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ARCADIS U.S., Inc.
100 Montgomery Street, Suite 300
San Francisco, CA 94104
Tel 415.374.2744
Fax 415.374.2745
www.arcadis-us.com

Response to Comments to Work Plan for Additional Site Investigation
Former ARCO Service Station No. 4931
731 W. MacArthur Boulevard
Oakland, California 94609
ACEH Site No.: RO0000076

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:
December 22, 2014

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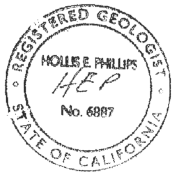
ARCADIS U.S., Inc



Hollis E. Phillips, PG
Project Manager

Contact:
Hollis E. Phillips

Phone:
415.432.6903

Email:
Hollis.phillips@arcadis-us.com

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Work Plan for Additional Site Investigation

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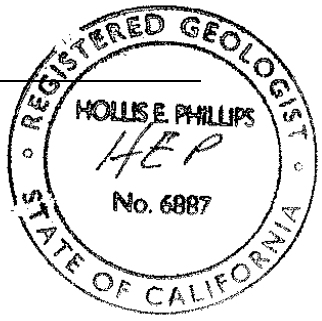
ARCADIS

Jamey Peterson
Project Geologist



Hollis E. Phillips, P.G. (6887)
Principal Geologist/Project Manager

Work Plan for Additional Site Investigation

Former ARCO Station No. 4931
731 West MacArthur Boulevard,
Oakland, CA
ACEH Site No.: RO0000076

Prepared for:
BP Remediation Management,
a BP affiliated company

Prepared by:
ARCADIS U.S., Inc.
100 Montgomery Street
Suite 300
San Francisco
California 94104
Tel 415 374 2744
Fax 415 374 2745

Our Ref.:
GP09BPNA.C110.C0000

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ARCADIS

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Acronyms and Abbreviations

1,2-DCA	1,2-dichloroethane
ACEH	Alameda County Environmental Health
ACWPA	Alameda County Public Works Agency
ARCADIS	ARCADIS U.S., Inc.
ASTM	ASTM International
ARCO	Atlantic Richfield Company
bgs	below ground surface
btoc	below top of casing
BTEX	benzene, toluene, ethylbenzene, and xylenes
COPCs	constituents of potential concern
DTW	depth to water
DIPE	di-isopropyl ether
DTSC	Department of Toxic Substances Control
EDB	1,2-dibromoethane

ESL	Environmental Screening Level
ETBE	ethyl tertiary butyl ether
GRO	gasoline range organics (C6-C12)
HASP	Health and Safety Plan
IDW	investigation-derived waste
LTC Policy	Low-Threat Underground Storage Tank Case Closure Policy
µg/L	micrograms per liter
mL/min	milliliters per minute
MTBE	methyl tertiary-butyl ether
PAHs	polycyclic aromatic hydrocarbons
PID	photoionization detector
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
SCM	Site Conceptual Model
SF-RWQCB	San Francisco Bay–Regional Water Quality Control Board
Site	former ARCO service station No. 4931, located at 731 West MacArthur Boulevard, Oakland, California
SIM	Selective Ion Monitoring
Soil Gas Advisory	DTSC's Advisory - Active Soil Gas Investigations Guidance
SWRCB	State Water Resources Control Board
TAME	tertiary-amyl methyl ether
TBA	tertiary-butyl alcohol
USA-North	Underground Service Alert
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds
WQO	water quality objectives

1. Introduction

ARCADIS U.S., Inc. (ARCADIS) has prepared this work plan for the former ARCO service station No. 4931 located at 731 W. MacArthur Boulevard in Oakland, California (the 'Site'; Figure 1). This work plan was prepared in response to the Alameda County Environmental Health's (ACEH) letter dated October 13, 2014 which directed the completion of additional site investigation to generate data that can be used to address ACEH's technical comments (ACEH 2014).

1.1 Site Description and Background

The Site is located at the southeastern corner of the intersection of West MacArthur Boulevard and West Street in Oakland, California. Currently, the Site is an active Westco Gasoline-branded retail fuel dispensing facility and includes a service station building, three dispenser islands, and four gasoline underground storage tanks (USTs). UST locations are shown on Figure 2 and include the following:

- Four 10,000-gallon double-wall fiberglass unleaded gasoline UST.

Except for landscaped planters along portions of the property boundary and the station building, the Site is covered with asphalt and/or concrete.

Commercial and residential properties surround the Site. The Site is bound by West MacArthur Boulevard to the north-northeast and West Street to the west-northwest. Residential dwellings are located adjacent to the Site along the south and east property boundaries. An automotive repair facility known as *Auto Mechs* and residential dwellings are located directly west and southwest of the Site beyond West Street. A Big-O Tires-branded service center is located on the northwest corner of the intersection of West MacArthur Boulevard and West Street. An oil change service center known as *Insta Lube i*s located on the northeast corner of the intersection of West MacArthur Boulevard and West Street. Interstate 580 is located approximately 600 feet south-southwest of the Site and Highway 24 is located approximately 1,000 feet east of the Site (Figure 1).

As shown on Figure 2, the Site and vicinity currently have 15 groundwater monitoring wells (A-2 through A-13 and AR-1 through AR-3), one soil vapor extraction well (AV-1), six soil vapor monitoring probes (SV-1 through SV-6), and three sub-slab vapor probes (SS-SV-1 through SS-SV-3). Available records indicate that the groundwater

monitoring wells are screened at depths ranging from 5 to 40 feet below ground surface (bgs).

Previous investigation information and site history can be found in Appendix A of the *Second Quarter 2014 and Third Quarter 2014 - Semi-Annual Groundwater Monitoring Report* dated October 31, 2014 (ARCADIS 2014a).

1.2 Summary of ACEH Directives

In the October 13, 2014 letter, ACEH summarizes data gaps that they contend persist at the Site and must be understood in order to provide a complete site conceptual model (SCM) and to facilitate in the evaluation of site conditions relevant to the State Water Resources Control Board (SWRCB) *Low-Threat Underground Storage Tank Case Closure Policy* (LTC Policy) adopted by the SWRCB on May 1, 2012 (SWRCB 2012) and effective on August 17, 2012. The recommendations provided by ACEH in their letter (ACEH 2014) include the following evaluations concerning the Site:

- Downgradient Extent of Groundwater Plume;
- Groundwater Plume Stability;
- Declining Groundwater Concentrations;
- Distance to Nearest Well;
- Neighborhood Sensitive Receptors;
- Soil Vapor Concentrations Proximal to Upgradient Residential Property Line; and
- Addition of groundwater monitoring wells AR-1, AR-2, and AR-3 to the groundwater sampling program.

2. Proposed Scope of Work

ARCADIS proposes the following scope of work:

- Soil and grab groundwater sampling from a soil boring completed west and downgradient of groundwater monitoring well A-8;

- Installation and sampling of two soil vapor probes along the eastern portion of the Site adjacent to the upgradient residential property at 725 West MacArthur Boulevard; and

- Performance of an updated sensitive receptor survey.

Wells AR-1, AR-2, and AR-3 are all within 10 to 20 feet of wells that are sampled as part of the monitoring program. The well that is adjacent to AR-3 (A-10) only contains low levels (6.1 µg/L in August 2014) of methyl-tertiary-butyl-ether (MTBE). It has basically only had MTBE detected in it and as described in Section 4 it shows a significantly decreasing MTBE trend. A-2 (adjacent to AR-2) contains low levels of MTBE (8.9 µg/L in August 2014); the highest concentration since the well was installed was 19 µg/L in 2008. As described in Section 4 it shows sable conditions with no apparent trend. A-4 (adjacent to AR-1) contains gasoline range organics (GRO), MTBE, and tertiary butyl alcohol (TBA) above cleanup goals, however as discussed in Section 4 the concentrations at A-4 show statistically significant decreasing groundwater concentration trends for the all of COPCs, with the exception of TBA at A-4 where stable concentrations with no apparent trend was derived. ARCADIS is not proposing to sample these wells because doing so will not yield any significantly different data than what is in the adjacent wells.

A detailed description of the sampling activities is provided below, and the proposed sampling locations are shown on Figures 3 and 4. The proposed locations may be modified depending on surface and aboveground obstructions, overhead and underground utilities, and accessibility.

2.1 Health and Safety, Permitting, and Utility Clearance

Prior to initiating field activities, the site-specific Health and Safety Plan (HASP) will be updated in accordance with state and federal requirements for use during the proposed field activities. All necessary permits and licenses will be obtained prior to the initiation of the subsurface investigation, including drilling permits from ACEH. Access agreements will be in place with the current property owner prior to field mobilization. Encroachment permits will be obtained as necessary from the City of Oakland. Underground utilities and other potential subsurface obstructions in the vicinity of the proposed drilling locations will be located and marked prior to drilling. The utility survey will include identifying the boring location using white paint and obtaining an Underground Service Alert (USA-North) ticket by calling USA-North at least 48 hours prior to drilling activities. Additionally, a private third-party utility locator will screen the proposed locations to determine the location(s) of nearby underground utilities.

2.2 Soil Boring Completions

To investigate the downgradient extent of the constituent-affected groundwater plume associated with the Site, one (1) soil boring will be advanced downgradient of existing site groundwater monitoring well A-8 in West Street (Figures 3 and 4). Groundwater flow direction has been predominately observed to the west as measured in 36 of the past 48 groundwater monitoring events conducted at the Site between the second quarter 2000 through the third quarter 2014 (ARCADIS 2014a). During this time frame, groundwater flow direction was also measured to the west-southwest during 9 events and to the southwest during 3 events. In their October 13, 2014 letter, ACEH claims that groundwater monitoring well A-8 is located in the downgradient core of the groundwater plume (ACEH 2014). The location of the proposed soil boring shown on Figures 3 and 4 was selected to obtain soil and groundwater data from the area specifically west and downgradient of A-8. Additional soil borings do not appear warranted downgradient of the Site. As stated by ACEH in their October 13, 2014 letter, groundwater monitoring wells A-11 and A-12 appear to monitor the lateral extent of the plume rather than the downgradient extent and that groundwater samples collected from A-11 and A-12 have consistently yielded non-detectable concentrations at good limits of detection (ACEH 2014).

2.2.1 Soil Boring Advancement

To minimize the potential for encountering subsurface utilities, the proposed soil boring (SB-01) will be cleared to a minimum depth of 6.5 feet bgs with a hand auger prior to drilling. Once cleared, boring will be advanced using direct-push probing equipment to an approximate total depth of 25 feet bgs by a C-57 licensed drilling contractor for field logging and sampling purposes. The exact depth of the soil boring will be identified by the depth at which groundwater is encountered, based on the observation of saturated soils and/or groundwater flowing into the bottom of the borehole. Review of boring logs from the active groundwater monitoring well network and soil borings completed in 2010 indicates that first groundwater has been encountered at an average depth ranging between approximately 15 to 20 feet bgs. The soil borings will be advanced slightly past the first encountered groundwater to facilitate grab groundwater sample collection. Table A presents the depth-to-water measurements observed at groundwater monitoring wells in the downgradient portion of the Site as well as the encounter groundwater levels during completion of the 2010 soil borings.

Table A: Encountered Groundwater Levels from Select Locations

Well/Boring	Date Installed	Total depth (feet bgs)	DTW – first (feet bgs)	DTW – static (feet btoc)
SB-1A	10/19/2010	25	21	--
SB-2	10/19/2010	25	23	--
SB-3	10/18/2010	25	20	--
SB-6	10/18/2010	25	23	--
A-8	Unknown	16.35	unknown	5.01 – 9.44
A-9	12/15/87	40	15	5.98 – 8.32
A-11	12/16/1987	30	15	7.70 – 9.90
A-12	12/16/1987	30	15	7.68 – 9.40

Notes:
DTW – first = depth water was encountered during drilling
DTW – static = depth to water measured during groundwater monitoring events conducted between March 2010 through August 2014
bgs = below ground surface
btoc = below top of casing
Sources: ARCADIS 2014a; ARCADIS 2013

2.2.2 Soil Sampling and Laboratory Analysis

As the boring is advanced from 6.5 feet bgs to its total depth, soil samples will be collected continuously to the extent feasible in 4-foot-long acetate liners, logged for stratigraphic characteristics (contacts, color, staining, odors, etc.) in accordance with the Unified Soil Classification System (USCS) and field screened for the presence of volatile organic compound (VOC) concentrations as measured with a photo-ionization detector (PID) under the supervision of a California Professional Geologist.

Soil samples will be collected for petroleum hydrocarbon assessment. Soil samples will be collected from the boring for analytical testing at the following approximate depth intervals:

- 4.5 feet to 5 feet bgs;
- 9.5 to 10 feet bgs; and
- The bottom of the borehole.

Additional soil samples will be collected if indications of petroleum hydrocarbon impacts (odor, elevated PID readings, staining, etc.) are observed at additional depth intervals.

Samples designated for laboratory analysis will be collected in direct-push acetate liners in an effort to collect relatively undisturbed soil samples. Sample sleeves will be cut in 0.5-foot increments in the field.

Sample sleeves designated for laboratory analysis will be logged visually, as inspected through the liners and to the extent feasible for soil properties (e.g., soil type, color, moisture content). Additional observations will be noted regarding observed odor, staining, and relative VOCs concentrations as measured with a PID from soil headspace at the ends of each section. The boring subsections will then be capped with Teflon squares and plastic end caps, labeled, sealed in plastic wrap, and placed in an ice-chilled cooler for delivery to a California Department of Public Health-certified analytical laboratory, under proper chain-of-custody procedures. The selected soil samples will be analyzed for the presence of the following constituents:

- GRO, benzene, toluene, ethylbenzene, xylenes (BTEX), MTBE, naphthalene, TBA, di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary-amyl methyl ether (TAME), ethanol, 1,2-dichloroethane (1,2-DCA), and ethylene dibromide (EDB) using United States Environmental Protection Agency (USEPA) Method 8260B; and
- Polycyclic aromatic hydrocarbons (PAHs) by USEPA 8270C/D- Selective Ion Monitoring (SIM).

Once the laboratory samples are collected, the remaining acetate sleeves will be cut open and logged by experienced field personnel, under the supervision of a California Professional Geologist. Additionally, soil will be placed in a zip-top bag and headspace PID readings will be collected.

2.2.3 Grab-Groundwater Sample Collection

Following the completion of the borehole, a grab groundwater sample will be collected by placing a 1-inch-diameter polyvinyl chloride (PVC) casing with a 5-foot screened interval of 0.010-inch slotted PVC at the bottom of the boring. Blank PVC riser pipe will be connected to the PVC screen to facilitate sample collection at the surface. Prior to grab groundwater sample collection, the static water level will be measured using an electronic water level indicator.

Once a sufficient volume of groundwater is present in the sampling device, several casing volumes of groundwater will be purged, and a sample will be collected using a peristaltic pump, disposable polyethylene bailer, or similar sampling device. The grab groundwater sample will be sealed, labeled, and placed in an ice-chilled cooler for delivery to a California Department of Public Health-certified analytical laboratory, under proper chain-of-custody procedures. Grab groundwater samples will be analyzed for the following:

- GRO, BTEX, MTBE, TBA, DIPE, ETBE, TAME, ethanol, 1,2-DCA, and EDB using USEPA Method 8260B; and

2.3 Soil Boring Abandonment

Upon completion of grab groundwater sampling activities, the borings will be abandoned in accordance with the Alameda County Public Works Agency (ACPWA) requirements. PVC casings will be removed, and the borings will be grouted through a tremie pipe from the total depth to ground surface using neat cement (composed of one sack [94 pounds] of Portland Type II/V and approximately 6 gallons of water) or as directed by ACPWA grout inspection personnel. The ground surface will be restored to its previous condition or as required by City of Oakland.

2.4 Soil Vapor Assessment

In an effort to support the assessment of potential constituent soil vapor concentrations nearby the offsite, upgradient residential property, ARCADIS proposes the installation and sampling of two soil vapor probes along the eastern property boundary of the Site. These areas were chosen due to their proximity to the offsite, upgradient residential property and to fulfill ACEH's request to install and sample within proximity to the upgradient residential building in order to determine the potential soil vapor risk to offsite residents (ACEH 2014). The exact vapor probe locations are subject to change

by the field team based on site utilities and maneuverability issues. Permanent sampling points will be installed so that repeated sampling can be conducted, as necessary, to evaluate seasonal variations. The installation and sampling will be completed in accordance with the *Advisory - Active Soil Gas Investigations* guidance (Soil Gas Advisory; Department of Toxic Substances Control [DTSC] 2012). The proposed sub-slab soil vapor probes are shown on Figure 5.

2.4.1 Soil Vapor Probe Installation

The asphalt and/or concrete surface materials at each soil vapor probe location will be cored with a concrete coring machine that will remove a 4-inch diameter cylinder of the asphalt and/or concrete and aggregate material to expose the subsoil. The diameter of the concrete core may be adjusted based access issues or for efficiency of the task in relation to disturbance of the surface materials.

Once the surface materials core is removed, the soil vapor probe will be installed immediately beneath the overlaying asphalt/concrete to approximately 5 feet bgs with a hand auger. Final depths of the soil vapor probes may change based on observed field conditions and moisture content of encountered soil. Soil samples will be collected continuously to the extent feasible from ground surface to the total completion depth of the borehole with the hand auger. Retrieved soil will be logged visually as described above in Section 2.2.2.

2.4.2 Soil Vapor Probe Construction

Each probe will be constructed with a stainless steel soil vapor screen implant 6 inches long and 0.5-inch in diameter, with a slot size of 0.01 inch. The soil vapor screen implant will be connected to Teflon-lined polyethylene tubing to enable sampling at the ground surface. Valves will be installed at the tube ends that can be closed when sampling is not being conducted. The vapor screen implant will be set from approximately 4.25 to 4.75 feet bgs. Approximately three inches of #3 Sand will be placed in the borehole above and below the implant. A 1-foot interval of dry granular bentonite will be placed above the sand pack of each vapor probe. A limited amount (<2 inches) of hydrated granular bentonite may be placed above the dry granular bentonite to secure the sand pack from the grout mixture. Following the hydrated granular bentonite, a neat cement grout/bentonite mixture will be added. Near the surface, the probes will be completed with approximately 6-inches of concrete and completed with a flush-mounted well box. The surface completion design may change

based on field conditions and at the request of the property owner. A schematic drawing of the soil vapor probes is presented in Figure 5.

2.4.3 Soil Sampling

Soil samples from at least one probe location will be collected from the undisturbed core sampler for geotechnical analysis for potential use in vapor transport modeling. The geotechnical soil samples will be analyzed for:

- Site-specific physical properties, such as soil dry bulk density, grain density and soil moisture content; and
- Soil grain size distribution to interpret the moisture content data and soil type.

The following California Environmental Protection Agency-recommended analytical methods will be used for these parameters (DTSC 2011):

- Dry bulk soil density by ASTM International (ASTM) D2937;
- Grain density by ASTM D854;
- Soil moisture by ASTM D2216; and
- Grain size distribution (Sieve Method) by ASTM D422.

Results from grain density and dry bulk soil density will be used to calculate total soil porosity.

Soil samples will also collected for petroleum hydrocarbon assessment. Soil samples will be collected for analytical testing from each hand auger boring for analytical testing at the following approximate depth intervals:

- 2.5 feet to 3 feet bgs; and
- 4.5 to 5 feet bgs.

Additional soil samples will be collected if indications of petroleum hydrocarbon-impacts (odor, elevated PID readings, staining, etc.) are observed at additional depth intervals.

Sample interval designated for laboratory analysis will be collected with a hand auger and placed into appropriate laboratory supplied sample containers, labeled, and placed in an ice-chilled cooler for delivery to a California Department of Public Health certified analytical laboratory, under proper chain-of-custody procedures. The selected soil samples will be analyzed for the constituents stated above in Section 2.2.2.

2.4.4 Soil Vapor Sampling

Due to the introduction of atmospheric oxygen into the vadose zone during soil vapor probe installation, an equilibration time is required to allow the sand pack and tubing to equilibrate with the subsurface prior to sampling. A minimum of 72 hours will be allowed for equilibration following soil vapor probe installation.

Soil vapor sampling will be performed using laboratory-supplied 1-liter SUMMA canisters. Using small (1-liter, or similar) SUMMA canisters is desirable to minimize the potential for breakthrough of ambient air into the samples as described in Section 3.6 of the Soil Gas Advisory (DTSC 2012). The laboratory-supplied SUMMA canisters will be batch certified by the laboratory prior to field receipt.

As described in Section 4.2 of the Soil Gas Advisory, soil gas assembly tests will be conducted at each probe prior to sample collection. These pre-sampling tests include shut-in, leak, and purge volume tests that will be completed before soil gas samples are collected after the soil gas well has equilibrated (DTSC 2012).

2.4.4.1 Shut-in Tests

Prior to purging or sampling, a shut-in test should be conducted to check for leaks in the aboveground sampling system. To conduct a shut-in test, the aboveground valves, lines, and fittings downstream from the top of the probe will be assembled. The system will be evacuated to a minimum measured vacuum of about 100 inches of water (7.35 inches of mercury) using a purge pump. The shut-in test will be conducted while the sampling canister is attached with its valve in the closed position. The vacuum gauge will be connected to the system with a ‘T’-fitting for at least 1 minute or longer. If there is any observable loss of vacuum, the fittings will be adjusted until the vacuum in the sample train does not noticeably dissipate. After the shut-in test is validated, the sampling train will not be altered. The vacuum gauge will be calibrated and sensitive enough to indicate a water pressure change of 0.5 inch (DTSC 2012).

2.4.4.2 Leak Tests

A leak test will be used to evaluate whether ambient air is introduced into the soil gas sample during the collection process and to determine the integrity of the sampling system. Atmospheric leakage occurs in three ways, according to the Soil Gas Advisory (DTSC 2012):

1. Advection through voids in the probe packing material and along the borehole sidewall;
2. Advection directly through the soil column; and
3. Advection through the fittings in the sampling train at the surface.

A leak test will be conducted at every soil gas probe each time a soil gas sample is collected to evaluate the integrity of the sample. As stated in the Soil Gas Advisory, introducing ambient air may result in an underestimation of actual site contaminant concentrations or, alternatively, may introduce external contaminants into samples from ambient air (DTSC 2012).

The well head and entire sampling train (valves, tubing, fittings, gauges, and SUMMA canister) will be placed in a sampling shroud. Commercial grade helium will be used as a tracer compound for the leak test. The tracer compound will be permitted into the shroud and monitored for concentration stability using a helium detector (e.g., Radio detection MGD-2002 or similar). Helium concentrations will be maintained at approximately 10 to 20 percent (%) for the duration of purging and sampling at each location.

2.4.4.3 Purging

Purging will consist of removing approximately three volumes of stagnant soil gas from the sampling system to ensure that samples are representative of subsurface conditions (DTSC 2012). A SUMMA canister dedicated to purging activities will purge each sub-slab probe at a flow rate of approximately 100 milliliters per minute (mL/min). The purge volume will be calculated based on the dimensions of the following:

- The internal volume of tubing;
- The void space of the sand pack around the probe tip; and

- The aboveground gauges, tubing, sampling equipment.

2.4.4.4 Soil Vapor Sample Collection

Following purging, the soil vapor sample will be collected using an evacuated 1-liter SUMMA canister with a laboratory-provided flow regulator (combined with a laboratory-provided soil vapor sampling manifold) set to approximately 100 mL/min. The valve on the sampling train will be opened, allowing soil gas to flow into the SUMMA canisters until the vacuum gauge reads approximately -5 inches of mercury. Initial and final vacuum gauge readings will be taken and recorded on the chain-of-custody form and on the laboratory-supplied sample labels included on each SUMMA canister.

Passivated stainless steel canisters, such as SUMMA canisters, have minimal problems associated with their handling. Therefore, no additional precautions or safeguards are needed (DTSC 2012). The soil vapor sample will be delivered under appropriate chain-of-custody protocols to a California Department of Public Health certified analytical laboratory, under proper chain-of-custody procedures. The soil gas samples will be analyzed for the presence of the following constituents:

- GRO, BTEX, naphthalene, MTBE, and TBA using Modified USEPA Method TO-15; and
- Fixed gases, including oxygen and helium, using Modified ASTM Method D-1946.

2.5 Decontamination

All down-hole drilling and sampling equipment will be steam-cleaned prior to deployment and following completion of each sampling location. Decontamination of non-dedicated or non-disposable field equipment will be conducted using a Liquinox® solution and deionized water rinse to prevent potential cross-contamination.

2.6 Investigation Derived Waste Disposal

Soil cuttings and purge/rinse water generated during drilling operations will be placed in 55-gallon drums and temporarily stored onsite pending characterization and disposal. A composite sample of investigation derived waste will be collected for waste profiling purposes. Following the receipt of waste characterization analytical data, investigation derived waste will be transported to an appropriate disposal and treatment facility. A

copy of the certificate of disposal will be included in the summary report for the investigation derived wastes.

2.7 Quality Assurance and Quality Control Procedures

To verify that the analytical data collected during the investigation is valid and useable, the data will be evaluated using a standard quality assurance and quality control (QA/QC) program.

Field QA/QC procedures will include calibration of sampling equipment (including the PID and water quality parameter meter), the use of standard chain of custody procedures for sample control, and written and visual documentation of field activities in daily field logs and by photograph.

The degree of laboratory accuracy and precision will be established by evaluating method blanks, laboratory control samples, matrix spike samples, and surrogate quality control sample results. All comments reported by the laboratory will be reviewed during this evaluation and incorporated into the summary report as necessary.

2.8 Sensitive Receptor Survey

As noted in the *ACEH Low Threat Closure Policy Checklist and Site Conceptual Model* (ARCADIS 2013) no water producing wells or sensitive ecological receptors were found within 0.5 mile of the Site. ARCADIS proposes to reexamine this report and execute an updated sensitive receptor survey with a 1,000 foot search radius around the Site for water wells (residential, municipal, industrial, etc.) and surface water bodies. Review of previous well searches for the Site and copies of available well reports from the Department of Water Resources and ACPWA will be reviewed. The survey will also include residential properties (basements and private wells) within 500 feet of the Site. ARCADIS proposes to do a formal investigation of public records as well as distribute questionnaires to nearby residents within at least 500 feet of known impacts to identify “The potential existence of wells, groundwater pumping sumps, basements, and sensitive groups and land use” in that area. An example of the questionnaire is included as Appendix A. The findings of the sensitive receptor survey will be presented in the summary report.

3. Evaluation and Comparison with Screening Criteria

Soil and soil vapor sample results will be compared to established screening levels to assess potential residual risks. Concentrations of analytes in groundwater will be compared to San Francisco Bay - Regional Water Quality Control Board (SF-RWQCB) Environmental Screening Levels (ESLs) for commercial/industrial land uses (SF-RWQCB 2013). Soil analytical results will also be compared to the SWRCB LTC Policy screening criteria for potential commercial exposure for benzene, ethylbenzene, naphthalene, and PAHs (SWRCB 2012).

4. Response to ACEH Comments Regarding Declining Groundwater Concentrations

In their October 13, 2014 letter, ACEH stated that five years of declining groundwater concentrations are not being demonstrated at the Site. ARCADIS evaluated the stability of dissolved petroleum hydrocarbon constituents in groundwater by conducting statistical analyses and comparing the results to groundwater concentration trend charts. The objective of these analyses is to determine if statistically significant concentration trends exist for the site constituents-of-potential-concern (COPCs) and to calculate approximate dates to achieve water quality objectives (WQOs). SF-RWQCB ESLs protective of a drinking water resource (SF-RWQCB 2013; *Table F-3 Summary of Drinking Water Screening Levels*) were used as the WQOs evaluated in the linear regression analyses. Site data to date indicate that statistically significant decreasing concentration trends are observed at the majority of groundwater monitoring well and site constituent pairs, with times to reach SF-RWQCB ESLs between 2 and 19 years (by 2016 to 2033).

Concentration trends for GRO, BTEX, MTBE, and TBA were evaluated for 5 (A-2, A-4, A-5, A-8, and A-10) of the 15 groundwater monitoring wells using linear regression analyses to determine if they are statistically significant. COPC concentration trends were evaluated on monitoring well-constituent combinations that have exceeded groundwater WQOs since 2010, contained sufficient data (dataset has a minimum of eight analytical results), and have had a minimum of 75 percent detections above laboratory reporting limits in a dataset. A total of 11 monitoring well-constituent combinations had sufficient data to run linear regression analyses. Concentration trends were not evaluated at A-3, A-6, A-7, A-9, A-11, A-12, A-13, AR-1, AR-2, and AR-3 as these groundwater monitoring wells did not meet the screening criteria due to historical non-detect COPC concentrations and/or limited sampling events.

The data collected across the Site indicate statistically significant decreasing groundwater concentration trends for the all of COPCs, with the exception of benzene at A-8, MTBE at A-2, and TBA at A-4 where stable concentrations with no apparent trend were derived for those pairs. Although concentrations of benzene at A-8, MTBE at A-2, and TBA at A-4 do not demonstrate significantly decreasing trends, the concentrations are stable as presented in Appendix B. These indicate that the plume cores of benzene, MTBE, and TBA are stable and not expanding. Benzene at A-8 has been detected as low as 4.4 micrograms per liter (µg/L) and 130 µg/L during the February 2014 and August 2014 groundwater sampling events, respectively, which are slightly above the SF-RWQCB ESL of 1 µg/L (February 2014) and benzene concentrations have significantly decreased since the recent (within the last 5 years) maximum concentration of 1,800 µg/L in August 2012. At A-2, no apparent trend was derived for MTBE concentrations, but the most recent detection of 8.9 µg/L in August 2014, was slightly above the SF-RWQCB ESL of 5 µg/L. Results for TBA concentrations did not yield a statistically significant trend at A-4; however, visual observation of the groundwater analytical data from A-4 suggests that TBA concentrations are decreasing from the maximum historical concentration of 3,400 µg/L during August 2010. Results of the regression trend analyses are presented in Appendix B and are summarized below:

GRO: Results of the linear regression analysis indicate statistically significant decreasing trends for GRO concentrations in groundwater monitoring wells A-4 and A-8. The remaining three of the potential five GRO and groundwater monitoring well pairs did not meet the screening method criteria for a linear regression analysis.

Benzene: Results of the linear regression analysis indicate statistically significant decreasing trends for benzene in groundwater monitoring well A-4. No trend was observed in groundwater benzene concentrations at A-8. However, visual observation of the groundwater analytical data from A-8 suggests that benzene concentrations are decreasing from the recent maximum concentration of 1,800 µg/L during August 2012. The remaining three of the potential five benzene and monitoring well pairs did not meet the screening method criteria for a linear regression analysis.

Toluene: Linear regression analysis was not performed for this constituent because it did not fit the screening method criteria stated above for any of the site groundwater monitoring wells.

Ethylbenzene: Linear regression analysis was not performed for this constituent because it did not fit the screening method criteria stated above for any of the site groundwater monitoring wells.

Total Xylenes: Linear regression analysis was not performed for this constituent because it did not fit the screening method criteria stated above for any of the site groundwater monitoring wells.

MTBE: Results of the linear regression analysis indicate statistically significant decreasing trends for MTBE in groundwater monitoring wells A-4, A-5, A-8, and A-10. The groundwater MTBE concentrations at A-2 do not indicate an apparent trend. However, the groundwater MTBE concentrations at A-2 have generally been near the WQO of 5 µg/L since June 2000. MTBE concentrations in groundwater samples collected from A-2 have ranged from non-detect above the laboratory reporting limit (<0.5 µg/L to <3.0 µg/L) to a maximum of 19 µg/L since June 2000, indicating stable concentrations.

TBA: Results of the linear regression analysis indicate a statistically significant decreasing trend for TBA in well A-5. The groundwater TBA concentrations at monitoring wells A-4 indicated a stable trend, albeit, not decreasing. The remaining 3 of the potential 5 TBA and monitoring well pairs did not meet the screening method criteria for a linear regression analysis.

Overall, significant attenuation of the groundwater impacts is observed at the Site. Concentrations of GRO, benzene, MTBE, and TBA show either declining or stable trends for all groundwater monitoring well locations, with predicted times to reach the cleanup goals between 2 and 19 years. Although no apparent trend can be derived from benzene concentrations at A-8; MTBE concentrations at A-2; and TBA concentrations at A-4, visual observations of the monitoring data indicate a stable or decreasing trend. These analyses suggested that the groundwater plumes at the Site are stable and not migrating (Appendix B).

5. Schedule and Reporting

Soil boring completion and sampling is anticipated to take 1 day to complete. Soil vapor probe installation and sampling is anticipated to take a total of 2 days to complete. The implementation schedule for all field events will be dependent on

approval of this work plan by ACEH, obtaining all necessary drilling permits from ACPWA, and execution of acceptable encroachment agreements with the City of Oakland.

As noted in the recent groundwater report for ACEH Case #RO0000426 (Former BP Station #11109 located at 4280 Foothill Blvd, Oakland, California), a proposed site investigation for Former BP Station #11109 is experiencing a lengthy delay because of the permitting process with the City of Oakland (ARCADIS 2014b). The City of Oakland requires the property owner, not the responsible party, to apply for encroachment permits which will likely add additional time to the permitting process for the Site as the proposed soil boring will be placed in a City of Oakland right-of-way. Several additional permitting items beyond what was anticipated for the Former BP Station #11109 permitting, such as materials for an *Indenture Agreement* and retroactive encroachment permits for existing groundwater monitoring wells that were installed in the City of Oakland right-of-ways, will likely also be required for the permitting of the proposed work for the Site (former ARCO service station No. 4931). Drilling permits from ACPWA can only be applied for when all necessary permits and agreements are in-place with the City of Oakland. This information is being brought to ACEH's attention as it relates to the due date of the report that will summarize the proposed activities in this work plan. ARCADIS requests that the due date of the summary report be given based receipt of the drilling permits from ACPWA (e.g., summary report is due at least 90 days following receipt of all necessary permits).

During the permitting process, ARCADIS will make good faith efforts to work with the City of Oakland Planning and Building Department to verify to the best of our knowledge that any submitted permit applications are being processed by City of Oakland personnel in a reasonable manner. ARCAIDS will keep ACEH appraised of permit application submittal dates and of any delays with the permitting.

Following the site investigation activities, a report will be prepared for submittal to the ACEH. The report will include a summary of field activities and results, a table and figure showing sample results and the final soil boring and soil vapor probe locations.

6. References

Alameda County Environmental Health (ACEH), 2014. Subject: *Request for Data Gap Work Plan and Focused Site Conceptual Model; Fuel Leak Case No. RO0000076 and GeoTracker Global ID T0600100110, ARCO #04931, 731 W Macarthur Blvd, Oakland, CA 94609*. October 13.

ARCADIS U.S., Inc. (ARCADIS). 2014a. Second Quarter 2014 and Third Quarter 2014 Semi-Annual Groundwater Monitoring Report, Former Atlantic Richfield Company Station No. 4931, 731 West MacArthur Boulevard, Oakland, California 94609. October 31.

ARCADIS U.S., Inc. (ARCADIS). 2014b. Second Quarter and Third Quarter 2014 Semi-Annual Groundwater Monitoring Report, Former BP Station #11109, 4280 Foothill Blvd, Oakland, California, ACEH Case #RO0000426. December 10.

ARCADIS. 2013. ACEH Low Threat Closure Policy Checklist and Site Conceptual Model, Former Atlantic Richfield Company Station No. 4931, 731 West MacArthur Boulevard, Oakland, California 94609. June 28.

Department of Toxic Substances Control (DTSC). 2011. Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance). October.

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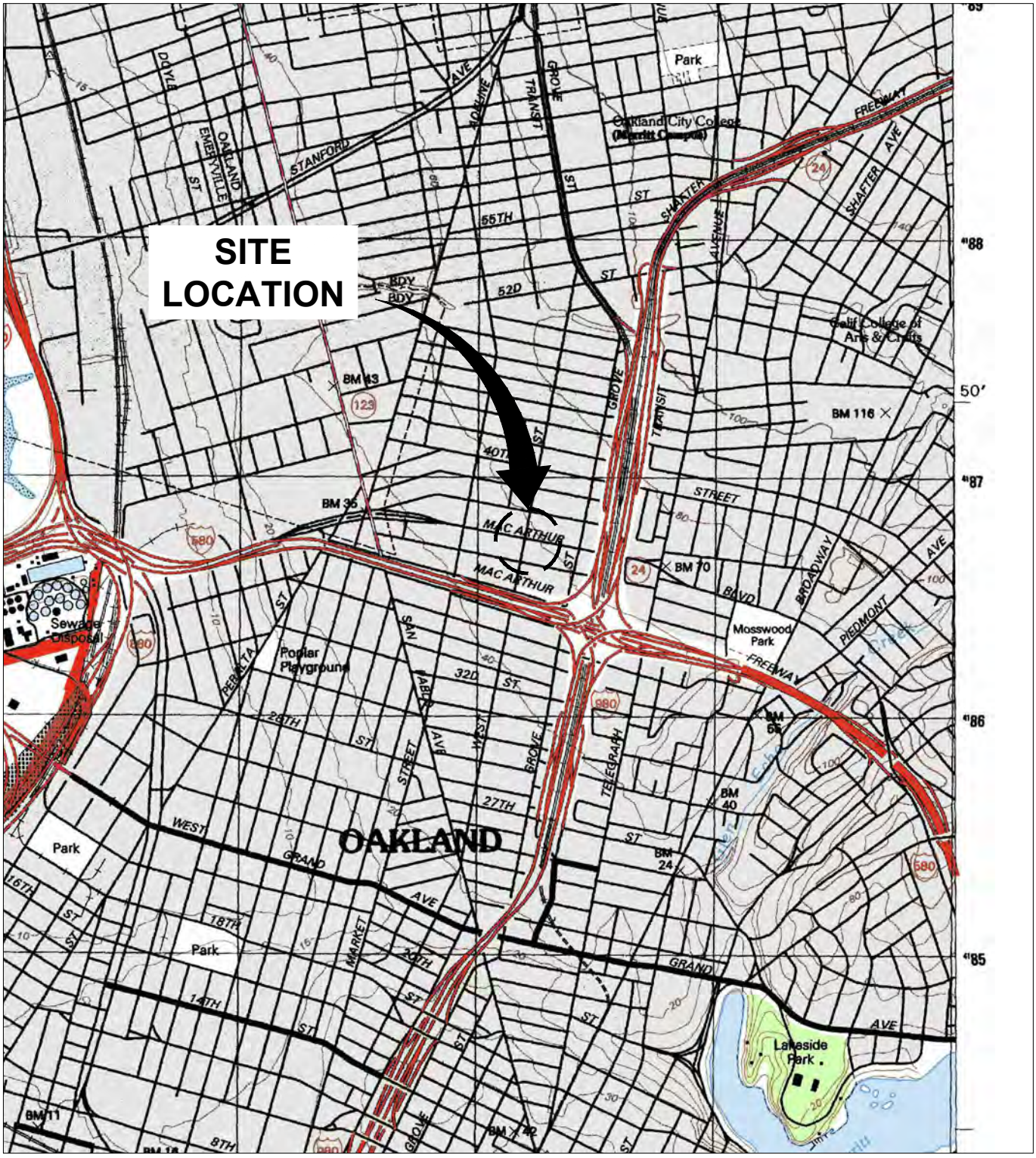
ARCADIS

Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., OAKLAND WEST, CALIFORNIA, 1993.

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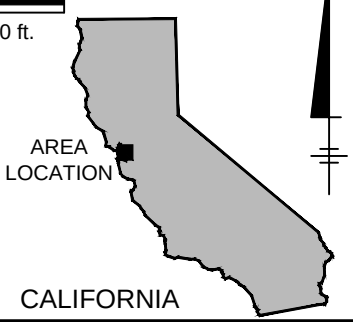

FORMER ARCO STATION #4931
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY: PETALUMA, CA DIV/GROUP: ENV DB: J. HARRIS
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XREFS: IMAGES: PROJECTNAME: ---
Oakland West.jpg

WEST STREET

A-12

A-11

DRIVEWAY

SIDEWALK

DRIVEWAY

D.I.

IRR.

PLANTER

D.I.

C.B.

IRR.

D.I.

A-9

SB-3

SV-1

A-8

A-5

SB-6

PRODUCT ISLAND

L13

L12

L1

L11

L10

L9

L2

L8

L3

L7

A-7

S12

S11

S10

S9

SV-3

SV-2

SS-SV-1

SB-5

A-4

A-10

AR-3

EXISTING
UNDERGROUND FUEL
STORAGE

AR-1

SS-SV-3

A-6

PRODUCT ISLANDS

S8

L4

L6

S7

L5

PRODUCT ISLANDS

S4

L3A

L5

S3

L3

BUILDING

BUILDING

KIOSK

SS-SV-2

SB-1A

SV-5

S6

L4

S2

L1

A-3

?

SW7

SW8

SW9

S5

L2

L11

IRR.

SIDEWALK

L8/L12

SW21

L7

SV-4

SW20

S1

L6/L9/L10

SW1

SV-6

SB-2

A-13

AV-1

AR-2

ST-A

FT-A

SW17

SW18

SW15

SW2

FORMER USTs

SW10

SW11

SW16

T1A

FORMER UST

T1B

SW12

SW19

ST-B

SW3

SW14

TREATMENT
ENCLOSURE

BLOCKWALL

SW4

SW5

A-2

SW6

SW13

BUILDING
GARAGE

BUILDING

BUILDING

WEST MACARTHUR BOULEVARD

LEGEND

- MONITORING WELL
- SOIL BORING (ARCADIS, OCTOBER 2010)
- SOIL SAMPLE LOCATION
- SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR PROBE (ARCADIS, MAY-JUNE 2011)
- SUB-SLAB SOIL VAPOR PROBE (ARCADIS, DECEMBER 2012)
- PRODUCT/VENT LINE
- WATER
- SANITARY SEWER
- STORM DRAIN

NOTE:

SITE MAP ADAPTED FROM FIGURES BY OTHERS.
ALL FEATURES AND LOCATIONS ARE APPROXIMATE.

N

0 20' 40'

Approximate Scale: 1 in. = 20 ft.

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE PLAN WITH HISTORICAL SAMPLING LOCATIONS

ARCADIS

FIGURE
2

CITY: EMERYVILLE, CA DIV/GROUP: ENVCAD DB: A. REYES, J. HARRIS
C:\Users\jharris\Desktop\ENVCAD\RETURN-TO\EMERYVILLE, CA\GP09BPNAC110\C00000\SITE INVESTIGATION\DWG\GP09BPNAC110-B02.dwg LAYOUT: 2 SAVED: 12/10/2014 7:13 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 12/10/2014
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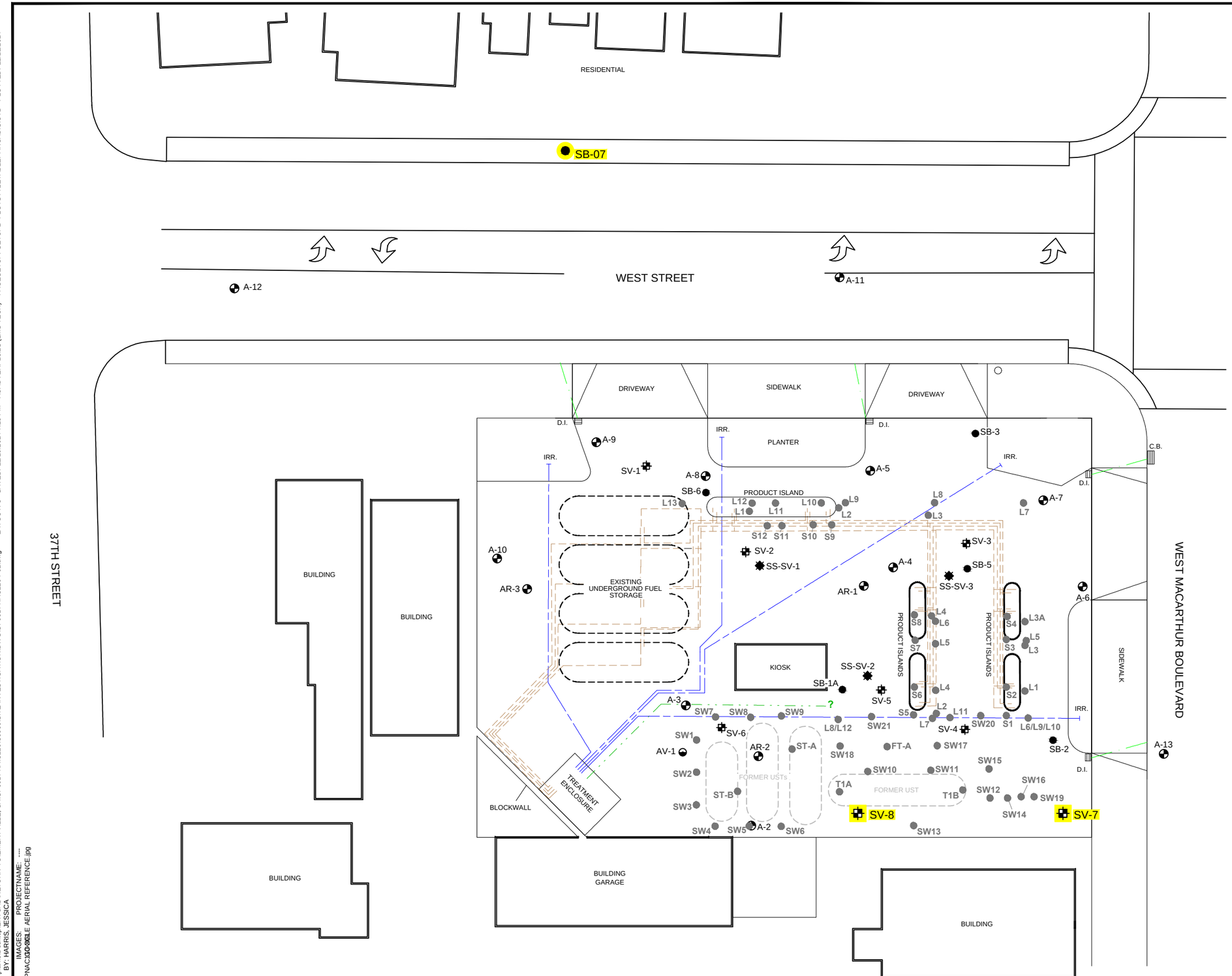

LEGEND

- MONITORING WELL
- SOIL BORING (ARCADIS, OCTOBER 2010)
- SOIL SAMPLE LOCATION
- SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR PROBE (ARCADIS, MAY-JUNE 2011)
- SUB-SLAB SOIL VAPOR PROBE (ARCADIS, DECEMBER 2012)
- PROPOSED SOIL VAPOR PROBE
- PROPOSED SOIL BORING
- PRODUCT/VENT LINE
- WATER
- SANITARY SEWER
- STORM DRAIN

NOTE:

SITE MAP ADAPTED FROM FIGURES BY OTHERS.
ALL FEATURES AND LOCATIONS ARE APPROXIMATE.

N

0 25' 50'

Approximate Scale: 1 in. = 25 ft.

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE PLAN WITH PROPOSED SAMPLE LOCATIONS

ARCADIS

FIGURE 3

CITY: EMERYVILLE, CA DIV/GROUP: ENVCAD DB: A. REYES, J. HARRIS
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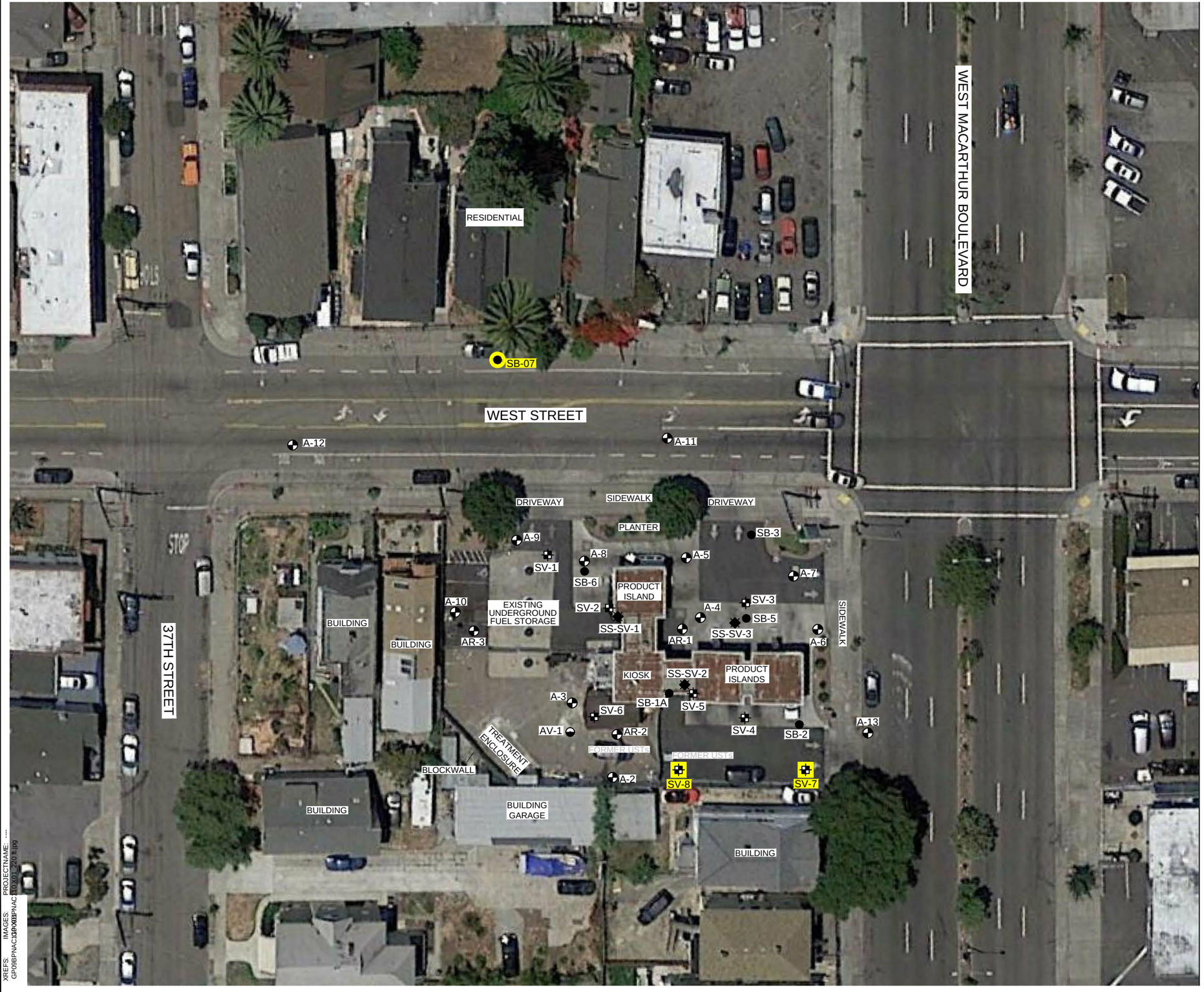
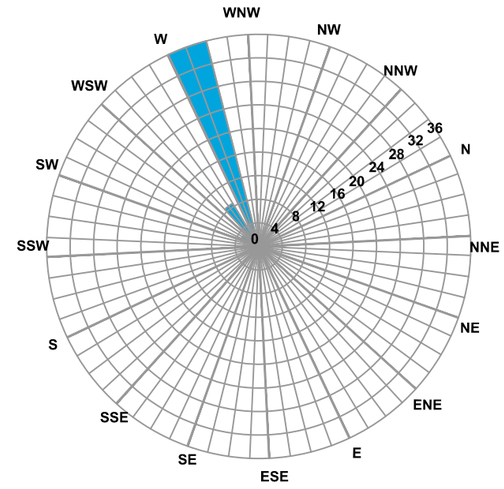


LEGEND

- MONITORING WELL
- SOIL BORING (ARCADIS, OCTOBER 2010)
- SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR PROBE (ARCADIS, MAY-JUNE 2011)
- SUB-SLAB SOIL VAPOR PROBE (ARCADIS, DECEMBER 2012)
- PROPOSED SOIL VAPOR PROBE
- PROPOSED SOIL BORING

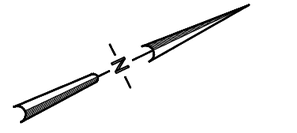


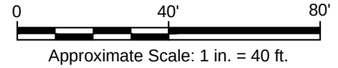
CONCENTRIC CIRCLES REPRESENT 48 MONITORING EVENTS CONDUCTED BETWEEN THE SECOND QUARTER 2000 THROUGH THE THIRD QUARTER 2014.

GROUNDWATER FLOW DIRECTION

NOTE:

SITE MAP ADAPTED FROM FIGURES BY OTHERS.
ALL FEATURES AND LOCATIONS ARE APPROXIMATE.
IMAGE SOURCE: GOOGLE™ EARTH, 6/9/2014.





Approximate Scale: 1 in. = 40 ft.

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE VICINITY AND PROPOSED SAMPLE LOCATIONS

ARCADIS

FIGURE
4

CITY: EMERYVILLE, CA DIV/GROUP: ENVCAD DB: A. REYES, J. HARRIS
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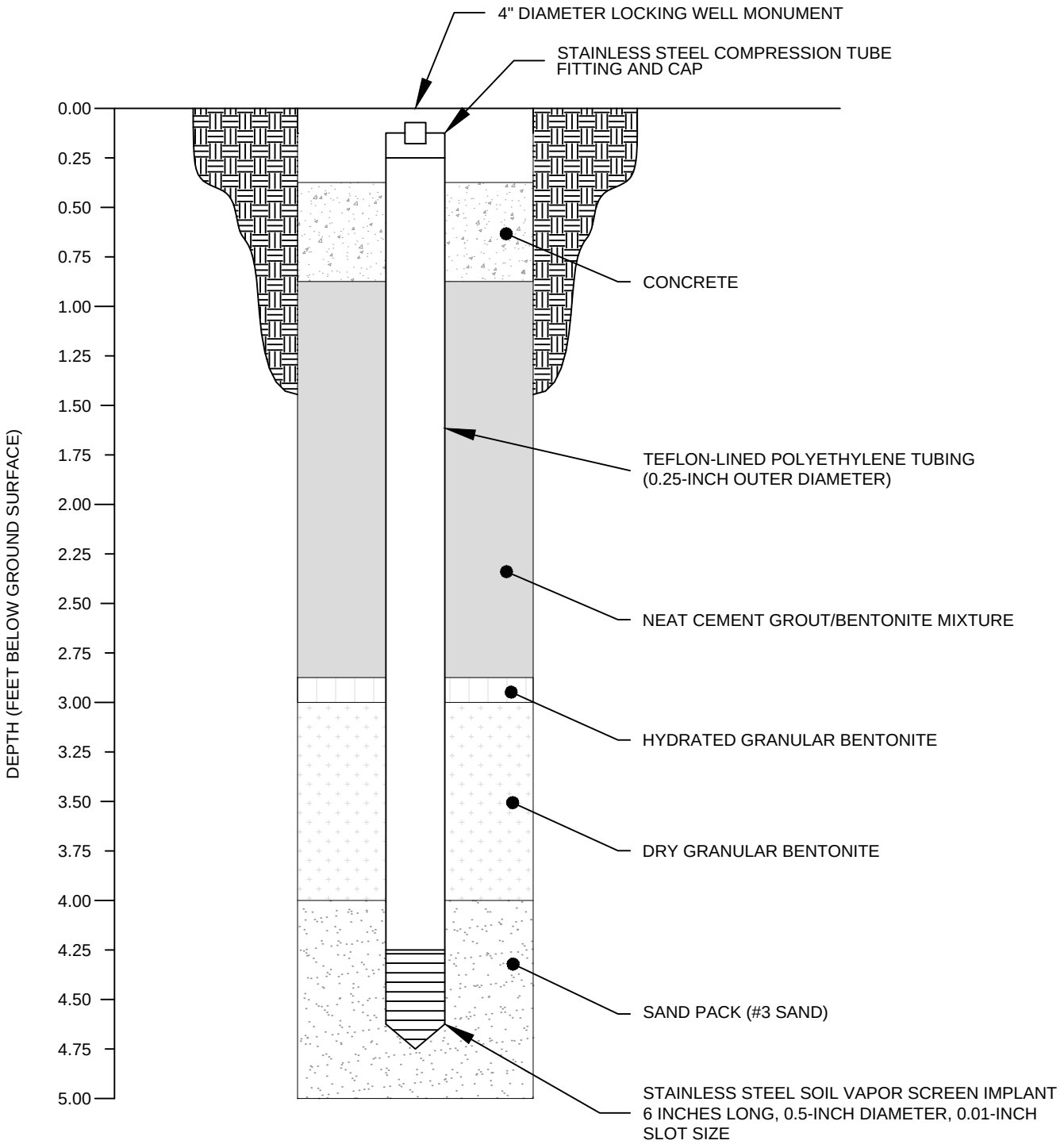


NOT TO SCALE

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

VAPOR PROBE SCHEMATIC DIAGRAM

ARCADIS

FIGURE
5

Appendix A

Sensitive Receptor Survey Questionnaire

ARCADIS U.S., Inc.
100 Montgomery Street
Suite 300
San Francisco
California 94104
Tel 415 374 2744
Fax 415 374 2745

PROPERTY OWNER OR CURRENT RESIDENT
Oakland, California

Subject:
Public Health Assessment - Neighborhood Basement, Sump, and Water Well Survey

ENVIRONMENTAL

Dear PROPERTY OWNER OR CURRENT RESIDENT:

Date:
December XX, 2014

Contact:
Hollis E. Phillips

Phone:
415.432.6903

Email:
hollis.phillips@arcadis-us.com

Our ref:
GP09BPNA.C110.Q0000

At the request of the Alameda County Environmental Health's (ACEH), ARCADIS U.S., Inc. (ARCADIS) is conducting a door-to-door survey of homes and properties in your neighborhood. The purpose is to identify any potential receptors that could be affected by the historic fuel released from the former ARCO service station located at the intersection of West MacArthur Boulevard and West Street in Oakland. The attached map shows the location of the service station in relation to your neighborhood.

P**lease complete and return the survey so that we may better assist the ACEH monitor and protect your groundwater**. It is permissible to write "unknown" if you simply don't know.

Once completed, please send the survey form back to our San Rafael office in the enclosed self-addressed and stamped envelope. It may also be scanned or photographed and emailed to hollis.phillips@arcadis-us.com.

If you have any questions or comments regarding the content of this letter, please contact Hollis E. Phillips by telephone (415.432.6903) or by e-mail (hollis.phillips@arcadis-us.com), or contact Jamey Peterson by telephone (707.889.6739) or by e-mail (jamey.peterson@arcadis-us.com). You may also contact Mr. Mark E. Detterman of the ACEH by telephone (510.567.6876) or by email (mark.detterman@acgov.org).

Sincerely,
ARCADIS U.S., Inc.

Prepared by:

Jamey Peterson
Project Geologist

Approved by:

REGISTERED GEOLOGIST
HOLLIS E. PHILLIPS
HEP
No. 6887
STATE OF CALIFORNIA

Project Manager/ Principal Geologist

Attachments:
Figure 1 Site Vicinity Map
Self-Addressed Stamped Envelope

Property Information

Street Address: XXX West Street, Oakland APN: xxx-xxx-xxx

Name of property owner (and your name of tenant if applicable):

_____

Owner address: _____

Does the property have a *water well*? **Yes or No**

A Sump pump? **Yes or No**

A Basement? **Yes or No**

Please continue below only if you have answered Yes to the above questions.

Owner telephone number: _____

Residence's telephone number: _____

Is the subject site used for commercial or residential purposes? _____

Is there currently a multi-family complex at the property (e.g. apartment building)?

_____

SECTION A – ***Please complete if a well exists at the subject site***

Number of wells: _____ Well Diameter(s):_____

Well Depth(s): _____ Pump Depth(s): _____

Material used for the well casing: _____

Date(s) the well(s) were installed: _____

How frequently are the well(s) used? _____

Approximate gallons of water pumped during each well cycle: _____

What is the well water used for?

_____

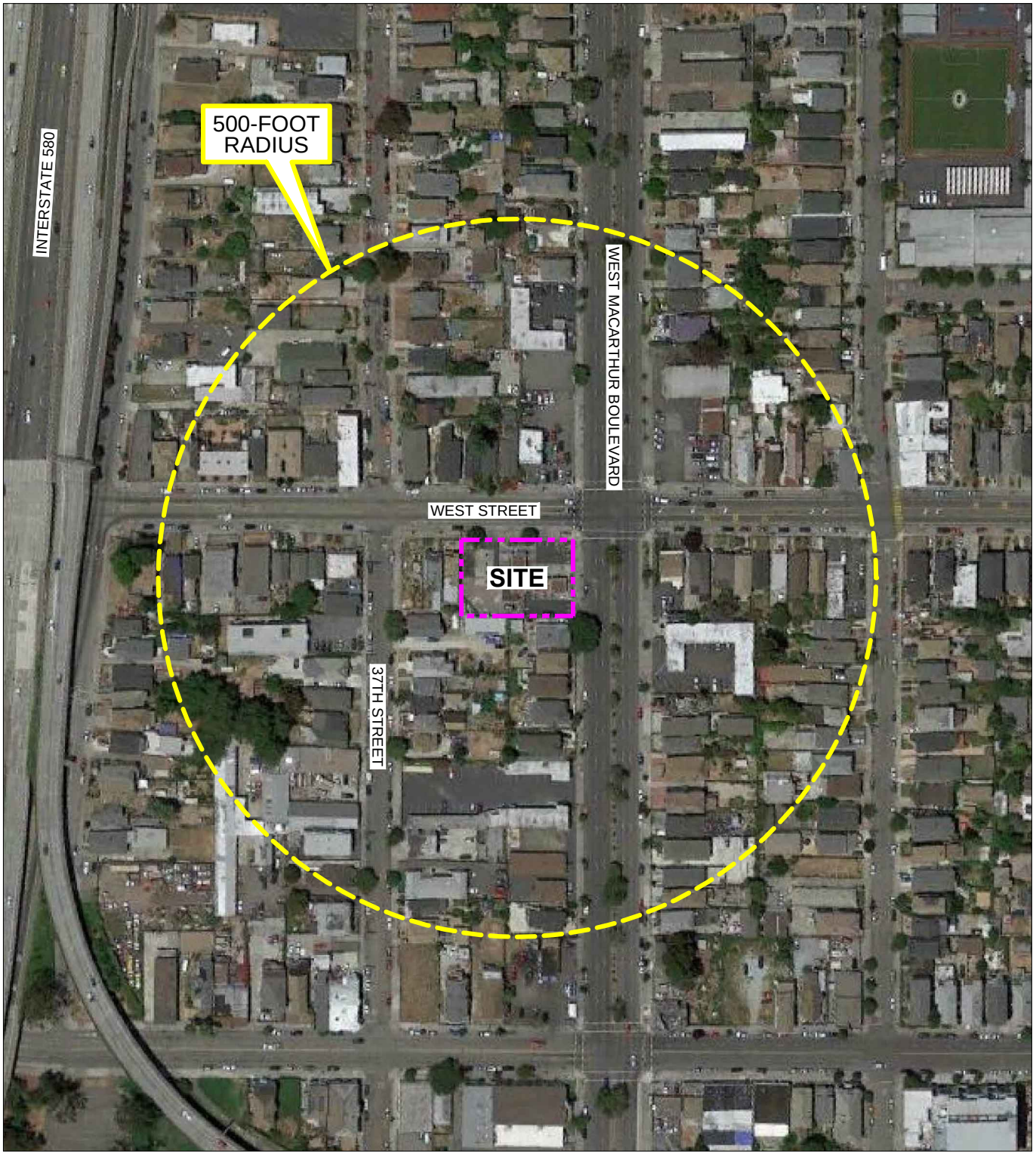
SECTION B – ***Please complete if you have a sump which pumps groundwater***

Frequency of Use: _____

Approximate gallons of water pumped from the sump each day: _____

Where is the sump water discharged? _____

Thank you again for you time.



REFERENCE: GOOGLE™ EARTH, IMAGE DATE 6/9/2014.

0 200' 400'

Approximate Scale: 1 in. = 200 ft.

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE VICINITY MAP

ARCADIS

FIGURE
1

Appendix B

Linear Regression Analysis

Appendix B - Linear Regression Analysis

Former ARCO Service Station No. 4931
731 W. MacArthur Boulevard
Oakland, California 94609

Linear Regression Analysis

A statistical analysis of groundwater monitoring data was completed to assess the temporal trends in gasoline range organics (GRO), benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tert butyl ether (MTBE), and tert-butyl alcohol (TBA) concentrations at selected groundwater monitoring wells and derive a time to reach remedial goals or screening levels (SL). The statistical analysis was based on a review of the available historical groundwater monitoring data from the site groundwater monitoring wells. The screening process included comparing the historical monitoring data for GRO, BTEX, MTBE, and TBA to SLs summarized in Table 1 of Appendix B below, and selecting a list of candidates for linear regression analyses. Constituents were selected for linear regression analysis based on the following criteria:

(1) The dataset has a minimum of eight analytical results
(2) A minimum of 75 percent detections in a dataset
(3) Any of the monitoring data is above the SL during the last four years (since 2010)

Based on these criteria, linear regression analysis was performed for GRO and benzene at monitoring wells A-4 and A-8; MTBE at monitoring wells A-2, A-4, A-5, A-8 and A-10 as well as TBA at monitoring wells A-4 and A-5.

Linear Regression Methodology

Linear regression analyses using natural log-normalized concentration data were conducted to estimate trend direction, rate of concentration decrease, and approximate time to achieve SLs for the selected locations and constituents following USEPA protocols (2002). Results of the linear regression analyses, including coefficients of determination (R^2 values), p-values of the correlation, and trend directions, are summarized in Table 1 of Appendix B; individual analyses are also included in Attachments B-1 through Attachment B-11. The R^2 value is a measure of how well the linear regression fits the site data; R^2 values less than 0.1 indicate poor model fits while R^2 values greater than 0.5 indicate stronger model fits. Results with R^2 values less than 0.1 and a large scatter in data points were defined as datasets with no discernible trend (no trend). The p-value of the correlation provides a measure of the level of significance of the statistical test. Correlations were accepted as significant for p-values less than or equal to 0.05 (95 percent confidence level) and were considered not significant for p-values greater than 0.05. The trend direction was defined as decreasing if the slope of the linear regression was negative and increasing if the slope of the regression was positive.

Where non-detect or qualified values were used in computations, the concentrations were set equal to the laboratory reporting limits or reported value, where available. Use of the laboratory reporting limit for concentrations that were below detection provides a conservative estimate for evaluating the concentration trends through time.

Linear Regression Results

Results of the linear regression analysis are summarized in Table 1 of Appendix B.

Appendix B - Linear Regression Analysis
Former ARCO Service Station No. 4931
731 W. MacArthur Boulevard
Oakland, California 94609

GRO: Results of the linear regression analyses indicated statistically significant decreasing concentration trends for GRO in groundwater at A-4 and A-8, and concentrations of GRO at these locations are projected to reach the SL in 2033 and 2025, respectively.

Benzene: Result of the linear regression analysis indicated statistically significant decreasing concentration trend for benzene in groundwater at A-4, and concentration of benzene at this location is projected to reach the SL in 2019. Benzene was non-detect in February and August 2014. No apparent trend was derived for benzene concentrations at A-8, but the concentrations are stable, as presented in Attachment B-4. This indicates that the plume core of benzene is stable and not expanding.

MTBE: Results of the linear regression analyses indicated statistically significant decreasing concentration trends for MTBE in groundwater at A-4 and A-8, and concentrations of MTBE at these locations are projected to reach the SL in 2019 and 2016, respectively. Results of the linear regression analyses also indicated statistically significant decreasing concentration trends for MTBE in groundwater at A-5 and A-10, and were projected to reach the SL in 2009 and 2012 respectively. MTBE has been below the SL since February 2014; however, A-10 had a detection of MTBE at 6.1 µg/L during August 2014 which is slightly above the SL of 5 µg/L. Although MTBE has not reached the SL at A-10, the overall concentrations are decreasing, as indicated in Attachment B-9. At A-2, no apparent trend was derived for MTBE concentrations, but the concentrations are stable, as presented in Attachment B-5. The most recent detection was 8.9 µg/L in August 2014, which is slightly above the SL.

TBA: No apparent trend was derived for TBA concentrations at A-4, but the concentrations are stable or decreasing, as presented in Attachment B-10. This indicates that the plume core of TBA is stable and not expanding. Results of the linear regression analysis indicated statistically significant decreasing concentration trend for TBA in groundwater at A-5, and concentrations of TBA at this location was projected to reach the SL in 2011. A-5 has not been monitored since August 2010; TBA in groundwater at this location during the last monitoring event was 30 µg/L.

In summary, GRO concentrations at A-4 and A-8; benzene concentrations at A-4; MTBE concentrations at A-4, A-5, A-8 and A-10; and TBA concentrations at A-5 are statistically decreasing and are predicted to reach SLs by year 2033, assuming that the attenuation rates in the future are comparable to the rates derived from the data points included in this evaluation. Although no apparent trend can be derived from benzene concentrations at A-8; MTBE concentrations at A-2; and TBA concentrations at A-4, visual observations of the monitoring data indicated a stable or decreasing trend. These analyses suggested that the groundwater plumes at the site are stable and not migrating.

Reference:

U.S. Environmental Protection Agency (USEPA). 2002. Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies. EPA/540/S-02/500, National Risk Management Research Laboratory, Office of Research and Development, Cincinnati, OH. www.epa.gov/swerust1/oswermna/mna_epas.htm.

Table 1 - Appendix B
Summary of Statistical Analysis of Groundwater Analytical Data
Former ARCO Service Station No. 4931
731 W. MacArthur Boulevard, Oakland, California 94609
ACEH Site No.: RO0000076

Constituent	Well	Cleanup Goal/Screening Level/Remediation goal (µg/L)[1]	Data Range						Linear Regression Analysis						Notes
			Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Concentration Measured Most Recently (µg/L)	% of Data Above Laboratory Reporting Limit	Start Date	End Date	Coefficient of Determination, R-squared[2]	p-value of Correlation (Significance of Slope)	Attenuation Half-life (days)	Trend Direction	Significance of Trend[3]	Projected Year to Screening Level	
GRO	A-4	100	*50*	6,000	1,900	88	6/21/2000	8/28/2014	0.15	<0.01	2,512	Decreasing	Significant	2033	
GRO	A-8	100	*50*	13,000	1,000	85	6/21/2000	8/28/2014	0.22	<0.01	1,564	Decreasing	Significant	2025	
Benzene	A-4	1	*0.5*	230	*5*	81	6/21/2000	8/28/2014	0.45	<0.01	962	Decreasing	Significant	2019	Non-detect in 2014
Benzene	A-8	1	*0.5*	3,500	130	96	6/21/2000	8/28/2014	0.03	0.24	NA	No Trend	NS	NA	
MTBE	A-2	5	0.74	19	8.9	100	8/11/2006	8/28/2014	0.02	0.69	NA	No Trend	NS	NA	
MTBE	A-4	5	*0.5*	4,700	41	96	6/21/2000	8/28/2014	0.54	<0.01	721	Decreasing	Significant	2019	
MTBE	A-5	5	*0.5*	3,200	3.7	86	6/21/2000	8/28/2014	0.52	<0.01	504	Decreasing	Significant	2009	BSL in 2014
MTBE	A-8	5	*0.5*	6,500	15	98	6/21/2000	8/28/2014	0.66	<0.01	580	Decreasing	Significant	2016	
MTBE	A-10	5	1.8	270	6.1	100	9/2/2004	8/28/2014	0.58	0.01	700	Decreasing	Significant	2012	6.1 µg/L on 8/28/2014
TBA	A-4	12	10	3,400	1,600	97	9/2/2004	8/28/2014	0.10	0.09	NA	No Trend	NS	NA	
TBA	A-5	12	*10*	1,100	35	93	2/2/2004	8/16/2010	0.53	<0.01	480	Decreasing	Significant	2011	Not sampled since 8/2010

Notes, Abbreviations and Assumptions:
µg/L = micrograms per liter
BSL = below screening level
NS = not significant
NA = not applicable due to increasing trend or non-significant trend
[1] Mention source/reference of CGs/SLs/RGs here.
[2] Linear regression analysis with R^2 values <0.1 and no statistically significant trend were defined as having no apparent trend (No Trend).
[3] Statistically significant trend defined as having p-value ≤ 0.05
Data in italics ND taken at reporting limit/reported value
GRO = gasoline range organics
MTBE = methyl tertiary-butyl ether
TBA = tert-butyl alcohol

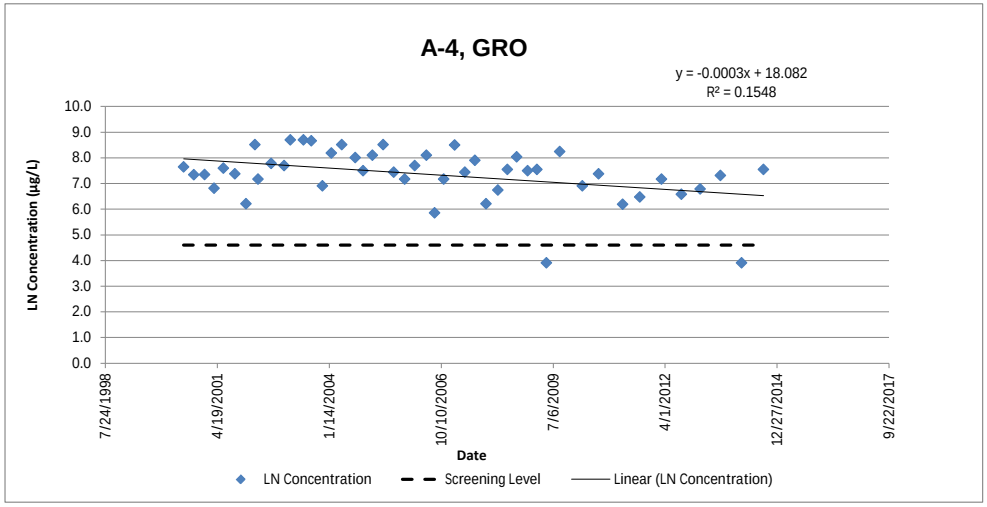
Appendix B - Screening Levels of the Linear Regression Analysis

Constituent	Screening Levels (µg/L)
B	1
E	300
GRO	100
MTBE	5
T	150
TBA	12
X	1750

Note:
2013 Tier 1/ Drinking Water ESLs
GRO = Gasoline range organics
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
MTBE = Methyl tert butyl ether
TBA = Tert-butyl alcohol

Attachment B-1
Sample Information
Sample Location **A-4**
Constituent GRO

Data		
Sample Date	Concentration (ug/L)	LN Concentration
6/21/2000	2,100	7.65
9/20/2000	1,540	7.34
12/26/2000	1,550	7.35
3/20/2001	913	6.82
6/12/2001	2,000	7.60
9/23/2001	1,600	7.38
12/31/2001	500	6.21
3/21/2002	5,000	8.52
4/17/2002	1,300	7.17
8/12/2002	2,400	7.78
12/6/2002	2,200	7.70
1/30/2003	6,000	8.70
5/28/2003	6,000	8.70
8/6/2003	5,800	8.67
11/14/2003	1,000	6.91
2/2/2004	3,600	8.19
5/4/2004	5,000	8.52
9/2/2004	3,000	8.01
11/10/2004	1,800	7.50
2/2/2005	3,300	8.10
5/9/2005	5,000	8.52
8/11/2005	1,700	7.44
11/18/2005	1,300	7.17
2/15/2006	2,200	7.70
5/30/2006	3,300	8.10
8/11/2006	350	5.86
11/1/2006	1,300	7.17
2/7/2007	4,900	8.50
5/9/2007	1,700	7.44
8/7/2007	2,700	7.90
11/14/2007	500	6.21
2/28/2008	850	6.75
5/23/2008	1,900	7.55
8/13/2008	3,100	8.04
11/19/2008	1,800	7.50
2/10/2009	1,900	7.55
5/7/2009	50	3.91
9/3/2009	3,800	8.24
3/23/2010	1,000	6.91
8/16/2010	1,600	7.38
3/18/2011	490	6.19
8/18/2011	650	6.48
2/29/2012	1,300	7.17
8/24/2012	720	6.58
2/8/2013	890	6.79
8/7/2013	1500	7.31
2/13/2014	50	3.91
8/28/2014	1,900	7.55



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	48
# of nondetects	6
% of data as detects	88

Results		
Coefficient of Determination (R^2) =	0.1548	
p-Value =	5.66E-03	
Attenuation Rate in Groundwater (K) =	0.0003	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0001	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	2.51E+03	days

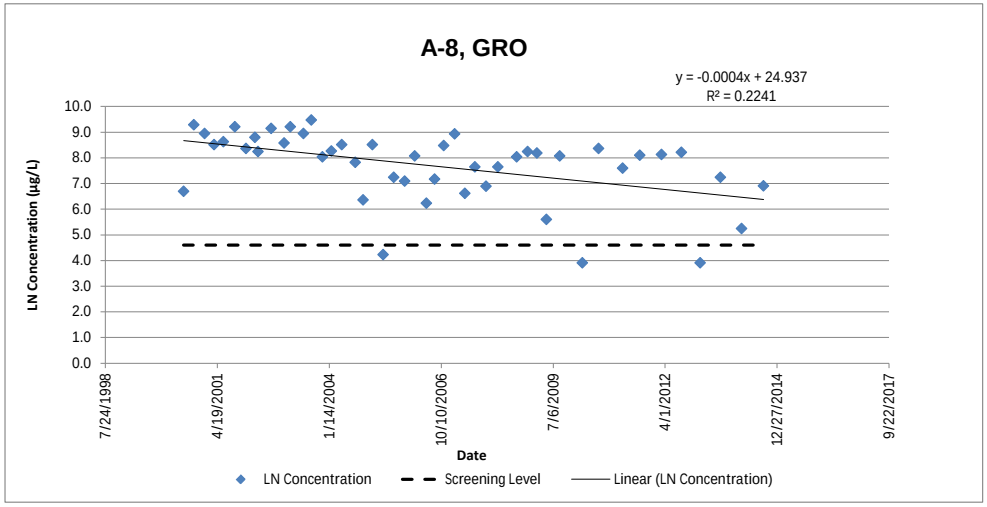
Date Screening Level Reached	
Screening Level	100
LN Screening Level	4.6
Intercept	18.082
Slope	-0.0003
Date to Screening Level	10/2/2033

Abbreviations and Notes

ug/l = micrograms per liter
LN = Natural Logarithm
GRO = gasoline range organics

Attachment B-2
Sample Information
Sample Location **A-8**
Constituent GRO

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
6/21/2000	810	6.70
9/20/2000	10,800	9.29
12/26/2000	7,700	8.95
3/20/2001	5,000	8.52
6/12/2001	5,600	8.63
9/23/2001	10,000	9.21
12/31/2001	4,300	8.37
3/21/2002	6,600	8.79
4/17/2002	3,800	8.24
8/12/2002	9,400	9.15
12/6/2002	5,300	8.58
1/30/2003	10,000	9.21
5/28/2003	7,700	8.95
8/6/2003	13,000	9.47
11/14/2003	3,100	8.04
2/2/2004	3,900	8.27
5/4/2004	5,000	8.52
9/2/2004	2,500	7.82
11/10/2004	580	6.36
2/2/2005	5,000	8.52
5/9/2005	69	4.23
8/11/2005	1,400	7.24
11/18/2005	1,200	7.09
2/15/2006	3,200	8.07
5/30/2006	510	6.23
8/11/2006	1,300	7.17
11/1/2006	4,800	8.48
2/7/2007	7,600	8.94
5/9/2007	750	6.62
8/7/2007	2,100	7.65
11/14/2007	990	6.90
2/28/2008	2,100	7.65
8/13/2008	3,100	8.04
11/19/2008	3,800	8.24
2/10/2009	3,600	8.19
5/7/2009	270	5.60
9/3/2009	3,200	8.07
3/23/2010	50	3.91
8/16/2010	4,300	8.37
3/18/2011	2,000	7.60
8/18/2011	3,300	8.10
2/29/2012	3,400	8.13
8/24/2012	3,700	8.22
2/8/2013	50	3.91
8/7/2013	1400	7.24
2/13/2014	190	5.25
8/28/2014	1,000	6.91



Notes:

	ND taken at reporting limit/reported value
	Qualified data converted to reported value

Data quality	
Total # of data points used in regression	47
# of nondetects	7
% of data as detects	85

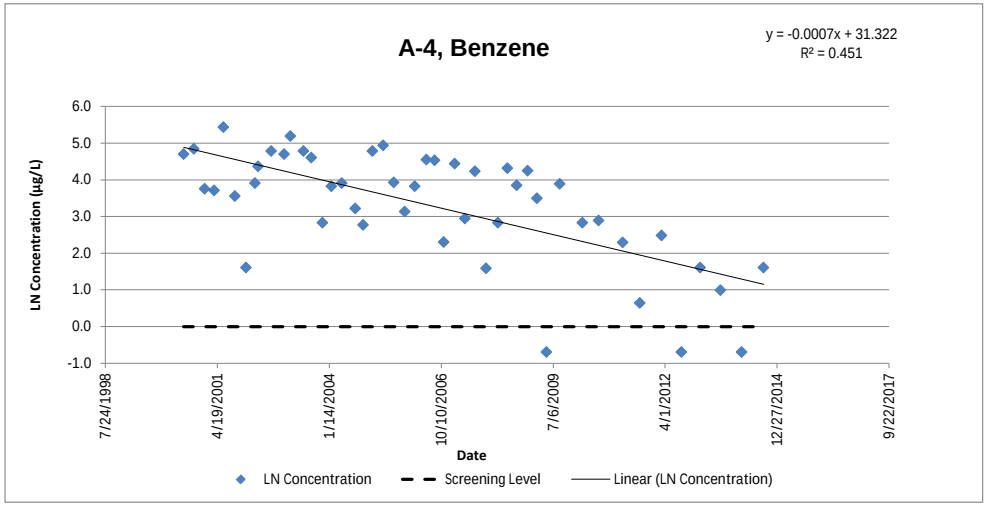
Results		
Coefficient of Determination (R^2) =	0.2241	
p-Value =	7.78E-04	
Attenuation Rate in Groundwater (K) =	0.0004	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0002	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	1.56E+03	days

Date Screening Level Reached	
Screening Level	100
LN Screening Level	4.6
Intercept	24.937
Slope	-0.0004
Date to Screening Level	8/5/2025

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
GRO = gasoline range organics

Attachment B-3
Sample Information
Sample Location **A-4**
Constituent Benzene

Data		
Sample Date	Concentration (ug/L)	LN Concentration
6/21/2000	110	4.70
9/20/2000	127	4.84
12/26/2000	42.7	3.75
3/20/2001	40.9	3.71
6/12/2001	230	5.44
9/23/2001	35	3.56
12/31/2001	5	1.61
3/21/2002	50	3.91
4/17/2002	79	4.37
8/12/2002	120	4.79
12/6/2002	110	4.70
1/30/2003	180	5.19
5/28/2003	120	4.79
8/6/2003	100	4.61
11/14/2003	17	2.83
2/2/2004	46	3.83
5/4/2004	50	3.91
9/2/2004	25	3.22
11/10/2004	16	2.77
2/2/2005	120	4.79
5/9/2005	140	4.94
8/11/2005	51	3.93
11/18/2005	23	3.14
2/15/2006	46	3.83
5/30/2006	95	4.55
8/11/2006	93	4.53
11/1/2006	10	2.30
2/7/2007	85	4.44
5/9/2007	19	2.94
8/7/2007	69	4.23
11/14/2007	4.9	1.59
2/28/2008	17	2.83
5/23/2008	75	4.32
8/13/2008	47	3.85
11/19/2008	70	4.25
2/10/2009	33	3.50
5/7/2009	0.5	-0.69
9/3/2009	49	3.89
3/23/2010	17	2.83
8/16/2010	18	2.89
3/18/2011	9.9	2.29
8/18/2011	1.9	0.64
2/29/2012	12	2.48
8/24/2012	0.5	-0.69
2/8/2013	5	1.61
8/7/2013	2.7	0.99
2/13/2014	0.5	-0.69
8/28/2014	5.0	1.61



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	48
# of nondetects	9
% of data as detects	81

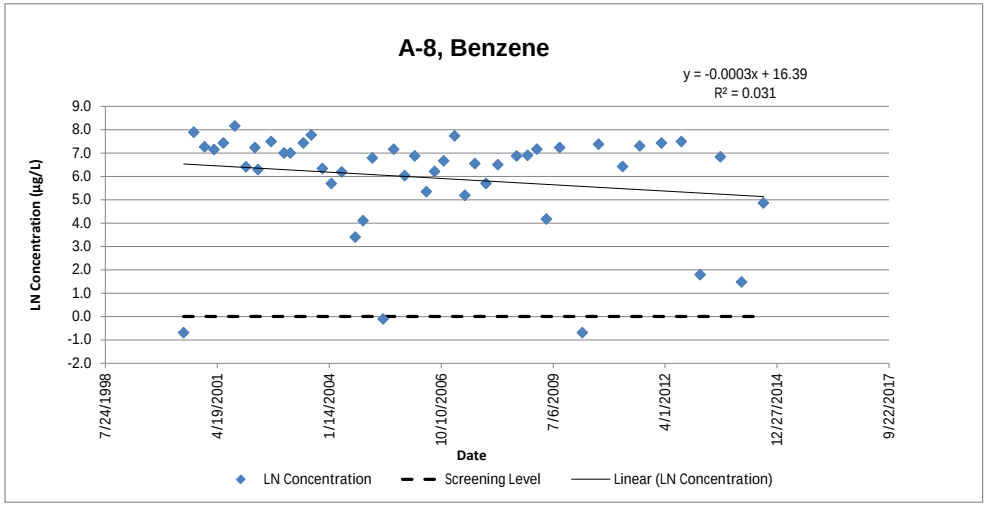
Results		
Coefficient of Determination (R^2) =	0.4510	
p-Value =	1.74E-07	
Attenuation Rate in Groundwater (K) =	0.0007	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0005	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	9.62E+02	days

Date Screening Level Reached	
Screening Level	1
LN Screening Level	0.0
Intercept	31.322
Slope	-0.0007
Date to Screening Level	1/13/2019

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm

Attachment B-4
Sample Information
Sample Location **A-8**
Constituent Benzene

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
6/21/2000	0.5	-0.69
9/20/2000	2,680	7.89
12/26/2000	1,440	7.27
3/20/2001	1,280	7.15
6/12/2001	1,700	7.44
9/23/2001	3,500	8.16
12/31/2001	610	6.41
3/21/2002	1,400	7.24
4/17/2002	540	6.29
8/12/2002	1,800	7.50
12/6/2002	1,100	7.00
1/30/2003	1,100	7.00
5/28/2003	1,700	7.44
8/6/2003	2,400	7.78
11/14/2003	570	6.35
2/2/2004	300	5.70
5/4/2004	490	6.19
9/2/2004	30	3.40
11/10/2004	61	4.11
2/2/2005	890	6.79
5/9/2005	0.9	-0.11
8/11/2005	1,300	7.17
11/18/2005	420	6.04
2/15/2006	970	6.88
5/30/2006	210	5.35
8/11/2006	500	6.21
11/1/2006	790	6.67
2/7/2007	2,300	7.74
5/9/2007	180	5.19
8/7/2007	700	6.55
11/14/2007	300	5.70
2/28/2008	670	6.51
8/13/2008	970	6.88
11/19/2008	1,000	6.91
2/10/2009	1,300	7.17
5/7/2009	65	4.17
9/3/2009	1,400	7.24
3/23/2010	0.5	-0.69
8/16/2010	1,600	7.38
3/18/2011	620	6.43
8/18/2011	1,500	7.31
2/29/2012	1,700	7.44
8/24/2012	1,800	7.50
2/8/2013	6	1.79
8/7/2013	940	6.85
2/13/2014	4.4	1.48
8/28/2014	130	4.87



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	47
# of nondetects	2
% of data as detects	96

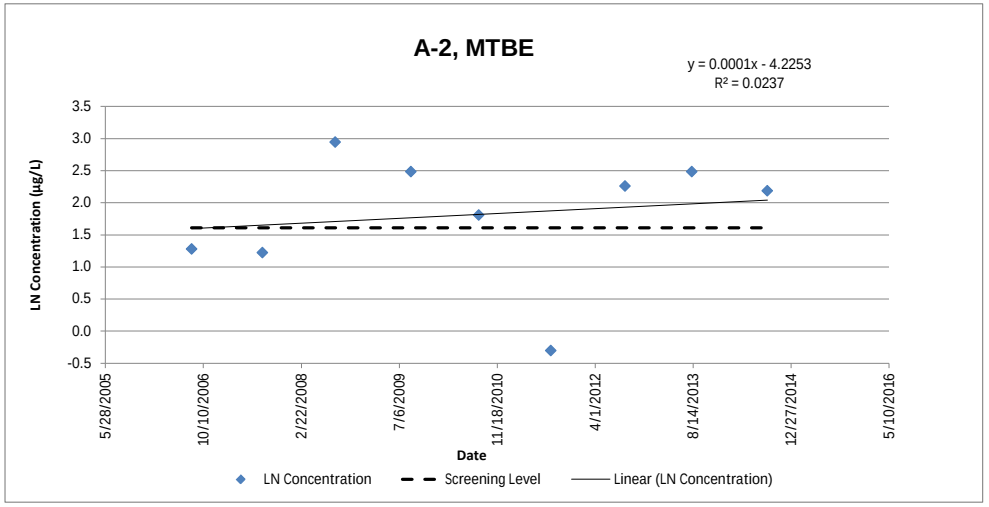
Results		
Coefficient of Determination (R^2) =	0.0310	
p-Value =	2.36E-01	
Attenuation Rate in Groundwater (K) =	0.0003	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	-0.0002	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	NA	days

Date Screening Level Reached	
Screening Level	1
LN Screening Level	0.0
Intercept	16.390
Slope	-0.0003
Date to Screening Level	NA

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm

Attachment B-5
Sample Information
Sample Location **A-2**
Constituent MTBE

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
8/11/2006	3.6	1.28
8/7/2007	3.4	1.22
8/13/2008	19	2.94
9/3/2009	12	2.48
8/16/2010	6.1	1.81
8/18/2011	0.74	-0.30
8/31/2012	9.6	2.26
8/7/2013	12	2.48
8/28/2014	8.9	2.19



Notes:

	ND taken at reporting limit/reported value
	Qualified data converted to reported value

Data quality	
Total # of data points used in regression	9
# of nondetects	0
% of data as detects	100

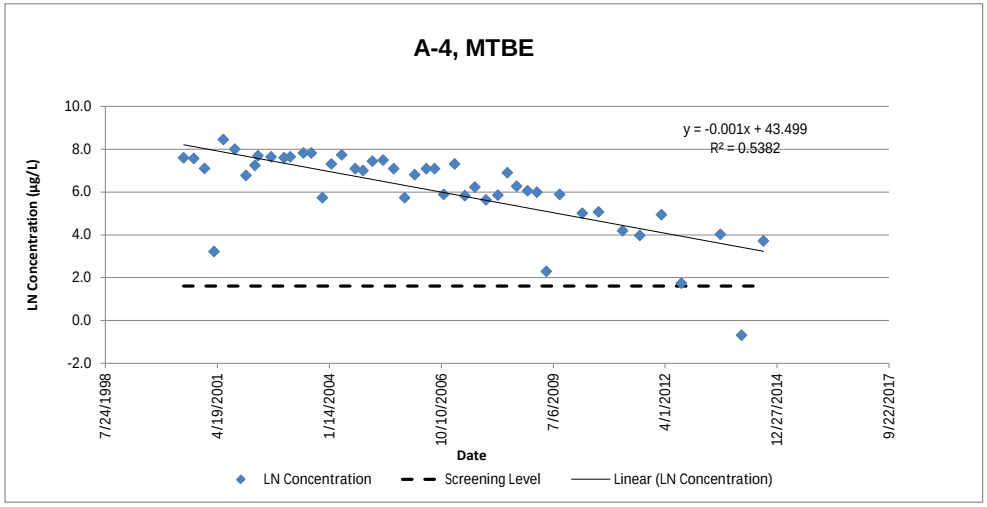
Results		
Coefficient of Determination (R^2) =	0.0237	
p-Value =	6.93E-01	
Attenuation Rate in Groundwater (K) =	-0.0001	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	-0.0010	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	NA	days

Date Screening Level Reached	
Screening Level	5
LN Screening Level	1.6
Intercept	-4.225
Slope	0.0001
Date to Screening Level	NA

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
MTBE = methyl tertiary-butyl ether

Attachment B-6
Sample Information
Sample Location **A-4**
Constituent MTBE

Data		
Sample Date	Concentration (ug/L)	LN Concentration
6/21/2000	2,000	7.60
9/20/2000	1,940	7.57
12/26/2000	1,210	7.10
3/20/2001	25	3.22
6/12/2001	4,700	8.46
9/23/2001	3,000	8.01
12/31/2001	880	6.78
3/21/2002	1,400	7.24
4/17/2002	2,200	7.70
8/12/2002	2,100	7.65
12/6/2002	2,000	7.60
1/30/2003	2,100	7.65
5/28/2003	2,500	7.82
8/6/2003	2,500	7.82
11/14/2003	310	5.74
2/2/2004	1,500	7.31
5/4/2004	2,300	7.74
9/2/2004	1,200	7.09
11/10/2004	1,100	7.00
2/2/2005	1,700	7.44
5/9/2005	1,800	7.50
8/11/2005	1,200	7.09
11/18/2005	310	5.74
2/15/2006	910	6.81
5/30/2006	1,200	7.09
8/11/2006	1,200	7.09
11/1/2006	360	5.89
2/7/2007	1,500	7.31
5/9/2007	340	5.83
8/7/2007	510	6.23
11/14/2007	280	5.63
2/28/2008	350	5.86
5/23/2008	1,000	6.91
8/13/2008	530	6.27
11/19/2008	430	6.06
2/10/2009	400	5.99
5/7/2009	9.9	2.29
9/3/2009	360	5.89
3/23/2010	150	5.01
8/16/2010	160	5.08
3/18/2011	66	4.19
8/18/2011	53	3.97
2/29/2012	140	4.94
8/24/2012	5.7	1.74
8/7/2013	56	4.03
2/13/2014	0.5	-0.69
8/28/2014	41	3.71



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	47
# of nondetects	2
% of data as detects	96

Results		
Coefficient of Determination (R^2) =	0.5382	
p-Value =	4.46E-09	
Attenuation Rate in Groundwater (K) =	0.0010	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0007	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	7.21E+02	days

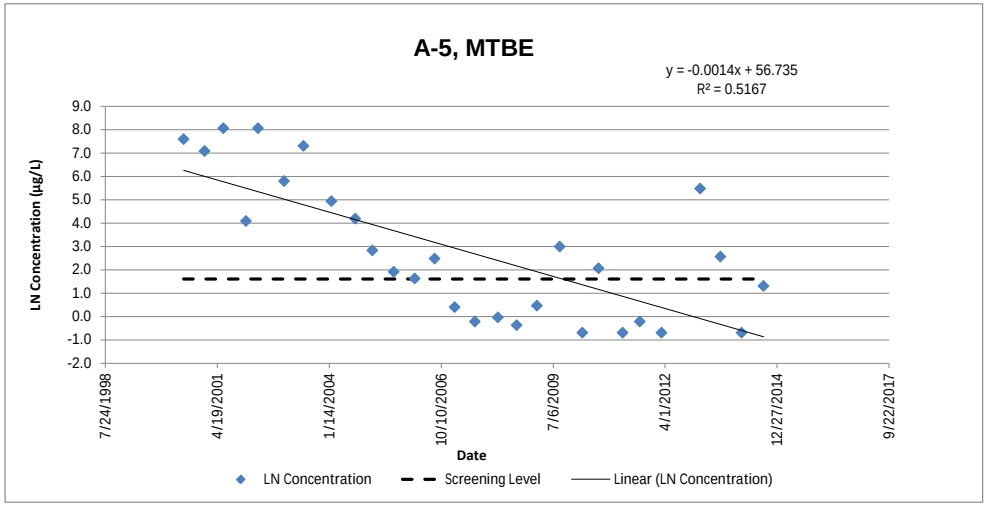
Date Screening Level Reached	
Screening Level	5
LN Screening Level	1.6
Intercept	43.499
Slope	-0.0010
Date to Screening Level	4/12/2019

Abbreviations and Notes

ug/l = micrograms per liter
LN = Natural Logarithm
MTBE = methyl tertiary-butyl ether

Attachment B-7
Sample Information
Sample Location **A-5**
Constituent MTBE

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
6/21/2000	2,000	7.60
12/26/2000	1,200	7.09
6/12/2001	3,200	8.07
12/31/2001	60	4.09
4/17/2002	3,200	8.07
12/6/2002	330	5.80
5/28/2003	1,500	7.31
2/2/2004	140	4.94
9/2/2004	66	4.19
2/2/2005	17	2.83
8/11/2005	6.8	1.92
2/15/2006	5.1	1.63
8/11/2006	12	2.48
2/7/2007	1.5	0.41
8/7/2007	0.81	-0.21
2/28/2008	0.97	-0.03
8/13/2008	0.69	-0.37
2/10/2009	1.6	0.47
9/3/2009	20	3.00
3/23/2010	0.5	-0.69
8/16/2010	7.9	2.07
3/18/2011	0.5	-0.69
8/18/2011	0.81	-0.21
2/29/2012	0.5	-0.69
2/8/2013	240	5.48
8/7/2013	13	2.56
2/13/2014	0.5	-0.69
8/28/2014	3.7	1.31



Notes:

	ND taken at reporting limit/reported value
	Qualified data converted to reported value

Data quality	
Total # of data points used in regression	28
# of nondetects	4
% of data as detects	86

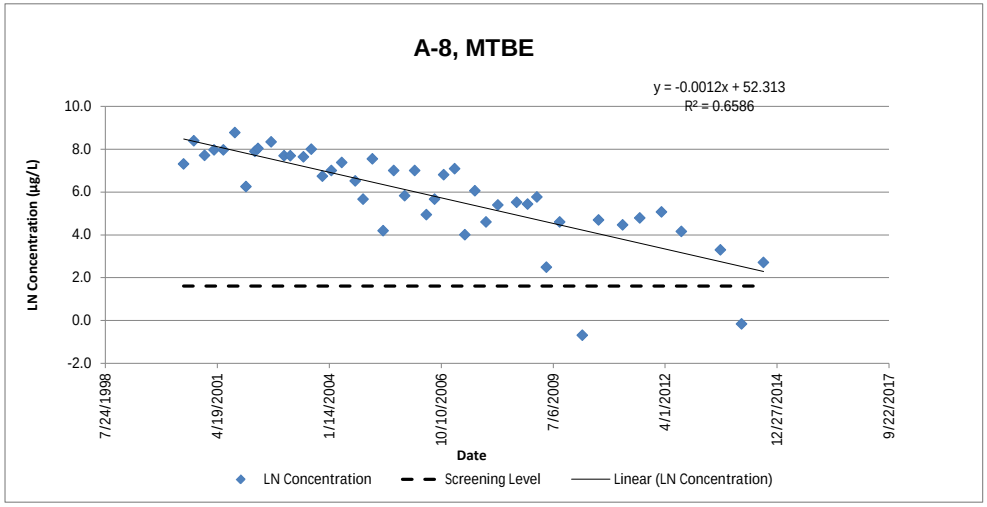
Results		
Coefficient of Determination (R^2) =	0.5167	
p-Value =	1.64E-05	
Attenuation Rate in Groundwater (K) =	0.0014	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0008	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	5.04E+02	days

Date Screening Level Reached	
Screening Level	5
LN Screening Level	1.6
Intercept	56.735
Slope	-0.0014
Date to Screening Level	9/22/2009

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
MTBE = methyl tertiary-butyl ether

Attachment B-8
Sample Information
Sample Location **A-8**
Constituent MTBE

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
6/21/2000	1,500	7.31
9/20/2000	4,410	8.39
12/26/2000	2,230	7.71
3/20/2001	2,880	7.97
6/12/2001	2,900	7.97
9/23/2001	6,500	8.78
12/31/2001	520	6.25
3/21/2002	2,700	7.90
4/17/2002	3,100	8.04
8/12/2002	4,200	8.34
12/6/2002	2,200	7.70
1/30/2003	2,200	7.70
5/28/2003	2,100	7.65
8/6/2003	3,000	8.01
11/14/2003	850	6.75
2/2/2004	1,100	7.00
5/4/2004	1,600	7.38
9/2/2004	680	6.52
11/10/2004	290	5.67
2/2/2005	1,900	7.55
5/9/2005	66	4.19
8/11/2005	1,100	7.00
11/18/2005	340	5.83
2/15/2006	1,100	7.00
5/30/2006	140	4.94
8/11/2006	290	5.67
11/1/2006	910	6.81
2/7/2007	1,200	7.09
5/9/2007	55	4.01
8/7/2007	430	6.06
11/14/2007	100	4.61
2/28/2008	220	5.39
8/13/2008	250	5.52
11/19/2008	230	5.44
2/10/2009	320	5.77
5/7/2009	12	2.48
9/3/2009	100	4.61
3/23/2010	0.5	-0.69
8/16/2010	110	4.70
3/18/2011	87	4.47
8/18/2011	120	4.79
2/29/2012	160	5.08
8/24/2012	64	4.16
8/7/2013	27	3.30
2/13/2014	0.85	-0.16
8/28/2014	15	2.71



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	46
# of nondetects	1
% of data as detects	98

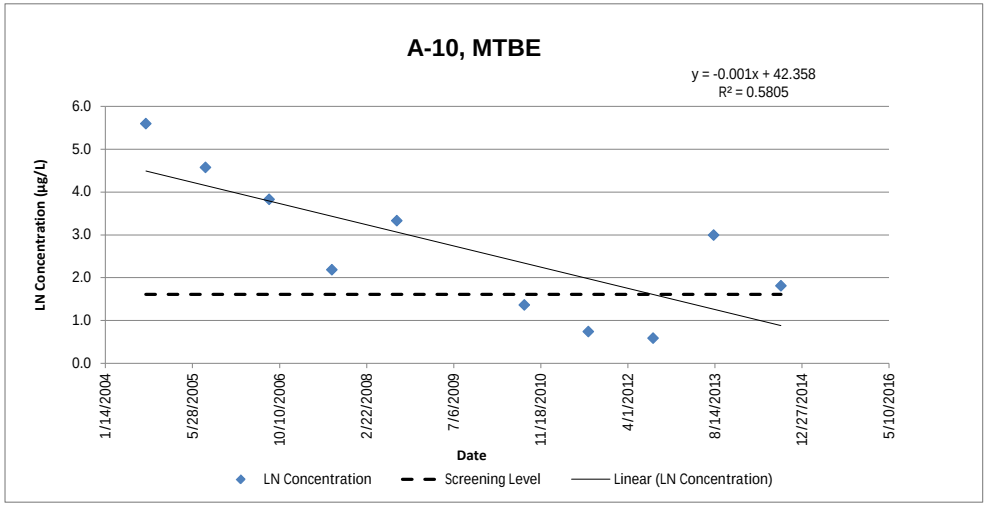
Results		
Coefficient of Determination (R^2) =	0.6586	
p-Value =	7.87E-12	
Attenuation Rate in Groundwater (K) =	0.0012	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0009	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	5.80E+02	days

Date Screening Level Reached	
Screening Level	5
LN Screening Level	1.6
Intercept	52.313
Slope	-0.0012
Date to Screening Level	3/14/2016

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
MTBE = methyl tertiary-butyl ether

Attachment B-9
Sample Information
Sample Location **A-10**
Constituent MTBE

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
9/2/2004	270	5.60
8/11/2005	97	4.57
8/11/2006	46	3.83
8/7/2007	8.9	2.19
8/13/2008	28	3.33
8/16/2010	3.9	1.36
8/18/2011	2.1	0.74
8/24/2012	1.8	0.59
8/7/2013	20	3.00
8/28/2014	6.1	1.81



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	10
# of nondetects	0
% of data as detects	100

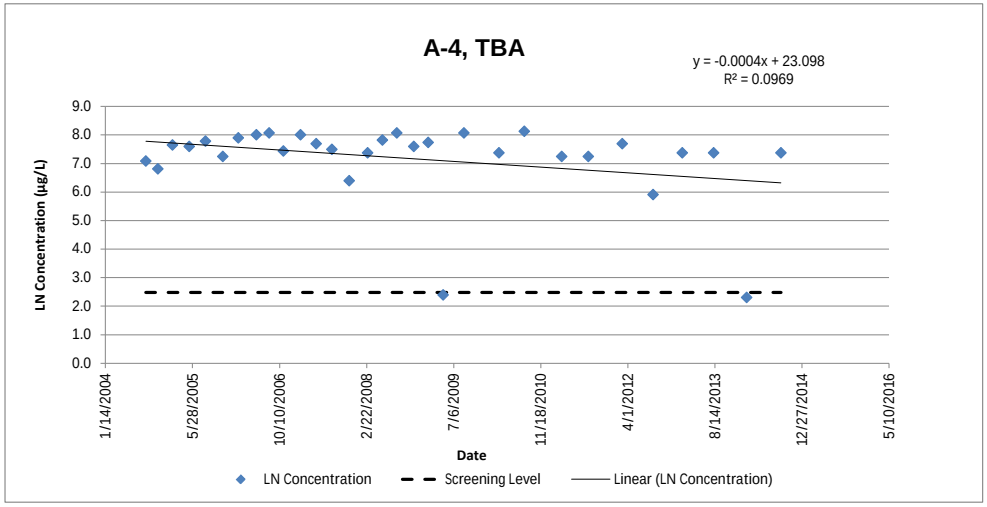
Results		
Coefficient of Determination (R^2) =	0.5805	
p-Value =	1.04E-02	
Attenuation Rate in Groundwater (K) =	0.0010	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0003	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	7.00E+02	days

Date Screening Level Reached	
Screening Level	5
LN Screening Level	1.6
Intercept	42.358
Slope	-0.0010
Date to Screening Level	8/23/2012

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
MTBE = methyl tertiary-butyl ether

Attachment B-10
Sample Information
Sample Location **A-4**
Constituent TBA

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
9/2/2004	1,200	7.09
11/10/2004	910	6.81
2/2/2005	2,100	7.65
5/9/2005	2,000	7.60
8/11/2005	2,400	7.78
11/18/2005	1,400	7.24
2/15/2006	2,700	7.90
5/30/2006	3,000	8.01
8/11/2006	3,200	8.07
11/1/2006	1,700	7.44
2/7/2007	3,000	8.01
5/9/2007	2,200	7.70
8/7/2007	1,800	7.50
11/14/2007	600	6.40
2/28/2008	1,600	7.38
5/23/2008	2,500	7.82
8/13/2008	3,200	8.07
11/19/2008	2,000	7.60
2/10/2009	2,300	7.74
5/7/2009	11	2.40
9/3/2009	3,200	8.07
3/23/2010	1,600	7.38
8/16/2010	3,400	8.13
3/18/2011	1,400	7.24
8/18/2011	1,400	7.24
2/29/2012	2,200	7.70
8/24/2012	370	5.91
2/8/2013	1,600	7.38
8/7/2013	1,600	7.38
2/13/2014	10	2.30
8/28/2014	1,600	7.38



Notes:

	ND taken at reporting limit/reported value
	Qualified data converted to reported value

Data quality	
Total # of data points used in regression	31
# of nondetects	1
% of data as detects	97

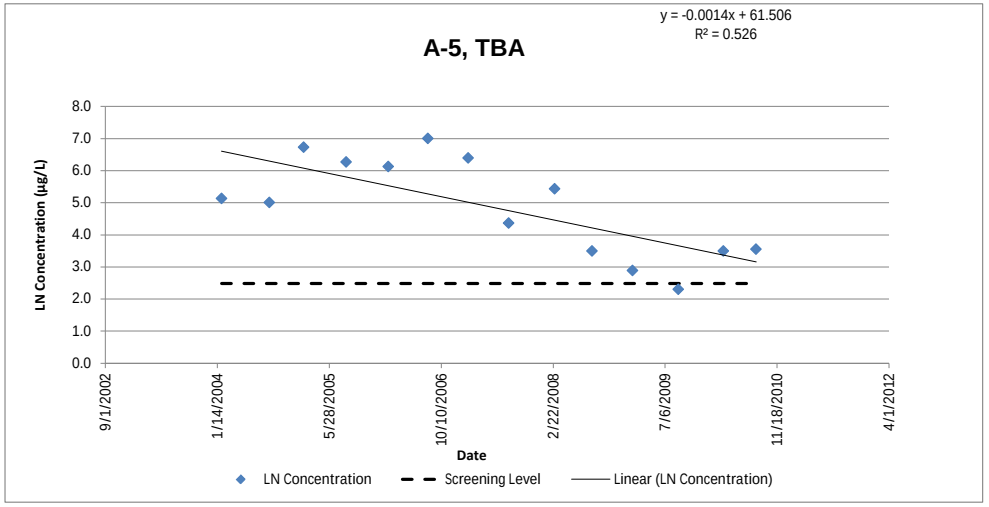
Results		
Coefficient of Determination (R^2) =	0.0969	
p-Value =	8.82E-02	
Attenuation Rate in Groundwater (K) =	0.0004	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	-0.0001	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	NA	days

Date Screening Level Reached	
Screening Level	12
LN Screening Level	2.5
Intercept	23.098
Slope	-0.0004
Date to Screening Level	NA

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
TBA = tert-butyl alcohol

Attachment B-11
Sample Information
Sample Location **A-5**
Constituent TBA

Data		
Sample Date	Concentration	LN Concentration
	(ug/L)	
2/2/2004	170	5.14
9/2/2004	150	5.01
2/2/2005	840	6.73
8/11/2005	530	6.27
2/15/2006	460	6.13
8/11/2006	1,100	7.00
2/7/2007	600	6.40
8/7/2007	79	4.37
2/28/2008	230	5.44
8/13/2008	33	3.50
2/10/2009	18	2.89
9/3/2009	10	2.30
3/23/2010	33	3.50
8/16/2010	35	3.56



Notes:

ND taken at reporting limit/reported value
Qualified data converted to reported value

Data quality	
Total # of data points used in regression	14
# of nondetects	1
% of data as detects	93

Results		
Coefficient of Determination (R^2) =	0.5260	
p-Value =	3.33E-03	
Attenuation Rate in Groundwater (K) =	0.0014	$days^{-1}$
Attenuation Rate in Groundwater at 90% confidence (K) =	0.0009	$days^{-1}$
Chemical Half Life in Groundwater ($t_{1/2}$) =	4.80E+02	days

Date Screening Level Reached	
Screening Level	12
LN Screening Level	2.5
Intercept	61.506
Slope	-0.0014
Date to Screening Level	11/28/2011

Abbreviations and Notes
ug/l = micrograms per liter
LN = Natural Logarithm
TBA = tert-butyl alcohol