	NS	59,000	NS

MW-12

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	NS	2,500	NS
TPHD	NA	NA	NS	24,000	NS

MW-4

DATE	5/5/2010	10/29/10	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<50	150	250	430	150	NA	NA	69	<50	86
TPHD	5,200	2,000	24,000	7,700	12,000	NA	NA	6,400	9,900	1,100

MW-9

DATE	5/5/2010	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<50	<50	<50	<50	NA	NA	<50	<50	<50
TPHD	110	580	240	160	NA	NA	21	320	<52

MW-8

DATE	5/5/2010	10/29/10	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<50	<50	<50	<50	<50	NA	NA	<50	<50	<50
TPHD	70	1,100	280	200	120	NA	NA	160	280	170

IW-2

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	130	<500	<500
TPHD	2,500	NA	3,000	6,200	3,400

IW-3

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	91	<50	<250
TPHD	2,400	NA	650	1,100	95

MW-13

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	<50	<50	<50
TPHD	690	NA	750	880	88

MW-14

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	<50	<50	<50
TPHD	260	NA	370	230	<56

IW-6

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	280	120	110
TPHD	6,100	NA	5,600	4,800	970

IW-5

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13	8/12/13
TPHG	NA	NA	920	3,200	3,500	NA
TPHD	220,000	NA	36,000	25,000	35,000	39,000

OW-1

DATE	3/28/08	9/30/08	5/5/2010	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13
TPHG	1,700	340	74	NA	NA	1,200	NA	NA	510	NS
TPHD	120,000	180,000	7,000	NA	NA	27,000	NA	NA	75,000	NS

MW-3

DATE	5/5/2010	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<150	NA	450	520	NA	NA	1,200	200	290
TPHD	24,000	NA	24,000	13,000	NA	NA	43,000	12,000	7,000

IW-4

DATE	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	NA	NA	160	5,600	NS
TPHD	110,000	NA	250,000	34,000	NS

MW-10

DATE	5/5/2010	10/29/10	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<50	<50	<50	<50	<50	NA	NA	<50	<50	<50
TPHD	110	650	5,600	250	170	NA	NA	280	440	62

MW-1

DATE	3/28/08	9/30/08
TPHG	55	280
TPHD	13,000	9,800

MW-11

DATE	5/5/2010	10/29/10	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	<50	<50	<50	<50	<50	NA	NA	<50	<50	<50
TPHD	430	7,200	1,900	1,100	1,200	NA	NA	860	1,200	78

MW-2

DATE	3/28/08	9/30/08	5/5/2010	2/25/11	9/1/11	2/29/12	3/19/12	4/19/12	8/1/12	2/26/13	7/23/13
TPHG	210	220	<50	360	140	510	NA	NA	110	910	NS
TPHD	6,200	23,000	3,700	37,000	4,600	13,000	NA	NA	13,000	38,000	NS

LEGEND

- MONITORING WELL
- TEMPORARY VACUUM TEST WELL
- PHASE I INJECTION WELL
- ABANDONED MONITORING WELL
- SOIL BORING LOCATION (2010) CONTAINING TPHD GREATER THAN 66 mg/kg
- PROPERTY BOUNDARY
- CATCH BASIN/STORM DRAIN
- LIGHT POST/ POWER POLE
- PROPOSED CPT/UVOST LOCATION
- PROPOSED GEOPROBE AND GRAB GROUNDWATER INVESTIGATION LOCATION

SAMPLE LOCATION	
DATE	SAMPLE DATE
TPHG	TPH GASOLINE
TPHD	TPH DIESEL

ALL RESLUTS REPORTED IN MICROGRAMS PER LITER (µg/L),

BOLD VALUES INDICATE THE CONCENTRATION EXCEEDS THE CLEANUP TARGET LEVEL LISTED IN TABLE I OF CHAPTER 62-777 F.A.C.

BOLD AND SHADED VALUES INDICATE DETECTIONS ABOVE NON-DRINKING WATER MCL.

NA = NOT ANALYZED

NS = NOT SAMPLED

mg/kg = MILLIGRAMS PER KILOGRAM

0 50' 100'

GRAPHIC SCALE

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA

HISTORICAL TPHG AND TPHD IN GROUNDWATER QUALITY MAP

ARCADIS

FIGURE 2

Attachment A

TABLE 2

HISTORICAL GROUNDWATER MONITORING RESULTS AND BASELINE SAMPLING SUMMARY

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA
STATE ID # 583

Monitoring Well	Date	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	MTBE µg/L	TPH as gasoline µg/L	TPH as diesel µg/L	D.O. (mg/L)	Temperature °C	pH	Conductivity µs	EDB µg/L	1,2-DCA µg/L	Methane µg/L	Nitrate as Nitrogen µg/L	Magnesium µg/L	Sulfate µg/L	Sulfide µg/L	Iron µg/L	Naphthalene µg/L	TDS (mg/L)
Field Analysis	--	--	--	--	--	--	--	--	--	--	--	5,000	--	--	--	--	--	--	--	--	--	3,000
ESL - Drinking Water	--	1	40	30	20	5	100	100	--	--	--	--	0.05	0.5	--	--	--	--	--	--	17	--
ESL - Non-Drinking Water	--	46	130	43	100	1800	210	210	--	--	--	--	150	200	--	--	--	--	--	--	24	--
MW-1	8/28/1990	3.00	1.40	4.00	2.40	NA	NA	21,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/19/1991	1.70	0.70	0.50	0.90	NA	NA	7,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/23/1991	1.60	1.10	0.50	1.50	NA	220	8,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/26/1991	180.00	120.00	31.00	160.00	NA	NA	2,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/18/1991	1.10	0.40	0.50	< 0.3	NA	NA	6,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/3/1992	0.90	< 0.3	0.80	0.70	NA	NA	2,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/29/1992	0.80	0.40	0.40	0.90	NA	NA	2,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/23/1993	0.66	< 0.5	0.50	< 0.5	NA	NA	3,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/1993	1.30	< 0.5	< 0.5	< 0.5	NA	NA	9,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/4/1994	2.10	0.65	1.30	2.10	NA	NA	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/10/1994	0.54	0.53	< 0.5	1.10	NA	NA	6,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/1/1995	< 1.0	< 1.0	1.00	< 1.0	NA	510	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/2/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	510	8,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/16/1995	2.80	< 0.5	< 0.5	< 0.5	NA	830	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/28/1995	2.10	< 0.5	< 0.5	< 0.5	NA	560	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/4/1997	NA	NA	NA	NA	NA	NA	28,000	0.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/1999	< 0.5	0.60	< 0.5	1.80	<3.0	1,600	28,000	9.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/2000	< 0.5	< 0.5	< 0.5	< 1.0	< 5	260	21,000	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/3/2002	<0.5	<0.5	<0.5	0.50	<0.5	1,00	38,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2003	<5	<5	<5	<10	<5.0	250	35,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/9/2003	<0.5	<0.5	<0.5	<1.0	0.60	440	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/19/2004	3.20	<2.5	<2.5	<5.0	<2.5	280	24,000 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/29/2004	<1.0	<1.0	<1.0	<2.0	2.10	1,400 g	150,000 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/23/2005	<1.0	<1.0	<1.0	<2.0	<1.0	550 Q1	15,000 Q2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/29/2005	< 0.50	< 0.50	< 0.50	<1.0	0.94	310	7,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/27/2006	< 0.50	< 0.50	< 0.50	<1.0	0.62	420	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/28/2006	< 0.50	< 0.50	< 0.50	<1.0	0.87	220	28,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/19/2007	< 0.50	< 0.50	< 0.50	<1.0	<1.0	940	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2007	<0.50	<0.50	<0.50	1.1	<0.50	240	9,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2008	<0.50	<0.50	<0.50	<1.0	<0.50	55	13,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/2008	<0.50	<0.50	<0.50	<1.0	<0.50	280	9,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/3/2009	ABANDONED																				
MW-2	8/28/1990	0.60	0.40	0.60	0.70	NA	NA	3,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/19/1991	0.50	< 0.3	< 0.3	< 0.3	NA	NA	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/23/1991	0.70	< 0.3	< 0.3	< 0.3	NA	<500	660	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/26/1991	0.70	< 0.3	< 0.3	< 0.3	NA	NA	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/18/1991	0.80	< 0.3	< 0.3	< 0.3	NA	NA	3,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/3/1992	0.70	< 0.3	< 0.3	0.50	NA	NA	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/29/1992	0.60	< 0.3	< 0.3	< 0.3	NA	NA	250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/23/1993	0.55	< 0.5	< 0.5	< 0.5	NA	NA	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/1993	1.20	< 0.5	< 0.5	1.30	NA	NA	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/4/1994	0.72	< 0.5	< 0.5	1.10	NA	NA	3,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/10/1994	0.74	< 0.5	< 0.5	0.70	NA	NA	2,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/1/1995	2.10	< 1.0	< 1.0	< 1.0	NA	<100	2,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/2/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	210	3,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/16/1995	0.73	< 0.5	< 0.5	< 0.5	NA	130	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/28/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	210	2,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/12/1996	NS	NS	NS	NS	NS	NS	--	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/4/1997	NA	NA	NA	NA	NA	NA	3,300	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/1999	< 0.5	< 0.5	< 0.5	< 1.0	< 3.0	220	6,300	9.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/2000	< 0.5	< 0.5	< 0.5	< 1.0	< 5.0	170	4,400	0.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/27/2002	0.7J	<2.5	<2.5	<2.5	<2.5	17000	67,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2003	<25	<25	<25	<50	<25	1600	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2003	0.52	<0.50	<0.50	<1.0	<0.50	150	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/29/2004	0.51	<0.50	<0.50	<1.0	<0.50	84 g	7,800 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/29/2004	<0.50	<0.50	<0.50	<1.0	<0.50	630 g	10,000 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/24/2005	<0.50	<0.50	<0.50	<1.0	<0.50	2,300 Q1	15,000 Q2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/29/2005	<1.0	<1.0	<1.0	<2.0	<1.0	1,900	22,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/27/2006	<1.0	<1.0	<1.0	<2.0	<1.0	710	8,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/28/2006	<0.50	<0.50	<0.50	<1.0	<0.50	62	7,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/19/2007	<0.50	<0.50	<0.50	<1.0	<0.50	<50	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2007	<0.50	<0.50	<0.50	<1.0	<0.50	55	8,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2008	<0.50	<0.50	<0.50	<1.0	<0.50	210	6,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/2008	<0.50	<0.50	<0.50	<1.0	<0.50	220	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/5/2010	NA	NA	NA	NA	NA	<50	3,700	NA	NA	NA	NA	<0.5	<0.6	NA	NA	NA	NA	NA	NA	<1.0	2,800
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	360	37,000	NA	NA	NA	3,236	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	0.59	4.90	0.98	10.0	<0.50	140	4,600	NA	NA	NA	4,240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2

HISTORICAL GROUNDWATER MONITORING RESULTS AND BASELINE SAMPLING SUMMARY

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA
STATE ID # 583

Monitoring Well	Date	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	MTBE µg/L	TPH as gasoline µg/L	TPH as diesel µg/L	D.O. (mg/L)	Temperature °C	pH	Conductivity µS	EDB µg/L	1,2-DCA µg/L	Methane µg/L	Nitrate as Nitrogen µg/L	Magnesium µg/L	Sulfate µg/L	Sulfide µg/L	Iron µg/L	Naphthalene µg/L	TDS (mg/L)
MW-2 (cont.)	2/29/2012	<0.50	0.52	<0.50	1.7	<0.50	510	13,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110,000	3,300	NA	9,500	NA	2,400 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	< 0.50	2.0	<0.50	110	13,000	NA	NA	NA	3,682	NA	NA	810	< 230	NA	<1,000	<1,000	1,800	NA	2,700
	2/26/2013	<0.50	<0.50	<0.50	1.1	<0.50	**910**	**38,000**	NA	18.20	7.62	2,847	NA	NA	1,400	<230	140,000	<1,000	<1,000	4,100	3.3	2,900
	7/23/2013	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	8/28/1990	0.50	0.80	4.30	2.30	NA	NA	18,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/19/1991	0.40	0.40	1.70	1.40	NA	NA	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/23/1991	0.30	< 0.3	1.50	0.50	NA	330	6,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/26/1991	13.00	13.00	5.80	26.00	NA	NA	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/18/1991	0.60	< 0.3	< 0.3	< 0.3	NA	NA	2,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/3/1992	0.40	< 0.3	1.30	0.60	NA	NA	1,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/29/1992	< 0.3	< 0.3	1.30	0.30	NA	NA	3,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/23/1993	< 0.5	< 0.5	< 0.5	< 0.5	NA	NA	8,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/1993	1.00	< 0.5	1.50	2.40	NA	NA	7,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/4/1994	< 0.5	< 0.5	1.60	< 0.5	NA	NA	7,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/10/1994	< 0.5	< 0.5	< 0.5	< 0.5	NA	NA	5,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/1/1995	< 1.0	< 1.0	2.70	4.10	NA	810	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/2/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	1200	6,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/16/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	930	9,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/28/1995	< 0.5	< 0.5	< 0.5	< 0.5	NA	690	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/4/1997	NA	NA	NA	NA	NA	NA	34,000	0.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/1999	< 0.5	0.60	0.70	1.20	< 3.0	1300	8,700	8.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/2000	< 0.5	< 0.5	< 0.5	< 1.0	< 5.0	430	20,000	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/3/2002	<0.5	<0.5	<0.5	<0.5	<0.5	2,300	14,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2003	<25	<25	<25	<50	<25	2,500	19,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/9/2003	<0.5	<0.5	<0.5	<1.0	<0.5	700	73,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/19/2004	<0.50	<0.50	<0.50	<1.0	<0.50	99	14,000 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/29/2004	<2.5	<2.5	<2.5	<5.0	<2.5	390 g	10,000 ndp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/24/2005	<2.5	<2.5	<2.5	<5.0	<2.5	330 Q1	14,000 Q2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/29/2005	< 1.0	< 1.0	<1.0	< 2.0	< 1.0	1,200	8,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/27/2006	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	430	13,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/28/2006	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	370	17,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/19/2007	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0	510	26,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2007	<1.0	<1.0	<1.0	<2.0	<1.0	390	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2008	<0.50	<0.50	<0.50	<1.0	<0.50	280	21,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/2008	<0.50	<0.50	<0.50	<1.0	<0.50	270	9,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/5/2010	NA	NA	NA	NA	NA	<150	24,000	NA	NA	NA	NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	2.2	910
	2/25/2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	1.70	<0.50	2.1	<0.50	450	24,000	NA	NA	NA	1,378	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<0.50	<0.50	<0.50	1.3	<0.50	520	13,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47,000	7,900	NA	5,800	NA	770 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	1.1	<0.50	1,200	43,000	NA	NA	NA	NA	NA	NA	3,200	<230	NA	<1,000	< 1,000	4,600	NA	780
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	200	12,000	NA	16.70	7.96	1,407	NA	NA	4,100	<230	43,000	<1,000	<1,000	3,800	1.4	630
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	**290**	**7,000**	NA	25.28	7.16	1,696	<0.50	<0.50	8,200	<230	47,000	<1,000	<1,000	4,700	1.3	720
MW-4	5/5/2010	NA	NA	NA	NA	NA	<50	5,200	NA	NA	NA	NA	<5.0	<5.0	NA	NA	NA	NA	NA	NA	<1.0	1,100
	10/29/2010	<0.5	<0.5	<0.5	<1.0	<0.5	150	2,000	NA	NA	NA	1,940	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	250	24,000	NA	NA	NA	2,006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	<0.50	<0.50	<1.0	<0.50	430	7,700	NA	NA	NA	1,470	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<0.50	<0.50	<0.50	<1.0	<0.50	150	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	51,000	4,400	NA	22,000	NA	1,200 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.56	NA	NA	1,952	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	69	6,400	NA	NA	NA	NA	NA	NA	6,600	<230 H	NA	1,400	<1,000	2,400	NA	1,000
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	9,900	NA	16.70	7.85	1,995	NA	NA	3,700	<230	41,000	1,600	<1,000	3,400	<1.0	1,400
	7/22/2013	<0.50	<0.50	<0.50	<1.0	<0.50	86	**1,100**	NA	24.56	7.05	1,789	<0.50	<0.50	8,000	<230	45,000	<1,000	<1,000	3,600	<1.0	1,100
MW-8	5/5/2010	NA	NA	NA	NA	NA	<50	70	NA			NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	<1.0	2,900
	10/29/2010	<0.5	<0.5	<0.5	<1.0	<0.5	<50	1,100	NA			9,599	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	280	NA			9,379	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	200	NA			9,900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	120	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	170,000	1,600	NA	1,900	NA	5,800 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.85			3,634	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	160	NA			NA	NA	NA	1,100	<230 H	NA	<1,000	1,600	5,600	NA	4,900
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	280	NA	18.10	6.94	1,057	NA	NA	2,000	<230	170,000	<1,000	1,500	810	12	2,900
	7/22/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	**170**	NA	22.56	6.81	4,408	<0.50	<0.50	5,100	<230	170,000	<1,000	1,600	2,900	2.7	**5,300**
MW-9	5/5/2010	NA	NA	NA	NA	NA	<50	110	NA			NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	<1.0	6,200
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	580	NA			6,065	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	0.55	<0.50	<1.0	<0.50	<50	240	NA			2,358	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	160	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	170,000	4,000	NA	9,600	NA	10,000 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.87			5,322	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	210	NA			NA	NA	NA	2,100	<230 H	NA	<1,000	<1,000	13,000	NA	11,000
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	320	NA	19.30	6.75	22.83	NA	NA	2,600	<230	260,000	1,400	<1,000	4,000	<1.0	8,900
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	<52	NA	24.44	6.51	12,700	<0.50	<0.50	5,400	<230	390,000	<1,000	<1,000	11,000	<1.0	**16,000**

TABLE 2

HISTORICAL GROUNDWATER MONITORING RESULTS AND BASELINE SAMPLING SUMMARY

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA
STATE ID # 583

Monitoring Well	Date	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	MTBE µg/L	TPH as gasoline µg/L	TPH as diesel µg/L	D.O. (mg/L)	Temperature °C	pH	Conductivity µs	EDB µg/L	1,2-DCA µg/L	Methane µg/L	Nitrate as Nitrogen µg/L	Magnesium µg/L	Sulfate µg/L	Sulfide µg/L	Iron µg/L	Naphthalene µg/L	TDS (mg/L)
MW-10	5/5/2010	NA	NA	NA	NA	NA	<50	110	NA			NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	<1.0	2,100
	10/29/2010	<0.5	<0.5	<0.5	<1.0	<0.5	<50	650	NA			9,550	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	5,600	NA			3,508	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	250	NA			9,334	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	170	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.61			3,540	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	280	NA			NA	NA	NA	2,800	<230 H	NA	<1,000	<1,000	4,200	NA	3,700
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	440	NA	18.20	7.43	9,646	NA	NA	2,000	<230	110,000	21,000	<1,000	2,300	<1.0	3,000
	7/22/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	62	NA	22.83	6.84	**9,721**	<0.50	<0.50	7,700	<230	210,000	1,900	<1,000	7,700	<1.0	**5,200**
MW-11	5/5/2010	NA	NA	NA	NA	NA	<50	430	NA			NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	<1.0	10,000
	10/29/2010	<0.5	<0.5	<0.5	<1.0	<0.5	<50	7,200	NA			17,500	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	2/25/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	1,900	NA			525	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	<0.50	<0.50	<0.50	<1.0	<0.50	<50	1,100	NA			7,444	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	0.53	<0.50	<0.50	<1.0	<0.50	<50	1,200	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.91			3,097	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	860	NA			NA	NA	NA	2,800	<230 H	NA	<1,000	1,400	3,900	NA	4,900
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	1,200	NA	17.80	7.32	8,974	NA	NA	2,100	<230	120,000	<1,000	3,100	630	<1.0	4,700
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	78	NA	21.83	6.76	**9,905**	<0.50	<0.50	7,000	<230	180,000	<1,000	<1,000	5,900	<1.0	**5,700**
MW-12	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	NS	NS	NS	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	2,500	24,000	NA	18.50	7.37	2,377	NA	NA	1,600	<230	75,000	1,300	<1,000	9,200	3.9	1,500
	7/23/2013	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-13	3/19/2012	NA	NA	NA	NA	NA	NA	690	NA			NA	NA	NA	NA	NA	160,000	100,000	NA	390,000	NA	2,000 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.52			2,972	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	1.0	<0.50	<50	750	NA			NA	NA	NA	4,500	<230 H	98,000	3,300	4,300	1,100	NA	1,400
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	880	NA	17.70	7.46	2,056	NA	NA	3,600	<230	93,000	1,300	3,800	560	<1.0	1,300
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	88	NA	25.78	6.90	2,022	<0.50	<0.50	13,000	<230	81,000	2,100	<1,000	3,200	<1.0	1,400
MW-14	3/19/2012	NA	NA	NA	NA	NA	NA	260	NA			NA	NA	NA	NA	NA	180,000	94,000	NA	9,100	NA	8,400
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.96			4,872	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	<50	370	NA			NA	NA	NA	2,200	<230 H	270,000	53,000	4,500	9,100	NA	8,700
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	230	NA	15.80	6.36	5,600	NA	NA	3,700	<230	100,000	66,000	<1,000	990	<1.0	3,700
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	<50	<56	NA	26.00	6.53	**5,497**	<0.50	<0.50	6,000	NA	NA	NA	NA	NA	<1.0	NA
OW-1	6/23/1993	< 0.5	< 0.5	< 0.5	31.00	NA	NA	34,000,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/4/1997	NS	NS	NS	NS	NS	NS	NS	NS			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/1999	< 2.0	< 2.0	< 2.0	4.20	< 12.0	8,300	28,000,000	9.70			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/1999	< 1.0	< 1.0	1.90	8.90	< 6.0	2,900	340,000	--			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/11/2000	< 0.5	< 0.5	< 0.5	< 1.0	< 5.0	2,100	58,000	0.74			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/27/2002	0.6J	<2.5	<2.5	<2.5	<2.5	17,000	23,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2003	<50	<50	<50	<100	<50	820	81,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2003	<50	530	500	6200	<50	220	91,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/29/2004	<0.50	<0.50	<0.50	<1.0	<0.50	510	280,000 ndp	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/29/2004	<2.5	<2.5	<2.5	<5.0	<2.5	2,800 g	440,000 ndp	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1/24/2005	<0.50	<0.50	<0.50	<1.0	<0.50	220 Q1	16,000 Q2	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/29/2005	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	650	30,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/27/2006	<13	<13	<13	<25	<13	<1,300	58,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/28/2006	<2.5	<2.5	<2.5	<5.0	<2.5	820	130,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/19/2007	<2.5	<2.5	<2.5	<5.0	<2.5	460	76,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/25/2007	<2.0	<2.0	<2.0	<4.0	<2.0	<200	42,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/28/2008	<0.50	<0.50	<0.50	<1.0	<0.50	1,700	120,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/30/2008	<0.50	<0.50	<0.50	<1.0	<0.50	340	180,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/5/2010	NA	NA	NA	NA	NA	74	7,000	NA			NA	<0.50	<0.50	NA	NA	NA	NA	NA	NA	<1.0	1,800
	2/25/2011	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/1/2011	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/29/2012	<5.0	<5.0	<5.0	<10.0	<5.0	1200	27,000	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	<10.0	NA
	3/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	78,000	34,000	NA	19,000	NA	2,400 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<5.0	<5.0	<5.0	1.8	<0.50	**510**	**75,000**	NA			NA	NA	nA	3,800	<230	NA	16,000	<1,000	19,000	NA	2,300
	2/26/2013	NS	NS	NS	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IW-1	3/19/2012	NA	NA	NA	NA	NA	NA	16,000	NA			NA	NA	NA	NA	NA	97,000	4,500	NA	210,000	NA	1,500 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.48			2,639	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	NS	NS	NS	NS	NS	NS	NS	NS			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/26/2013	<5.0	<5.0	<5.0	<10	<5.0	32,000	59,000	NA	18.80	7.28	2,468	NA	NA	2,500	<230	71,000	<1,000	<1,000	15,000	42	1,500
	7/23/2013	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IW-2	3/19/2012	NA	NA	NA	NA	NA	NA	2,500	NA			NA	NA	NA	NA	NA	95,000	99,000	NA	8,200	NA	3,000
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.51			1,443	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<5.0	<5.0	0.74	1.4	<0.50	130	3,000	NA			NA	NA	NA	4,500	<230	180,000	4,000	6,400	8,000	NA	2,800
	2/26/2013	<5.0	<5.0	<5.0	<10	<5.0	<500	6,200	NA	17.90	7.45	4,494	NA	NA	1,500	<230	150,000	<1,000	5,400	6,400	480	3,500
	7/23/2013	<5.0	<5.0	<5.0	<10	<5.0	<500	**3,400**	NA	25.28	6.46	5,531	<5.0	<5.0	3,900	<230	180,000	<1,000	3,500	13,000	**430**	**3,700**
IW-3	3/19/2012	NA	NA	NA	NA	NA	NA	2,400	NA			NA	NA	NA	NA	NA	110,000	43,000	NA	30,000	NA	3,100
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.61			2,471	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	91	650	NA			NA	NA	NA	3,800	<230	130,000	<1,000	2,200	16,000	NA	2,700
	2/26/2013	<0.50	<0.50	0.58	<1.0	<0.50	<50	1,100	NA	17.70	7.02	3,890	NA	NA	2,800	<230	140,000	<1,000	8,200	20,000	430	2,800
	7/23/2013	<2.5	<2.5	<2.5	<5.0	<2.5	<250	95	NA	25.56	6.79	3,475	<2.5	<2.5	4,400	<230	170,000	<1.0	5,400	15,000	**150**	2,800
IW-4	3/19/2012	NA	NA	NA	NA	NA	NA	110,000	NA			NA	NA	NA	NA	NA	190,000	17,000	NA	350,000	NA	1,400 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.45			1,809	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	0.76	<0.50	<1.0	<0.50	160	250,000	NA			NA	NA	NA	1,900	<230 H	300,000	5,300	12,000	1,700	NA	1,100
	2/26/2013	<5.0	<5.0	<5.0	<10	<5.0	5,600	34,000	NA	17.00	7.02	2,058	NA	NA	3,900	<230	53,000	5,100	1,000	3,500	**24**	1,200
	7/23/2013	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE 2

HISTORICAL GROUNDWATER MONITORING RESULTS AND BASELINE SAMPLING SUMMARY

UPS-OAKLAND HUB
8400 PARDEE DRIVE, OAKLAND, CALIFORNIA
STATE ID # 583

Monitoring Well	Date	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	MTBE µg/L	TPH as gasoline µg/L	TPH as diesel µg/L	D.O. (mg/L)	Temperature °C	pH	Conductivity µs	EDB µg/L	1,2-DCA µg/L	Methane µg/L	Nitrate as Nitrogen µg/L	Magnesium µg/L	Sulfate µg/L	Sulfide µg/L	Iron µg/L	Naphthalene µg/L	TDS (mg/L)
IW-5	3/19/2012	NA	NA	NA	NA	NA	NA	220,000	NA			NA	NA	NA	NA	NA	150,000	25,000	NA	270,000	NA	910 H
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.70			1,253	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	920	36,000	NA			NA	NA	NA	6,200	<230 H	85,000	<1,000	2,300	4,900	NA	810 H
	2/26/2013	<0.50	<0.50	<0.50	<1.0	<0.50	3,200	25,000	NA	16.10	7.17	1,469	NA	NA	3,200	<230	45,000	1,200	<1,000	6,000	3.8	730
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	**3,500**	**35,000**	NA	26.06	6.75	1,316	<0.50	<0.50	13,000	<230	6,300	<1,000	5,800	7,400	5.0	830
	8/12/2013	NA	NA	NA	NA	NA	**NA**	**39,000**	NA				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IW-6	3/19/2012	NA	NA	NA	NA	NA	NA	6,100	NA			NA	NA	NA	NA	NA	270,000	48,000	NA	270,000	NA	6,200
	4/19/2012	NA	NA	NA	NA	NA	NA	NA	0.77			7,377	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/1/2012	<0.50	<0.50	<0.50	<1.0	<0.50	280	5,600	NA			NA	NA	NA	2,500	<230 H	300,000	2,100	10,000	43,000	NA	8,500
	2/26/2013	0.50	<0.50	<0.50	<1.0	<0.50	120	4,800	NA	16.10	6.56	9,861	NA	NA	3,300	<230	290,000	8,100	2,200	42,000	4.4	6,600
	7/23/2013	<0.50	<0.50	<0.50	<1.0	<0.50	**110**	**970**	NA	25.17	6.48	**14,451**	<0.50	<0.50	8,200	<230	410,000	<1,000	6,200	45,000	9.9	**10,000**

Notes:
(µg/L) = are micrograms per liter and mg/L are milligrams per liter.
NA = Not Analyzed; NS = Not Sampled; NM = Not Measured
TPH = Total petroleum hydrocarbons; MTBE = Methyl tertiary butyl ether.
Title 22 of the California Code of Regulations, California Maximum Contaminant Levels (MCLs) for drinking water.
D.O. = Dissolved Oxygen measured in the field.
Results collected between the dates of 8/28/90 and 12/28/95 are based on prior reporting by Geraghty & Miller, Inc. (1996).
Bold values indicate analytical detections above drinking water but below non-drinking water MCL.
Bold and shaded values indicate analytical detections above non-drinking water MCL.
The 9/96, 10/96 BBL reports revealed concentrations reported as TPH as diesel did not resemble the diesel chromatogram standard, containing > C-26.
J - Estimated value between MDL and PQL.
ndp - Hydrocarbon reported does not match the pattern of laboratory Diesel standard.
* = Not an MCL; Odor and taste threshold per the California Regional Water Quality Control Board regulations
Q2 = Quantity of unknown hydrocarbon(s) in sample based on diesel.
Q1 = Quantity of unknown hydrocarbon(s) in sample based on gasoline.

RWQCB ESLs = Regional Water Quality Control Board ESLs for Environmental Concerns at Sites with Contaminated Soil and Groundwater INTERIM FINAL - November 2007 (Revised May 2008) San Francisco Bay Region, CA

Attachment B

Site Visit Report

ARCADIS G&M Project Number:	Dates of Site Visit:
B0038398.0018	2/25/13
ARCADIS G&M Project Name:	**Location of Project:**
UPS Oakland	8400 Pardee Dr.
ARCADIS G&M Personnel Present:	**Other Persons Present:**
K. Firich	Icon Environmental

Purpose of Site Visit:

HVE Event

Date & Time:	Activities:
0640	Arrive Emeryville office to pick up equipment & field truck
0730	Berkeley shed- load more equipment onto truck
0830	Arrive at UPS Oakland H&S Tailgate, security check-in
0915	Begin setting up work station at MW-12 for extraction
	DTW: / DTP (Product) IW-1 6.50 / 5.65 IW-2 7.04 IW-3 5.90 MW-12 6.55 / 5.50 MW-13 4.61
1105	Phone calls to Arpen- working on setup
1115	Start running system, PID readings at MW-12 1115 = 0.2, 1200=0.2, 1400=1.1
1415	IW-1 DTW = 8.91 DTP = 8.00 275 gal of water extracted at MW-12
1430	Start extraction at IW-1
1500	PID reading = 0.2 at IW-1, hose length appx 25ft.
1600	Speak with Arpen- stop PID reading and Collect DTW at other wells

Weather: Sunny 50°

Signature & Date: Kari 2/25/13

Equipment billing submitted:_____

Date to accounting: _____

Site Visit Report

Date & Time:	Activities:
1615	MW-14 could not open
1630	MW-12 NO product. DTW = 8.62
1645	MW-8 DTW = 3.39
1655	Begin clean up. Stop running system. check IW-1
1700	DTW = 8.90 no solid beep but product on the probe. Begin extraction again with hose.
1720	check IW-1 again. Well is dry but residual product on probe.
1730	4.45 DTW in tank. 1100 gallons total Probe not working correctly (no solid beep for product)
1745	Empty Free Product drum and label as empty on-site
1800	off-site. Call Jennifer.
1830	Berkely Shed drop off
1915	Emeryville drop off and return truck.

ARCADIS

Document Control Number:TGM - _____

TGM + *project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year*

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name: UPS Oakland		**Project Location:** 8400 Pardee Dr.	
Date: 2/25/13	**Time:** 0940	**Conducted by:** K. Firich	**Signature/Title:** Kayz
Client: UPS		**Client Contact:** J. LeBeau	**Subcontractor companies:** Icon

TRACKing the Tailgate Meeting

Think through the Tasks (list the tasks for the day):

1 Driving
2 HVE extraction wells
3 Gauging
4
5
6

Other Hazardous Activities - Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations ☐ If there are none, write "None" here: None

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height	None	☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Topics from Corp H&S to cover?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ Any Stop Work Interventions yesterday?
☑ JLAs or procedures are available?	☐ Field teams to "dirty" JLAs, as needed?	☐ If deviations, notify PM & client
☑ Staff has appropriate PPE?	☑ Staff knows Emergency Plan (EAP)?	☑ All equipment checked & OK?
		☑ Staff knows gathering points?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☑ Gravity (i.e., ladder, scaffold, trips) (L M H)	☑ Motion (i.e., traffic, moving water) (L M H)	☑ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☑ Chemical (i.e., fuel, acid, paint) (L M H) COCs	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☑ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JLAs, and other control processes. Discuss and document any additional control processes.

- [x] **STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)

[ ] Elimination	[ ] Substitution	[ ] Isolation
[ ] Engineering controls	[ ] Administrative controls	[x] Monitoring
[x] General PPE Usage	[ ] Hearing Conservation	[ ] Respiratory Protection
[x] Personal Hygiene	[ ] Exposure Guidelines	[ ] Decon Procedures
[x] Emergency Action Plan (EAP)	[ ] Fall Protection	[x] Work Zones/Site Control
[x] JLA to be developed/used ***(specify)***	[ ] LPO conducted ***(specify job/JLA)***	[x] Traffic Control
[ ]	[ ]	[ ] Other ***(specify)***
[ ]	[ ]	[ ]

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP
Kathryn Birch /AVS	0845 KF		✓
Mike Brant Sr.	8:45		✓

Important Information and Numbers

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call WorkCare at 1.800.455.6155 and then notify the field supervisor who will, in turn, notify Corp H&S at 1.720.344.3844.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify Corp H&S at 1.720.344.3844 and then Corp Legal at 1.720.344.3756.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify Corp Legal at 1.678.373.9556 and Corp H&S at 1.720.344.3500

Visitor Name/Co - not involved in work

In	Out
In	Out
In	Out
In	Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- [ ] Lessons learned and best practices learned today: _____
- [ ] Incidents that occurred today: _____
- [ ] Any Stop Work interventions today? _____
- [ ] Corrective/Preventive Actions needed for future work: _____
- [ ] Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.800.455.6155
Near Loss Hotline - 1.866.242.4304

Icon Environmental Services, Inc.

WE ACCEPT VISA & MASTERCARD

REMIT TO:
P.O. Box 2407 UNION CITY, CA 94587-2407
(800) 499-3676 FAX (510) 476-1786
CAL 000 362 980

Bill of Lading
Invoice # 01179
Date 2-25-13

BILLING INFORMATION

NAME: Arcadis US Inc
ADDRESS: 630 Plaza Dr Ste # 600
CITY: Highlands Ranch STATE: CO ZIP: 80129
PHONE NO.: (770) 428-9009

JOB SITE

NAME: United Parcel Services Inc
ADDRESS: 8400 Pardee Dr
CITY: Oakland STATE: CA ZIP: 94621
PHONE NO.: ( )

PO # B0038398.0018 CASH CHECK
CUSTOMER EPA ID #

PROPER SHIPPING DESCRIPTION	WASTE CODE	MANIFEST NUMBER	QUANTITY	UNITS	PRICE	AMOUNT
Waste Flammable, Liquid N.O.S., 3 UN1993, PG III						
Non-RCRA Hazardous, Waste, Liquid	X	NH-11188	1100	Ga		
Non-RCRA Hazardous, Waste, Solid						
Waste Corrosive Liquid, N.O.S., 8						
RCRA Hazardous Waste						
Non Hazardous Waste Liquid						
Non Hazardous Waste Solid						
Transportation Charges	X	11	11.0	Hrs		
Additional Labor						
Pressure Washer						
Drum Setup Used / New	Metal / Poly	Size 55 / 30 / 15 / 5				
Empty Drum Disposal	Metal / Poly	Size 55 / 30 / 15 / 5				
Over Pack Drum	Metal / Poly	Size 95 / 85				
Drained Used Oil Filters						
Other:						

DISPOSAL/RECYCLING FACILITY:

TOTAL

NET 10 DAYS

[X] Icon Environmental Services
1220 Whipple Road, Union City, CA
CAL 000 369 026; 94587
(800) 499-3676

[ ] Ecology Control Industries
255 Parr Blvd., Richmond CA
CAD009466392; 94801
(310) 354-9999

[ ] US Ecology
HWY 95, 11 Miles S. of Beatty, Beatty, NV
NVD 048 946 016 89003
(775) 553-2203

[ ] DK Dixon
7300 Chevron Way, Dixon, CA
CAT 080 512 602; 95620
(707) 693-6008

[ ] AERC
30677 Huntwood Ave., Hayward, CA
(510) 429-1129; 94544

[ ] Commercial Filter Recycling
33210 Western Ave; Union City, CA
(510) 487-9227; 94587

[ ] East Bay MUD
2200 Wake Ave., Oakland, CA
(510) 313-8400; 94623

[ ] Crosby & Overton
1630 W. 17th St.; Long Beach, CA
CAD 028 409 019; 90183
(562) 432-5445

[ ] _____

I hereby certify that all information submitted in this and all attached documents contain true and accurate descriptions of the waste. All relevant information regarding known or suspected hazards associated with the waste has been disclosed. I certify that we have an established program to reduce the volume of waste to the degree to be economically practicable.

DRIVER SIGNATURE _____

GENERATOR SIGNATURE _____

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	2. Page 1 of 1	3. Document Number
		11188

GENERATOR

4. Generator's Name and Mailing Address

United Parcel Services Inc
8400 Pardee Drive
Oakland CA ~~94521~~ 94621 TT

Generator's Phone

same

5. Transporter Company Name	6. US EPA ID Number	7. Transporter Phone
Icon Environmental Services	CAL 000362980	
~~CLEARWATER ENVIRONMENTAL~~ TT	~~CAR000007013~~ TT	(510) 476-1740

8. Designated Facility Name and Site Address	9. US EPA ID Number	10. Facility's Phone
Icon Environmental Services Inc 1220 Whipple Rd Union City, CA 94587	CAL 000 369 026	510-476-1740

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. Non-Hazardous waste Liquid 1100	001	TT	1100	G
b.				

15. Special Handling Instructions and Additional Information

Wear PPE
Emergency Contact
(510) 476-1740
Attn: Charles Seaton

11.0

Handling Codes for Wastes Listed Above	
11a.	11b.

TRANSPORTER

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to state or federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
Kathryn Finch	Kat	2	25	13

17. Transporter Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Mik Brown Sr		2	25	13

FACILITY

18. Discrepancy Indication Space

19. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 18.

Printed/Typed Name	Signature	Month	Day	Year

WHITE–ORIGINAL (Return to Generator) YELLOW–TSDF (Retain Copy) PINK–TRANSPORTER COPY GOLDENROD-GENERATOR'S COPY

LPS Program (*check all that apply*)

- [x] LPS metrics are provided on the account level, refer to account guidance
- [ ] LPO required at the following frequency on this project:
  Select One: _____ mhrs _____ time(s) _____ Define: _____
- [ ] LPS Field Assessment required at the following frequency on this project:
  Select One: _____ mhrs _____ time(s) _____ Define: _____
- [ ] Other (specify):

Mobilization
Demobilization
Preliminary Risk Assessment & Survey
Remediation Injections
EFR Events
GW Monitoring

For successful LPOs, schedule feedback sessions with supervisor in advance!

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Printed Name	Signature	Date
Mike Brash Sr		2-25-13
Kathryn Finch		2-25-13

Add additional sheets if necessary

- [ ] Subcontractor Acknowledgement Form attached

You have an absolute right to STOP WORK if unsafe conditions exist!

Subject:

UPS Yard Safety Rules

Dear Sir:

UPS has developed a new Yard Safety Program to ensure the safety of employees, contractors and visitors who are required to work or operate vehicles on UPS yards. As part of the Yard Safety Program, all UPS contractors and vendors must comply with the following:

1. Prior to entering the property, all vendors and contractors are required to review and sign a copy of the UPS Yard Rules as they sign in at the guard house, even if they do not require access to the yard.
2. Reflective vests must be worn outside the vehicle in the yard in non-designated walk paths or break areas. Vendors and contractors who will need access to the yard are required to furnish and wear their own reflective vest. If a vendor arrives without a vest, one will be made available for purchase.
3. A Visitor Parking Pass with Yard Rules must be displayed in the windshield of the vehicle. In addition to signing a copy of the Yard Rules, any vendor or visitor who needs to drive a vehicle in the yard must display a visitor pass in the windshield of their vehicle. The visitor pass also will have a copy of the Yard Rules printed on the back of the pass.
4. Upon leaving the facility, contractors and vendors must return the parking pass and sign out.
5. Emergency flashers must be on when the vehicle is moving on UPS property.
6. Vendors and Contractors must park in the designated parking spaces unless prior authorization is given.
7. If work must be performed that requires parking in a non-designated area, warning cones must be placed next to the vehicle. When it is necessary for a visitor or vendor to park outside the designated parking area, cones must be placed around the vehicle in a manner that makes it clearly visible to other traffic in the yard. Vendors and contractors are required to supply their own cones.
8. Posted speed limits must be adhered to at all times. Unless otherwise posted, the speed limit in the yard is 10 MPH.
9. Traffic patterns and signage must be adhered to at all times.
10. Seat belts must be worn whenever the vehicle is in motion in the yard.
11. Parking pass is not required at facilities without a manned guard house.

These new rules are effective July 1, 2005 and will be included in all future UPS Plant Engineering Contracts. A copy of the Yard Rules must be reviewed and signed prior to entering the yard.

Contractor: ARCADIS

By: _____ 2-25-13
Signature *Date*

Title: Engineer

Please sign and fax to 407.826.8039

ARCADIS
Infrastructure · Water · Environment · Buildings

Smith System® Five Keys (Forward Driving)

1. **Aim High in Steering ®** - Avoid Collisions by seeing, evaluating, and acting upon all information available.
2. **Get the Big Picture ®** - Fewer mistakes are made when you have the complete traffic picture.
3. **Keep Your Eyes Moving ®** - Proper scanning techniques separate safe drivers from people who make costly errors.
4. **Leave Yourself an Out ®** - All that separates drivers from a collision is space. Use it to your advantage. This also applies to parking—to ensure safe and easy exit in case of emergency, choose pull through spaces or back into parking spaces when possible.
5. **Make Sure They See You ®** - Seek eye contact and use your warning devices at the same time

Smith System® Five Keys (Backing-Up Driving)

AVOID BACKING WHENEVER POSSIBLE - But When It's Unavoidable:

1. Check The Backing Area First
2. Back Slowly And Carefully – Use A Spotter If Necessary
3. Remain Aware Of The Blind Areas
4. Look Front, Sides, And Rear As You Back
5. Back No Further Than You Must

VEHICLE PRE-TRIP CHECKLIST

Date: 2/25/13

Unit: Personal car

Operator: KatnynFirich

CHECK BEFORE OPERATING	OK	NR	COMMENTS
Driver's License on Hand	✓		
ARCADIS Insurance Card in Vehicle	✓		
Back-up Alarm Operational	—		
Tires (tread, pressure, cracking)	✓		
Taillights Operational	✓		
Turn Signals Operational	✓		
Brake Lights Operational	✓		
Back-Up Lights Operational	✓		
Headlights Operational	✓		
Parking Lights Operational	✓		
Mirrors Adjusted to Minimize Blind Spots	✓		
Under the Vehicle (nothing hanging or leaking)	✓		
Windshield Wipers and Fluid all Functional	✓		
Heavy Items Secured Down Low or in Trunk	✓		
Make Sure All Doors are Fully Closed and Locked	✓		
Adjust Your Seat if Needed	✓		
Adjust Your Head Restraint to Match Height of Head	✓		
Driver and All Passengers Must Fasten Safety Belt	✓		
Scan the Gauges to Make Sure Everything is Normal	✓		
Adjust the Vents, Windows, and Heater or Air Conditioner for Comfort	✓		
Review Driving JLA	✓		
Make Sure You are Mentally and Physically Ready to Drive	✓		
Perform a Driving-Related Safety Moment (record in comments)	✓		Leave space

NR = Needs repair

Attachment C

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Standard Operating Procedure for LNAPL Baildown Test

Rev. # 2

Rev. Date: January 14, 2010

Approval Signatures

Prepared by: _____ Date: January 14, 2010
Jonathon J. Smith

Reviewed by: _____ Date: January 14, 2010
Brad W. Koons, P.E.

I. Scope and Application

The objective of this Standard Operating Procedure (SOP) is to establish uniform procedures for conducting rising-head light non-aqueous-phase liquid (LNAPL) baildown tests to evaluate LNAPL conductivity (K_n) in the subsurface at a specific well location. The data generated from the LNAPL baildown test can be used, along with other site data, to evaluate LNAPL mobility and recoverability at a site. This SOP describes the equipment, field procedures, materials and documentation procedures necessary to determine LNAPL conductivity. The details within this SOP should be used in conjunction with project work plans.

This SOP applies to task orders and projects associated with ARCADIS. This SOP may be modified, as required, depending on site-specific conditions, equipment limitations or limitations imposed by the procedure. The ultimate procedure employed will be documented in the appropriate project work plans or reports. If changes to the testing procedures are required due to unanticipated field conditions, the changes will be discussed with the project manager as soon as practicable and documented in the project report.

II. Personnel Qualifications

Only qualified ARCADIS-related personnel will conduct LNAPL baildown tests. ARCADIS field sampling personnel will have sufficient “hands-on” experience necessary to successfully complete the LNAPL baildown test field work. Training requirements for conducting LNAPL baildown tests include reviewing this SOP and other applicable SOPs and/or guidance documents, instrument calibration training, and health and safety training.

ARCADIS field sampling personnel will have completed current company-required health and safety training (e.g., 40-hour Hazardous Waste Operations training, site-specific training, first aid and cardiopulmonary resuscitation (CPR) training), as needed.

III. Equipment List

Equipment and materials used for conducting the LNAPL baildown tests may include, but are not limited to, the following:

- appropriate personal protective equipment (PPE), as specified in the site Health and Safety Plan (HASP)
- equipment decontamination supplies
- photoionization detector (PID) (see ARCADIS SOP: Photoionization Detector Air Monitoring and Field Screening)
- plastic sheeting
- oil absorbent pads
- stopwatch
- polypropylene rope
- clean disposable bailers
- oil-specific skimmer pump
- vacuum truck
- plastic bucket with lid
- plastic beakers or graduated cylinders (appropriately sized for anticipated NAPL/water recovery volume)
- Calculator
- appropriate field logs/forms
- oil-water interface probe (see ARCADIS SOP: Water Level Measurement)
- data logger and transducer
- white masking tape

- measuring tape with gradation in hundredths of a foot
- indelible ink pen
- monitoring well keys
- bolt cutters
- monitoring well locks
- field log book or PDA or field (computer) notebook

IV. Cautions and Procedure Considerations

Wells containing LNAPL for baildown testing should be selected based on project-specific objectives and a review of historical site data. It is good practice to select several baildown test wells to bracket the range of observed historical apparent LNAPL thickness measurements and LNAPL mobility/recoverability conditions across a given area. As a rule of thumb, apparent LNAPL thicknesses in wells used for baildown tests should be greater than or equal to the borehole diameter (Lundy and Parcher, 2007). Additional guidelines for selecting appropriate wells for LNAPL baildown testing include:

- Select wells located near the interior and exterior portions of the LNAPL plume(s)
- Select wells located in a variety of geologic materials, as feasible
- Consider the position of wells relative to groundwater and LNAPL flow direction
- Consider the potential of wells to exhibit different equilibrated apparent LNAPL thicknesses
- Select wells which contain different types of LNAPL, if present

In addition, understanding the areas affected by recent remediation efforts should be considered because these areas may not be representative of static subsurface conditions. Also, ARCADIS field sampling personnel must be aware of historical fluid levels as they compare to the conditions at the time of testing (i.e., the smear zone).

If higher LNAPL recovery rates are expected, larger diameter wells (4- to 6-inch-diameter casings) are generally preferred. The increased area of the wellbore

seepage face for larger diameter wells will provide information that is applicable to a larger, more representative volume of aquifer material. However, if the expected recovery rate is low, smaller diameter wells are often preferred because the volume of the borehole is smaller relative to the formation recovery capacity. Further discussion on accounting for the well filter pack is presented in *A Protocol for Performing Field Tasks and Follow-up Analytical Evaluation for LNAPL Transmissivity using Well Baildown Procedures* (Beckett and Lyverse, 2002).

ARCADIS project personnel must confirm that the test wells have been properly developed. This cannot be overemphasized, as incomplete well development results in underestimates of LNAPL transmissivity (T_n) and LNAPL conductivity (K_n). See the ARCADIS SOP titled *Monitoring Well Development* for additional details.

ARCADIS field sampling personnel must verify that the air/LNAPL and LNAPL/groundwater interfaces occur within the screen interval. At a minimum, the piezometric head elevation in the well should occur below the top of the screen.

ARCADIS field sampling personnel will choose the most appropriate technique to evacuate the LNAPL from the well. These techniques include:

- **Manual bailer** — A 1¾-inch-diameter bailer will be used for 2-inch-diameter wells. For 4-inch-diameter wells, a 3-inch-diameter bailer will be used for LNAPL recovery. ARCADIS highly recommends using product recovery cups, which attach to the bottom of the bailer and maximize the surface area for LNAPL recovery (For example, the Superbailer™, manufactured by EON Products, Inc. has this feature built-in). This will allow for more complete LNAPL removal and more accurate recovery measurements.

- **Pumping** — LNAPL removal can be accomplished by using an oil-specific skimmer pump that operates at a pumping rate which exceeds the LNAPL recharge capacity. For shallow wells (< 25 feet below ground surface), a peristaltic pump may also be a useful, effective and appropriate mode of LNAPL removal.

- **Vacuum Truck** — If large LNAPL volumes are to be removed or extremely rapid recovery rates are anticipated, LNAPL removal can be accomplished using a vacuum truck. The vacuum extraction line is to be outfitted with a small-diameter stinger attachment that will be extended down the well and an in-line site glass to observe extracted fluid color for determination of whether LNAPL or groundwater is being extracted. Begin pumping at the LNAPL/air interface and slowly move the stinger tube downward to extract LNAPL. When groundwater recovery is observed indicating that the LNAPL has been evacuated withdraw the stinger tube and begin fluid level measurements.

Follow the sequential steps below for each baildown test well. Data collection is generally manual using an interface probe, although a data logger can also be used as long as it can sense either the fluid interfaces or the head change only with respect to LNAPL. Before performing an LNAPL baildown test, allow monitoring well water and LNAPL levels to equilibrate with atmospheric pressure. Gauge fluid levels periodically for 5 to 10 minutes to monitor changes in head. Monitoring wells without vents (flush mounts) may require more time to equilibrate with atmospheric pressure following well cap removal.

ARCADIS recommends taking LNAPL measurements initially in one-minute intervals and then adjusting the frequency of measurements thereafter, based on site-specific conditions. The rate of LNAPL recovery will usually slow over time unless the zone of interest is highly conductive. Once the rate of recovery is slow enough, a new baildown test can be initiated at another location, returning to take periodic measurements at the initial test well. Continue this process as long as it is viable based on soil characteristics, field logistics, well locations and data collection needs. Real-time examination of the data curves is the best indicator of data sufficiency. A plot of the change in LNAPL thickness over time may exhibit up to three theoretical segments:

1) initial steep segment that could reflect filter pack drainage

2) main production segment where the formation LNAPL gradient to the wells controls recovery

3) third segment where the diminishing formation LNAPL gradient produces a flatter recovery curve

Repeatedly introducing the oil-water interface indicator may alter the fluid-level measurements. Avoid splashing the probe into the water table or lowering the probe too far beyond the LNAPL-water interface depth. To avoid introducing surface soil or other material into the monitoring well, stage downhole equipment on a clean and dry working surface.

Two field personnel are recommended to adequately perform this test, one person to collect the data and one person to record the data.

V. Health and Safety Considerations

Overall, the Loss Prevention System™ (LPS) tools and the site-specific HASP will be used to guide the performance of LNAPL baildown tests in a safe manner without incident. A Job Safety Analysis (JSA) will be prepared for LNAPL baildown tests. The

following specific health and safety issues must be considered when conducting LNAPL baildown tests:

- Monitoring for volatile organic compounds (VOCs) in the monitoring well head space must be conducted with a PID and recorded in the field logbook prior to initiating the LNAPL baildown test. PID readings will be compared to action levels established in the site HASP for appropriate action.

- Appropriate PPE must be worn to avoid contact with LNAPL during the baildown test.

- LNAPL removed from the test well must be managed with caution to avoid igniting the LNAPL material. LNAPL characteristics must be reviewed in the JSA, which will be prepared and reviewed by the project team prior to implementing the baildown test.

- LNAPL generated during the baildown test must be properly managed in accordance with facility and applicable regulatory requirements.

- Well covers must be carefully removed to avoid potential contact with insects or animals nesting in the well casings.

VI. Procedure

Specific procedures for conducting LNAPL baildown tests are presented below:

1. Identify site, well number, date and time on the LNAPL Baildown Test Log and field logbook or PDA, along with other appropriate LNAPL baildown testing information. An example LNAPL Baildown Test Log is provided in Attachment 1 to this SOP.

2. Place clean plastic sheeting and several oil absorbent pads on the ground next to the well.

3. Unlock and open the monitoring well cover while standing upwind from the well.

4. Measure the concentration of detectible organics present in the worker breathing zone immediately after opening the well using a PID. If the PID reading(s) exceed the thresholds provided in the HASP, take appropriate actions per the HASP. After monitoring the worker breathing zone, proceed to

monitor the well head space with the PID and record the PID reading in the field logbook.

5. Prepare a test log to record LNAPL recovery data. Initially, data should be collected very frequently. As time progresses and the LNAPL recovery rate slows, less frequent measurements will be required. In most cases, initial measurement increments of 1 minute are sufficient, with subsequent measurements farther apart as appropriate, based on observed rate of recovery during the first few readings. If LNAPL recovery rates are high, data should be collected more frequently. For lower LNAPL recovery rates, time intervals between measurements can be increased.

6. It is important to monitor rapid LNAPL recovery at a higher frequency, again as indicated by the observed recovery data.

7. Secure one end of the rope to the bailer and the other end to the well casing using a bowline knot.

8. Before beginning the baildown testing, measure and record static fluid levels using the oil/ water interface probe (i.e., depth to LNAPL and depth to groundwater) and document the well construction details. Using the conversion chart at the bottom of the test log, the measured LNAPL thickness and the well diameter, calculate and record the initial LNAPL volume in the well. Gauge fluid levels periodically for 5 to 10 minutes to monitor changes in head. Do not begin the test until the well has equilibrated. Ideally, one person will be responsible for lowering the bailer into the well and recording time intervals in the log, and another person will be responsible for lowering the water-level probe into the well and measuring and communicating water-level depths to the person recording information in the log.

9. To begin baildown testing, slowly lower the bailer or equivalent into the well until it is just below the LNAPL-water interface.

10. Set stopwatch. Wait to start the stopwatch until immediately after LNAPL removal is finished.

11. Evacuate LNAPL from the well by gently bailing, pumping, or vacuum recovery as described in Section IV above while minimizing water production. One of the assumptions employed in the analysis of the baildown test data is that the LNAPL is removed from the well instantaneously. Thus, it is important to avoid spending excessive amounts of time (more than 5 minutes) removing LNAPL from the well.

12. Record the time at which LNAPL removal is complete (or removed to the maximum practical extent) as the test start time. Begin measuring the elapsed time, starting with this point. Monitor depth to LNAPL and depth to water at the appropriate intervals, as discussed above (5). Measure fluid levels to the nearest hundredth of a foot with the oil-water interface probe and record, along with the corresponding time reading in minutes and seconds.

13. Transfer the LNAPL and groundwater evacuated from the well into an appropriately sized beaker or graduated cylinder. Record the volumes of LNAPL and groundwater on the Baildown Test Log (Attachment 1). If an LNAPL/water emulsion was formed during fluid recovery, allow time for LNAPL/water separation and make note of the observed emulsification.

14. Two to eight hours of data collection is usually sufficient. However, faster LNAPL recovery need not be monitored for extended periods, and slow recovering wells may benefit from follow-up readings the next day.

15. Place all LNAPL and groundwater collected during the test into an appropriate container for proper waste management.

16. Decontaminate the oil-water level indicator with a non-phosphate detergent and water scrub, a tap water rinse, a reagent grade methanol rinse, a second tap water rinse, a second methanol rinse, a third tap water rinse, and a triple rinse with distilled water (see SOP titled *Field Equipment Decontamination*).

17. Secure the monitoring well prior to leaving by replacing the well cap and/or cover and locking it.

VII. Waste Management

Rinse water, PPE and other waste materials generated during equipment decontamination must be placed in appropriate containers and labeled. Containerized waste will be disposed of in a manner consistent with appropriate waste management procedures for investigation-derived waste.

VIII. Data Recording and Management

ARCADIS field sampling personnel will record data using the LNAPL Baildown Test Log (Attachment 1). All information relevant to the test data beyond the items identified in the Baildown Test Log will be recorded using the field logbook, PDA or field computer. Field equipment decontamination activities and waste management activities will be recorded in the field logbook. Records generated as a result of

implementing this SOP will be controlled and maintained in the project record files in accordance with client-specific requirements.

IX. Quality Assurance/Quality Control

ARCADIS project personnel will review the data set collected during the LNAPL baildown test in the field to determine whether or not the data are reasonable given site-specific conditions. For example, if the data indicates that LNAPL recovery is very rapid in a very low-permeability soil type, this may indicate that there are problems with the data set. If the data are questionable, the field equipment must be checked to confirm it is working properly and the test will be repeated, if possible. Depending on data quality objectives, a duplicate LNAPL baildown test may be conducted as a quality control check 48 hours after the initial test, assuming water levels and apparent LNAPL thicknesses have returned to static conditions.

Any issues that may affect the data must be recorded in the field log book so that analysts can consider those issues when processing the data.

X. References

Beckett, G.D. and Lyverse, M.A. 2002. *A Protocol for Performing Field Tasks and Follow-up Analytical Evaluation for LNAPL Transmissivity using Well Baildown Procedures, August 2002.*

Lundy, D. and Parcher, M. 2007. *Assessment of LNAPL Volume, Mobility and Recoverability for Recovery Systems: Design and Risk-Based Corrective Action. National Ground Water Association Short Course, November 2007.*

ARCADIS SOPs Referenced Herein:

Field Equipment Decontamination, Revision No.1, April, 2009.

Monitoring Well Development, Revision No.2, March, 2008.

Photoionization Detector Air Monitoring and Field Screening, Revision No. 0, July, 2003.

Water Level Measurement, Revision No. 1, March, 2004.

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Attachment 1: LNAPL BAILDOWN TEST LOG

LNAPL Baildown Test Standard Operating Procedure

Site Name		Test Well ID	
Date and Time In		Date and Time Out	
Personnel		Weather	

Well Construction Details

Top of Casing Elevation (ft amsl)		Screen Slot Size (in)	
Total Well Depth (ft)		Filter Pack Type	
Depth to Top of Screen (ft)		Depth to Bottom of Screen (ft)	
Well Casing Diameter (in)		Borehole Diameter (in)	

Initial Test Conditions

Static Depth to LNAPL (ft)		Test Date	
Static Depth to Water (ft)		Start Time	
LNAPL Thickness (ft)		Initial LNAPL Volume in Well (gal)	

LNAPL Removal Information

LNAPL Removal Method/Equipment		Time LNAPL Removal Begins	
Volume of LNAPL Removed (gal)		Time LNAPL Removal is Completed	
Volume of Groundwater Removed (gal)			

Baildown Test Data

Elapsed Time (min)	Depth to LNAPL (ft)	Depth to Water (ft)	Observations

(Modified after Beckett and Lyverse, 2002)

Well Casing Volumes	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
(Gal./Ft.)	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47