REMEDIAL INVESTIGATION WORK PLAN
WHIDBEY MARINE & AUTO SUPPLY
1695 EAST MAIN STREET
FREELAND, WASHINGTON

by
Hart Crowser, a division of Haley & Aldrich
Seattle, Washington

for
Washington State Department of Ecology
Shoreline, Washington

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PREPARED FOR
WASHINGTON STATE DEPARTMENT OF ECOLOGY
SHORELINE, WASHINGTON

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1. Introduction

On behalf of the Washington State Department of Ecology (Ecology), Hart Crowser, a division of Haley & Aldrich (Hart Crowser), has prepared this remedial investigation work plan (RI Work Plan) for the Whidbey Marine & Auto Supply property (Property) located at 1695 East Main Street in Freeland, Washington (Facility Site ID number 17222251; Cleanup Site ID number 5610 [Site]; and parcel number R22911-076-1270). The Property is owned by David H. Campbell and is approximately 0.45 acre. The Property and vicinity topography are shown on Figure 1.

The proposed site investigation will address data gaps identified by Hart Crowser. The supplemental data will eventually be used along with current data to prepare a Remedial Investigation (RI) report for submittal to Ecology. The RI will evaluate the nature and extent of environmental contamination associated with historical uses at the Property.

1.1 PROJECT BACKGROUND

In 2017, the Whidbey Marine & Auto Supply Site was terminated from the Voluntary Cleanup Program (VCP), and the Site entered into the Washington Pollution Liability Insurance Agency (PLIA) Petroleum Technical Assistance Program (PTAP). PLIA funded a Preliminary Planning Assessment to assess soil and groundwater quality, and to develop a plan to clean up the remaining contamination. The Preliminary Planning Assessment Report and Focused Feasibility Study (FS) identified three cleanup action alternatives for consideration. The FS report recommended Cleanup Action Alternative 1 (Air Sparge and Soil Vapor Extraction Remediation System). However, PLIA terminated the Site from its program in 2020 due to lack of response from the responsible parties.

The Property vicinity and surrounding properties are shown on Figure 2. Previous explorations, soil vapor extraction points, and historical features are also presented on Figure 2.

1.2 REGULATORY FRAMEWORK

The RI Work Plan will be implemented in general accordance with guidance put forth in the Model Toxics Control Act (MTCA), as stipulated in Washington Administrative Code (WAC) 173-340. The investigation results will be used to prepare an RI report for the Property and, subsequently, a Feasibility Study/Cleanup Action Plan (FS/CAP) consistent with guidance put forth in MTCA. Under MTCA, an RI and FS are required to be developed once a Site is prioritized for remedial action (WAC 173-340-350). The purpose of the RI and FS reports are to evaluate the nature and extent of environmental contamination at the Property (Site) and remedial options and recommend cleanup action, as described in WAC 173-340-360 through 173-340-390, based on the collection, development, and evaluation of a sufficient site-specific data set.

1.3 PURPOSE AND OBJECTIVES

This RI Work Plan provides the scope, methodology, and implementation details for completing the RI and FS. The purpose of this RI is to generate data of sufficient quality to address the current data gaps and adequately characterize the nature and extent of environmental contamination on the Property and at off-property areas. Potentially impacted media include soil and groundwater.

The activities outlined in this work plan are also designed to meet the following specific project objectives:

- Develop data quality objectives for field investigation as well as sample collection and laboratory analytical activities.
- Develop data quality objectives for field investigation as well as sample collection and laboratory analytical activities.
- Develop preliminary and final conceptual site model (CSM).
- Evaluate potential risk to current and potential future human and ecological receptors from chemicals of concern (COCs).
- Evaluate data relative to appropriate cleanup levels (CULs).
- Define the subsurface geochemical conditions on and beneath the Property to support and evaluate potential cleanup actions.
- Evaluate the lateral and vertical extents of off-property impacts.

The objective of the RI and FS process is to identify COCs at the Site and their source(s) and extent. The primary COC appears to be gasoline-, diesel-, and/or heavy oil-range total petroleum hydrocarbons (TPH-G, TPH-D, and TPH-O, respectively), and petroleum-derived volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and total xylenes (BTEX), and potentially heavy metals.

This RI Work Plan provides an overview of pertinent background information, an initial evaluation of existing data for the Property (including a preliminary CSM), the identification of data needs to support the risk assessment and evaluation of remedial alternatives, and a scope of work designed to address the identified data needs. It also includes other components such as the Sampling and Analysis Plan (SAP) which is provided in Appendix A.

1.4 WORK PLAN ORGANIZATION

This RI Work Plan for the Site complies with MTCA requirements and is organized as follows:

- **Section 2.0 - Background and Physical Setting:** Provides background information of the Property, including current and historical land use, surface features, and local geology and hydrogeology.
- **Section 3.0 - Previous Investigations and Data Evaluation:** Details past investigations and remedial work performed at the Site and cultural and natural resources present on the Property.
- **Section 4.0 - Preliminary Screening Levels:** Presents the preliminary CSM for the Property, potential sources, fate and transport of COCs, and human and ecological exposure pathways.
- **Section 5.0 - Remedial Investigation Activities:** Presents the sampling objectives and approach as well as the scope and data collection activities.

2. Background and Physical Setting

The background and physical setting information summarized below are based on review of prior environmental data and documents.

2.1 SITE LOCATION AND OPERATIONAL HISTORY

Historically, the Property was occupied by the Whidbey Marine & Auto Supply between at least 1971 and 2014 which operated as a gasoline service station for a portion of that time. Property records indicate that four underground storage tanks (USTs) were installed at the Property between 1982 and 1986, which included one 3,000-gallon diesel UST (UST 1), two 10,000-gallon gasoline USTs (USTs 2 and 3), and one 8,000-gallon gasoline UST (UST 4). A release of unleaded gasoline from UST 2 was reported to Ecology in 2005. Fuel sales ceased in mid-2009, and the Property was sold in October 2009. The USTs were removed in January 2011 by Ultra-Tank Services, Inc (Farallon 2011). The Property is currently occupied by Scotty's Towing.

2.2 PHYSICAL SETTING

2.2.1 Geology

The Geologic Map of the Freeland and Northern Part of the Hansville 7.5-Minute Quadrangles, Island County, Washington (Polenz et al. 2006) indicates that the Property is underlain primarily by Everson Glaciomarine Drift deposits. Soil encountered during previous investigations beneath the Property generally consisted of sands and silty sands to depths of at least 115 feet below ground surface (bgs). Fine to coarse sand with trace silt was also encountered to approximately 55 to 65 feet bgs. A silt layer was encountered between approximately 55 and 65 feet bgs. The silt layer appears to be continuous on the Property, but discontinuous across the Property to the west and south, and ranges from 15 feet thick in boring B-7, to 3-inches thick in MW-11D (Figure 2). Soil from 65 feet bgs to total depth explored of 115 feet bgs generally consisted of fine to coarse sand with trace silt.

2.2.2 Hydrogeology

Previous investigations identified two distinct groundwater zones underlying the Property, a perched zone and a regional aquifer. A perched groundwater zone was encountered between 50 and 56 feet bgs and appears to be consistent with the silt layer observed in soil borings. Groundwater level measurements in perched groundwater zone wells have been between 50.51 and 57.25 feet bgs. Groundwater potentiometric maps, presenting previous groundwater monitoring events, have indicated that perched groundwater flows generally to the west-southwest. Perched groundwater was not encountered in soil borings west of MW-6S and MW-7S, and perched groundwater well MW-5S has been historically dry. This indicates that the perched groundwater zone is not continuous and appears to terminate between wells MW-7S and MW-9D. Based on the discontinuous silt layer and the absence of perched groundwater to the west, groundwater west of MW-6S and MW-7S likely migrates vertically to the deeper Sea Level Aquifer.

Regional groundwater in the Sea Level Aquifer was encountered between 102 and 106 feet bgs in monitoring wells MW-1S, and MW-9D through MW-18D. Groundwater measurements in the Sea Level

Aquifer monitoring wells have been between 99.66 and 104.80 feet bgs. Groundwater potentiometric maps indicate the Sea Level Aquifer generally flows to the southeast. The Sea Level Aquifer is Whidbey Island's primary drinking water source. Three drinking water wells are located approximately 1,900 to 2,900 feet south and south-southeast of the Property (Figure 1).

3. Previous Investigations and Cleanup Action

The following sections provide a brief summary of the previous investigations and groundwater monitoring events conducted between October 2005 and October 2017 at the Property.

3.1 SITE INVESTIGATIONS

In 2005, unleaded gasoline was released from one of the 10,000-gallon USTs (UST2) and was reported to Ecology. In October 2005, Farallon Consulting (Farallon) advanced six borings (B-1 through B-6) using a direct-push drill rig to a maximum depth of 40 feet bgs to assess the subsurface soil conditions. Benzene was detected at concentrations exceeding MTCA Method A CULs in soil samples analyzed from borings B-2 through B-5, between depths of 12 and 32 feet bgs (Figure 2).

In November 2005, a boring (MW-1S) was advanced to a depth of 135 feet bgs using sonic drilling methods. Reconnaissance groundwater samples were collected from the Sea Level Aquifer, and the boring was subsequently backfilled to approximately 65 feet bgs to install a monitoring well (MW-1S) in the perched aquifer. TPH-G and/or benzene were detected at concentrations above MTCA Method A CULs in soil samples collected from MW-1S between 14.5 and 61.5 feet bgs.

In November 2006, two groundwater monitoring wells (MW-2S and MW-3S), and one soil boring (B-7) were advanced using hollow-stem auger (HSA) drilling methods. Groundwater samples collected from MW-2S contained a concentration of benzene above the MTCA Method A CUL.

In June 2006, Farallon collected groundwater elevation measurements and groundwater samples from MW-1S through MW-3S. A second groundwater monitoring event was conducted in October 2006.

Between December 2007 and March 2008, five monitoring wells were installed (MW-4S through MW-8S) to depths ranging between 56 and 63 feet bgs. Following the monitoring wells installation, three groundwater monitoring events were conducted. MW-5S was dry during each of these monitoring events.

In April 2009, Farallon installed four groundwater monitoring wells (MW-9D through MW-12D) at the adjacent property, on tax parcel R22911-093-1210 and in the adjoining South Harbor Avenue right-of-way (ROW) to the west and southwest of the Property (Figure 2). Groundwater samples were collected from existing wells. TPH-G and/or BTEX were detected at concentrations above MTCA Method A cleanup levels in MW-2S, MW-4S, and MW-6S through MW-12D.

In 2012, Farallon began measuring the presence of light nonaqueous-phase liquid (LNAPL) in the Sea Level Aquifer monitoring well MW-9D. LNAPL thickness has ranged from less than 0.01 foot to 0.98 foot between 2012 and 2016. In 2012, a sorbent sock was installed in MW-9D to passively recover LNAPL.

Due to the use of the Sea Level Aquifer as Whidbey Island's primary drinking water source, Farallon installed four additional monitoring wells (MW-13D through MW-16D) downgradient of the Property to provide a monitoring network upgradient of the Freeland Water and Sewer District drinking water wells. Three drinking water wells are located approximately 1,900 to 2,900 feet south and south-southeast of the Property (Figure 1). TPH-G, TPH-D, and BTEX have been detected in well MW-13D at concentrations exceeding the applicable MTCA Method A cleanup levels. None of the COCs have been detected in groundwater samples collected from monitoring wells MW-14D, MW-15D, or MW-16D.

In 2017 Sound Earth Strategies, Inc. (SES) advanced 4 borings (B08, B09, MW-17D, and MW-18D) and collected soil samples for laboratory analysis; completed two borings as monitoring wells MW-17D and MW-18D; and collected groundwater samples from new and existing monitoring wells. Soil and groundwater samples were analyzed for TPH-G, TPH-D, TPH-O, BTEX, and particle size. TPH-G and/or BTEX were detected in soil samples collected from B08 and MW-17D. Groundwater sampling results indicated TPH-G and/or BTEX exceeding the applicable MTCA Method A cleanup levels in perched groundwater zone monitoring wells MW-4S through MW-8S and in Sea Level Aquifer monitoring wells MW-9D, MW-12D, MW-13D, and MW-17D.

Boring and well locations from previous investigations are shown on Figure 2. Historical soil data and groundwater data are shown on Figures 3 and 4, respectively. Monitoring well construction data is shown in Table 1.

3.2 CLEANUP ACTION

A soil vapor extraction (SVE) system, consisting of three SVE wells, one dual-purpose SVE/monitoring well, and a catalytic oxidation unit, were installed on the Property in 2006. The three SVE wells (SVE-2S, SVE-2D, and SVE-3) were installed using HSA drilling methods. SVE system installation details are summarized in the October 2006 Cleanup Action Progress Report (Farallon 2006b). Continuous SVE system operation began on September 13, 2006. Two additional remediation wells were concurrently installed, one air sparge (AS) well (AS-3) and one SVE well (SVE-4).

In October 2010, Farallon performed a preliminary injection test near monitoring well MW-3S using clean water to estimate the injection rates that could be achieved in the perched groundwater zone. The methods and results were presented in the Technical Memorandum regarding October 2010 Progress Report, dated December 15, 2010.

The products used for the *in situ* chemical oxidant injection at the Site were RegenOx, the primary oxidant, and Oxygen Release Compound Advanced (ORC-A), a proprietary formulation of food-grade calcium oxy-hydroxide that produces a controlled release of molecular oxygen for up to 12 months after hydration. RegenOx or the combination of RegenOx and ORC-A was injected into a total of 59 borings over the course of three injection events in February, March, and April 2011, as described in detail below. The injection area was constrained by the Site building in the north, utilities to the west and south, and the overhead canopy to the east.

In situ chemical oxidant injections were completed in events by Cascade Drilling, Inc. (Cascade) of Woodinville, Washington using direct-push drilling methods. The injection borings were advanced to depths ranging from 55 to 60 feet bgs. RegenOx was injected over the top of the upper silt layer to the groundwater surface measured in monitoring wells MW-2S and MW-4S at the time of the injections. The first injection event occurred in February 2011 and consisted of the injection of a 4 percent RegenOx solution into 16 injection points placed on 8-foot centers in the area near monitoring wells MW-2S and MW-4S. The second injection event consisted of injection of a 4 percent RegenOx solution along with ORC-A into 16 injection points placed on 8-foot centers in the same area as the first injection, but at staggered locations. The first two injection events were conducted over an average 5-foot-thick injection zone. Approximately 24.5 gallons of RegenOx solution was injected per foot across the 5-foot interval at each injection point.

The third event occurred in March and April 2011 and consisted of injection of a 4 percent RegenOx solution along with ORC-A at 25 injection points placed on 10-foot centers over a larger area of the Property than in the first two injection events. The third injection event was conducted over an average 8-foot-thick injection zone.

Initial concentration of COCs in groundwater increased, as expected, due to desorption from soil (Farallon 2012). Groundwater COC concentrations in the vicinity of the injection points decreased, but continue to exceed MTCA Method A CULs.

4. Preliminary Screening Levels

4.1 PROPOSED SCREENING LEVELS

Based on the previous site characterization efforts, the COCs for each medium of concern on the Property are listed in Table 4.1 along with their associated screening levels.

4.1.1 Soil

For human health screening, soil will be screened against MTCA Method A CULs for unrestricted land use. The Method A values are for protection of human health via the direct-contact or ingestion pathways and protection of groundwater via the soil-leaching-to-groundwater pathway. For certain constituents, MTCA Method A CULs are not available and Method B CULs will be applied. Method B CULs may be used at any site.

4.1.2 Groundwater

Groundwater will be screened to MTCA Method A CULs and applicable or relevant and appropriate requirements (ARAR) for freshwater surface water.

For certain constituents, MTCA Method A CULs are not available and Method B CULs will be applied. According to an inventory of groundwater supply wells in the vicinity of the Property, three drinking water wells are located approximately 1,900 to 2,900 feet south and south-southeast of the Property (Figure 1). None of the COCs have been detected in groundwater samples collected from MW-14D, MW-15D, or MW-16D, which are located downgradient of the Property and upgradient of the nearest drinking water wells. The non-detect wells between the known contaminate plume and the drinking water wells, indicate there is not an immediate threat to the water supply (SES, 2017). The perched groundwater zone at the Property is not used as a drinking water source and is likely a non-potable resource as defined in WAC 173-340-720[2][b][i].

Summary of Chemicals of Concern and Screening Levels

Media	COC	TPH-Gx	TPH-Dx	TPH-O	Benzene	Toluene	Ethylbenzene	Total Xylenes	Lead	Arsenic
Soil (mg/kg)	Screening Level	30/100[a]	2000	2000	0.03	7	6	9	250	20
Groundwater (µg/L)		800/1000[a]	500	500	5	1000	700	1000	15	5

Notes:

mg/kg = milligrams per kilogram

µg/L = micrograms per liter

a) 100 mg/kg for gasoline mixtures without benzene and the total of ethylbenzene, toluene, and xylenes are less than 1 percent of the gasoline mixture; 30 mg/kg for other gasoline mixtures.

b) 800 µg/L when benzene present in groundwater; 1,000 µg/L when no detectable benzene in groundwater.

4.2 PROPOSED POINTS OF COMPLIANCE

The soil point of compliance (POC) is the depth bgs at which soil CULs shall be attained. The standard POC in soil for human direct contact and for ecological receptors is 15 feet bgs throughout an entire site and the standard POC is all depths throughout a site for protection of groundwater and surface water. The standard POC for protection of groundwater and surface water is preliminarily applied to soil and sediment on the Property.

Additional assessment of soil and groundwater, on the Property will inform final POCs on the Property. It is anticipated that the determination of whether soil is protective of groundwater will be assessed using a POC established for groundwater. Note that a conditional POC of up to 6 feet bgs may be established for ecological receptors. The Property is currently partially paved, which minimizes the exposure risk for terrestrial receptors. Compacted gravel fill overlies the former UST excavation area on the southeastern portion of the Site. Based on the depth of soil contamination at the Property, the pathway is considered incomplete for direct contact, but the pathway for soil leaching to groundwater is considered complete (SES, 2017).

For groundwater, the POC is the point or points where the groundwater CULs must be attained for a site to comply with the cleanup standards. Groundwater CULs shall be attained in all groundwater from the POC to the outer boundary of the hazardous-substance plume. In accordance with (WAC 173-340-720(8)(c)), a conditional POC may be established if it is not practicable to meet the CULs throughout the site within a reasonable restoration time frame. A conditional POC for groundwater is not proposed at this time for the Property.

4.3 PRELIMINARY CONCEPTUAL SITE MODEL

A CSM describes potential chemical sources, release mechanisms, environmental transport processes, exposure routes, and receptors for sources identified on the Property. The primary purpose of the CSM is to identify potential current and future pathways by which human and ecological receptors could be exposed to site-related chemicals. A complete exposure pathway consists of four necessary elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium for a release chemical, (3) a point of potential contact with the impacted medium (referred to as the exposure point), and (4) an exposure route (e.g., soil ingestion) at the exposure point.

The preliminary CSM included herein is based on findings from previous investigations and remedial actions at the Property. Historical borings advanced around the former USTs confirmed petroleum hydrocarbon impacts to soil in the immediate vicinity of the former USTs from approximately 15 to 30 feet bgs. Deeper soil contamination remains on the Property, extending laterally to the west. and south from the Property in saturated soil in the perched groundwater zone from approximately 50 to 60 feet bgs, and at the top of the Sea Level Aquifer from approximately 100 to 110 feet bgs. COCs were not detected at or above laboratory reporting limits in soil samples collected within the silt layer at approximately 60 to 61 feet bgs.

Groundwater monitoring wells indicated that petroleum hydrocarbon impacts to groundwater are present in the perched groundwater zone and the Sea Level Aquifer underlying the Property. Perched groundwater contamination above MTCA Method A CULs extend laterally from the immediate vicinity of the former USTs and flows to the west (Figure 2). MW-5S is currently and historically dry, indicating the likely termination of the perched groundwater zone west of MW-6S and MW-7S. Based on the apparent steep perched groundwater zone gradient and the apparent termination of the perched groundwater zone, groundwater west of MW-6S and MW-7S appears to flow vertically into the Sea Level Aquifer in the vicinity of MW-9D. Sea Level Aquifer groundwater generally flows to the southeast (Figure 2). Petroleum impacts to the Sea Level Aquifer are consistent with the contoured flow direction to the southeast and south, observed in concentrations above MTCA Method A cleanup levels in wells MW-12D, MW-13D, and MW-17D.

Based on historical groundwater measurements, the Sea Level Aquifer flows generally toward the southeast. MW-12D is located west-southwest of MW-9D and the Property, and concentrations of TPH-G exceeding MTCA Method A CULs were detected in soil at 45 feet bgs. Based on the groundwater flow direction, shallow soil exceedances in MW-12D, and concentrations of petroleum hydrocarbons in groundwater in MW-12D, a secondary source may exist west of MW-12D.

Data generated from this RI Work Plan will be used to develop a comprehensive and updated CSM for the Property to be used during the RI and FS processes.

4.4 CONTAMINANT TRANSPORT AND EXPOSURE ROUTES

4.4.1 Source and Release Mechanisms

A confirmed release from former UST-2 is likely the primary source for petroleum impacts to soil and groundwater at the Property. Secondary sources of petroleum may exist from historical leaks and spills of petroleum hydrocarbons (including fuels and petroleum-based solvents and related compounds) and metals from past uses of the Property including the former gasoline service station and other historical operations/activities.

4.4.2 Fate and Transport Processes

The fate and transport of the contaminants in the environment affect their migration, mobility, and persistence. The primary mechanisms likely to influence the fate and transport of chemicals at the Property include natural biodegradation of organic chemicals, sorption to soil, overland stormwater runoff, advection and dispersion in groundwater, volatilization from soil or groundwater to air, and leaching of chemicals from soil to groundwater.

Within the media of concern, petroleum hydrocarbons may exist in four phases. The four phases include soil vapor (soil gas), solid phase (adsorption on to soil particles), aqueous phase (dissolved in groundwater and soil pore water), and light nonaqueous-phase liquids (LNAPL; within the soil and on the groundwater). The transport of petroleum hydrocarbons in soil and groundwater is the media of concern and is dependent on the properties of the soil and hydrologic properties of the aquifer. The fate of TPH is dependent on their chemical properties (solubility and volatility) and biological and abiological processes in the media of concern. The fate and transport of TPH results in their natural attenuation in the environment. Natural attenuation is defined by a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.

4.4.3 Primary Transport Pathways

Potential releases of lighter-than-water products (light non-aqueous phase liquids or LNAPLs), such as gasoline- through diesel-range organics and BTEX, would move downward through the unsaturated soil via leaching or under the force of gravity. Geologic heterogeneities may cause releases to spread out in the soil. Small releases may not have sufficient volume to reach the water table. Once the release encounters the water table, depending upon solubility, hazardous constituents from the release could dissolve in the groundwater where they could be transported along with the groundwater through advective flow.

Releases of lead in leaded gasoline would be transported along with the gasoline release, as described above. Releases of particles of lead or other metals (e.g., from car batteries or contaminated fill) would remain in the soil at the point of release due to their limited aqueous solubilities.

Naturally occurring arsenic in soil can be mobilized in groundwater by geochemical conditions caused by the natural microbial breakdown of petroleum or by other naturally reducing conditions.

Volatile constituents could also be transported via volatilization from unsaturated soil and shallow groundwater into soil gas, where they could migrate to the ambient air or overlying structures.

4.5 HUMAN HEALTH AND ECOLOGICAL EXPOSURE

4.5.1 Human Health Exposure Scenarios

Soil with concentrations of COCs above the preliminary CULs may present a potential exposure pathway to human and/or ecological receptors. The potential exposure pathways for soil at the Property include direct contact (dermal contact and ingestion), leaching to groundwater, direct contact to surface water, and inhalation of soil vapors. The exposure pathways for subsurface soil via dermal contact or ingestion and the exposure pathway via leaching to groundwater are considered complete for the COCs at the Property (SES 2017). The standard POC for the direct contact exposure pathway for soil is 15 feet bgs for human health and 6 feet bgs for terrestrial receptors. A depth of 15 feet bgs is a reasonable depth that could be excavated during normal redevelopment activities and distributed at the ground surface (WAC-173-340-[6][d] and WAC 173-340-7490[4][b]).

The Property is currently partially paved, which minimizes the exposure risk for terrestrial receptors. Compacted gravel fill overlies the former UST excavation area on the southeastern portion of the Property. Based on the depth of soil contamination at the Property, the pathway is considered incomplete for direct contact. The pathway for soil leaching to groundwater is considered complete.

Potential exposure pathways for groundwater contamination include volatilization into soil vapor or via the direct contact pathway, which comprises both the dermal contact and ingestion pathways. According to an inventory of groundwater supply wells in the vicinity of the Property, three drinking water wells are located approximately 1,900 to 2,900 feet south and south-southeast of the Site (Figure 1). None of the COCs have been detected in groundwater samples collected from monitoring wells MW-14D, MW-15D, or MW-16D, which are located downgradient of the Property and upgradient of the nearest drinking water wells. The non-detect wells between the known contaminate plume and the drinking water wells, indicate it is likely there is not an immediate threat to the water supply. The perched groundwater zone at the Site is not used as a drinking water source and is likely a non-potable resource as defined in WAC 173-340-720[2][b][i]. Based on the flow direction and impacts to the Sea Level Aquifer, the groundwater pathway is considered complete, due to the use of the aquifer as a drinking water source.

The exposure pathway for inhalation of volatile COCs from soil gas or groundwater is considered incomplete. The air-filled pore space between soil grains in the unsaturated zone, or partially saturated zone, is referred to as soil gas or soil vapor. Based on the depth to groundwater and remaining soil contamination underlying the Site of over 50 feet bgs, the vapor exposure pathway is considered incomplete for human or terrestrial exposure.

4.5.2 Terrestrial Ecological Receptors

The need for a Terrestrial Ecological Evaluation (TEE) must be considered in an RI. WAC 173-340-7940 through 173-340-7494 define the goals and procedures of a TEE, including determining whether a release of a hazardous substance to soil may pose a threat to the terrestrial environment, characterizing existing or potential threats to terrestrial plants and animals exposed to hazardous substances in soil, and establishing site-specific cleanup standards for the protection of terrestrial plants and animals. Based on existing data, the Property may qualify for a TEE exclusion based on WAC 173-340-7491(1)(a) since all soil contaminated with hazardous substances is located below the point of compliance (Section 5.2.2.1) following the UST decommissioning and removal and the soil remediation completed by Farallon in January 2011 (Farallon 2011a; Table 2). However, the need for a TEE will be reevaluated as part of the RI activities.

5. Remedial Investigation Activities

5.1 REMEDIAL INVESTIGATION DATA GAPS AND OBJECTIVES

5.1.1 Data Gaps

The data gaps remaining after the investigations that have occurred to date are:

- Data Gap 1. Lateral and vertical extent of known groundwater impacts at the Property. Previous investigations have identified impacts to the perched groundwater zone and Sea Level Aquifer. The lateral extent of the impacts to the Sea Level Aquifer has not been well defined to the east, west, or southwest.
- Data Gap 2. The lateral and vertical extents of remaining soil contamination at the Property. Previous reports indicate that the operation of an SVE system has removed a large portion of the contaminated source material from the Property. However, no additional soil sampling has been conducted since the interim remedial actions.
- Data Gap 3. The potential for additional source contributing to the contaminate plume. At least one former gasoline service station had operated southwest of the Property.

5.2 SCOPE OF WORK

- Obtain Access Agreements for nearby properties where borings are proposed;
- Conduct a baseline groundwater monitoring/sampling event at existing wells.
  - The existing monitoring wells have not been monitored/sampled since 2017. Therefore, a baseline monitoring/sampling event will be conducted utilizing the existing wells (after mechanical redevelopment of the wells). Field observations and groundwater analytical results from this event may better inform the approach described below and may allow us to reduce the number of proposed borings or new monitoring wells to be installed.
  - Existing well monuments and casings will be visually inspected at this time, and any necessary repairs will be completed during the larger field effort.
  - Groundwater samples will be analyzed on an expedited turnaround for TPH-G, TPH-D, TPH-O, VOCs, and metals (total and dissolved lead and arsenic). Depending on the analytical results, some of the proposed borings may not be required. However, for the purposes of this RI Work Plan, it is assumed that the findings will be consistent with historic data and the scope described below will remain necessary.
- Complete public and private utility locates to check for potential underground utilities and pipelines near the proposed sampling locations;
- Advance 12 borings to address the data gaps and delineate the lateral and vertical extents of soil and groundwater impacts;
- Install permanent 2-inch groundwater monitoring wells in four of the boring locations;
- Collect soil samples from borings and groundwater samples from newly installed monitoring wells;

- Analyze selected soil and groundwater samples for TPH-G, TPH-D, TPH-O, VOCs, volatile petroleum hydrocarbons and extractable petroleum hydrocarbons (VPH and EPH, respectively), 1-2-Dibromoethane (EDB), 1-2-Dichloroethane (EDC), Methyl tertiary-butyl ether (MTBE), polycyclic aromatic hydrocarbons (PAHs), and metals (total and dissolved lead and arsenic);
- Analyze selected groundwater samples for nitrate, nitrite, ammonia, total suspended solids (TSS), chloride, sulfate, alkalinity, sulfide, methane, ethene, ethane, dissolved ferrous iron, and dissolved manganese;
- Update the CSM to describe contaminant sources, exposure pathways, and potential receptors;
- Manage investigation-derived waste (IDW) by storing it in WA Department of Transportation approved 55-gallon steel drums at a designated location at the Property and disposing off-site at an appropriate regulated disposal facility; and
- Prepare a RI Report summarizing completed actions, discussing the analytical results and key findings, and assessing risks to on- and off-site receptors via exposure pathways identified in the CSM.

5.3 FIELD ACTIVITIES

Field activities should be coordinated with subcontractors, including a subsurface utility locator, driller, and analytical laboratory to complete this scope of work. Before field activities begin, the Underground Utility Notification Center should be notified, and boring locations should be cleared for subsurface utilities by public and private utility locators.

A SAP (see Appendix A) will guide environmental field sampling and a quality assurance project plan should be drafted to guide laboratory analytical methods and procedures. A site-specific HASP (for field activities) and Quality Assurance Project Plans (QAPP) (for laboratory and field analytical quality procedures) specific to this scope of work should also be drafted. An Inadvertent Discovery Plan (IDP) will likely need to be developed prior to initiating field activities.

5.3.1 Acquiring Access Agreements and ROW permits

Access agreements will need to be obtained with the nearby property owners to perform the RI activities on the nearby properties. If borings are completed in the ROW, ROW permits and/or traffic control will likely be required. ROW permits and access agreements will be acquired, as necessary.

Hart Crowser will identify adjacent properties that will potentially require Access Agreements, owner contact info, Parcel Numbers, and a Legal Description of each parcel. This will be provided to Ecology separate from this RI Work Plan.

5.3.2 Drilling and Grab Soil and Groundwater Sampling

All boring and monitoring well installation will be conducted by a driller licensed in the State of Washington. Borings will be advanced using a sonic drilling rig. Twelve borings will be advanced to approximately 130 feet bgs or deeper to reach the groundwater table to a maximum depth of 150 feet bgs for the collection and analysis of at least five soil samples per boring. Five of these borings may be completed as monitoring wells (recommended potential monitoring well locations are shown on

Figure 2). During the exploration advancements, a description of soil conditions and visual and olfactory observations will be recorded on boring logs by a geologist or hydrogeologist licensed in the State of Washington, or by a person working under the direct supervision of a Washington-State-licensed geologist or hydrogeologist. The soil from temporary borings will be field screened for organic vapors, using a photoionization detector. Soil and groundwater observations and sample parameters will be recorded on field sampling data sheets.

Non-dedicated sampling equipment will be decontaminated using industry-standard techniques. All downhole drilling equipment will be pressure-washed with hot, potable water before and after each use by the drilling subcontractor. At the completion of sampling IDW disposal will be coordinated with an approved subcontractor to transport and dispose of the IDW after proper characterization.

All sampling locations will be determined using a handheld global positioning system device with sub-meter accuracy. The proposed sampling locations are illustrated on Figure 2.

Grab groundwater (or reconnaissance) samples will be collected from the temporary borings. Grab groundwater samples should be collected from discrete intervals within the perched and sea level aquifers during drilling to evaluate the vertical distribution with each aquifer. Groundwater sample depths will be determined in the field based on observed soil stratigraphy. The outer steel casing used by drillers to prevent vertical migration of groundwater will be lowered to the transmissive zone. This should isolate groundwater entering the casing to only the desired transmissive zone. Groundwater samples will be collected directly from the borehole using low-flow sampling techniques.

Temporary borings will be abandoned by filling with hydrated bentonite chips or with bentonite grout to the surrounding grade, in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160).

5.3.3 Potential Monitoring Well Installations and Groundwater Monitoring

To further delineate the extent of impacts at the Site, monitoring wells will be installed at select boring locations. Figure 2 shows potential monitoring well locations to assess the lateral distribution of contaminants. All monitoring wells will be installed and constructed in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160) and as described below:

Construction. Monitoring wells will be constructed of 2-inch-diameter Schedule 40 PVC with 10 to 20 feet of screened casing. It is anticipated that most of the perched aquifer wells will be screened at depths ranging between 45 to 65 feet bgs and sea level aquifer wells will be screened from 110 to 130 feet bgs. However, boring depth will be determined based on soil field screening results and depth of groundwater. If field screening results indicate that contamination may be present at depth, the borings may continue advancing and the monitoring wells would be completed after having delineated the vertical extent of contamination. A clean silica sand pack will be placed about 1 foot above the screened section, and a minimum 3-foot bentonite seal will be placed above the sand to within about 1 foot of the ground surface. A concrete surface seal will secure a flush-mounted, traffic-rated monument. A watertight locking cap and lock will secure the wellhead, and bolts will secure the monument cover. All monuments will be permanently marked with well identification numbers. The top of the well casing will be surveyed to calculate groundwater elevations and flow direction.

Development. Following installation, monitoring wells will be developed at least 12 hours after construction. Each well will be mechanically developed by fully swabbing the screen interval at 2-foot intervals at a time with a surge block, followed by surging, and then pumping until the groundwater shows minor presence of fine sediments and is not overly cloudy or dark. Development will be considered complete after water from the well becomes visibly clear, 10 well casing volumes have been removed, or the well bails dry (whichever is less). Development water will be handled in accordance with *Section 5.3.7 - IDW Management*.

Decontamination Procedures. Non-disposable sampling equipment and reusable materials that contact the soil or water will be decontaminated on site before and after use at each sampling location. Decontamination will consist of the following:

- Tap-water rinse (may consist of an equivalent high-pressure or hot-water rinse). Visible soil to be removed by scrubbing.
- Non-phosphate detergent wash, consisting of a dilute mixture of Liqui-Nox® (or equivalent) and tap water.
- Distilled-water rinse.

Decontamination fluids will be transferred to drums for management as described below in *Section 5.3.7 - IDW Management*.

Quarterly Groundwater Monitoring Events. The proposed new monitoring wells will be sampled no sooner than 12 hours after development. Quarterly groundwater monitoring events will be conducted for the entire monitoring well network associated with the Property. For the purposes of the work plan, we are assuming an additional three-quarters of groundwater monitoring will be conducted following the installation of the monitoring wells and initial sampling event.

After the groundwater levels are measured, each well will be purged at a low-flow rate using a bladder pump or submersible pump connected to disposable tubing. The tubing inlet will be placed approximately at the center of the well screen or if the water table is below the top of the screened interval, then the tubing inlet will be placed at the center of the monitoring well's water column. To assess the effectiveness of purging and verify that the water quality parameters have stabilized, field parameters including pH, dissolved oxygen (DO), oxidation reduction potential (ORP), electrical conductivity, turbidity, and temperature will be measured by means of a flow-through cell. Purging will be considered complete when three casing volumes of water have been removed, the well purges dry, or field parameters stabilize to within 10 percent (whichever is less). If the well is purged dry, it will be allowed to recover before sampling is performed.

5.3.4 Soil Screening and Sampling and Documentation

Field personnel will collect soil samples generally at 5-foot intervals from the explorations. Field screening will be performed on each sample for environmental impacts using physical observation, performing sheen tests, and measuring headspace vapor using a photoionization detector (PID). A minimum of five soil samples from each subsurface exploration will be submitted to the analytical laboratory for chemical analysis. Additional information for soil screening and sampling is detailed in the SAP (Appendix A).

Soil and other observations at each boring location will be documented on a boring log and in field notes by a geologist or hydrogeologist licensed by the State of Washington or by a person working under the direct supervision of a Washington State-licensed geologist or hydrogeologist. Boring logs will include information such as the project name and location, the name of the drilling contractor, the drilling method, the sampling method, sample depths, a description of soil encountered, and screened intervals. Soils will be described using American Society for Testing and Materials designation D2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). The information will be recorded on a boring log form or in field notes.

Observations during well development activities should also be documented in field notes and forms. Observations will include, but are not limited to, groundwater levels, development water characteristics (e.g., color, turbidity, sheen), and development purge volumes.

5.3.5 Laboratory Analysis and Quality Assurance and Quality Control

Laboratory analyses should be completed by an Ecology-accredited analytical laboratory consistent with the protocols described in the SAP (Appendix A) and QAPP. The QAPP should be designed to guide aspects of laboratory and field analytical quality procedures and QA/QC requirements for analytical sampling and analysis.

Soil and groundwater samples collected by field personnel should be submitted under standard chain-of-custody procedures and will be analyzed as described in the SAP and QAPP.

5.3.6 Reporting

Upon completion of field work and data analysis, a RI report will be drafted for Ecology, which will summarize the field activities, sampling procedures, laboratory testing results, and provide an updated CSM. Documentation of the fieldwork, data validation and QA/QC will be provided, along with an evaluation of the analytical results, and recommendations for further assessment, if applicable. Following the completion of the RI report a feasibility study report, with disproportionate cost analysis, and a draft Cleanup Action Plan will be prepared.

5.3.7 IDW Management

IDW will consist of excess soil cuttings, development and purged groundwater from borings and monitoring wells, decontamination water, and personal protective equipment (PPE). Soil IDW will be placed in a roll off drop box and/or in labeled, Department of Transportation (DOT)-approved, 55-gallon steel drums. Water IDW will be placed in separately labeled, DOT-approved, 55-gallon steel drums. Associated samples collected from the supplemental RI activities will be used to profile the IDW for disposal. As a contingency, however, IDW samples will be collected from the drummed soil and water and only analyzed if requested by the receiving facility. Upon receipt of the results, the IDW will be appropriately disposed of at a permitted disposal or treatment facility. Copies of all disposal documentation (e.g., manifests, weight tickets) for IDW will be provided in the final report.

6. Limitations

Work for this project will be performed in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work will be performed. It is intended for the exclusive use of Ecology for specific application to the referenced property. This RI Work Plan is not meant to represent a legal opinion. No other warranty, express or implied, is made.

References

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2. 2006b. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. October.

3. 2007. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. July.

4. 2008a. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. February.

5. 2008b. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. May.

6. 2008c. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. December.

7. 2009. Cleanup Action Progress Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington. May.

8. 2010a. February 2010 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. April.

9. 2010b. October 2010 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. December.

10. 2011a. Underground Storage Tank Closure Report, Scotty's Towing, Freeland Washington. May.

11. 2012a. April 2012 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. April.

12. 2012b. November 2012 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. December.

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14. 2014b. May 2014 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. July.

15. 2014c. July 2014 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. November.

16. 2015a. Scope of Work for 2015 Cleanup Action Activities, Whidbey Marine & Auto Supply Site, Freeland, Washington. January.

17. 2015b. February 2015 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. May.

18. 2015c. July 2015 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. October.

19. 2016a. Scope of work for January 2016 Groundwater Sampling and Ongoing LNAPL Monitoring and Maintenance, Whidbey Marine & Auto Supply Site, Freeland, Washington. January.

20. 2016b. February 2016 Progress Report, Whidbey Marine & Auto Supply Site, Freeland, Washington. April.

21. Sounds Earth Strategies Inc. (SES) 2017. Preliminary Planning Assessment, Former Whidbey Marine & Auto Supply, 1695 East Main Street, Freeland, Washington. October 23.

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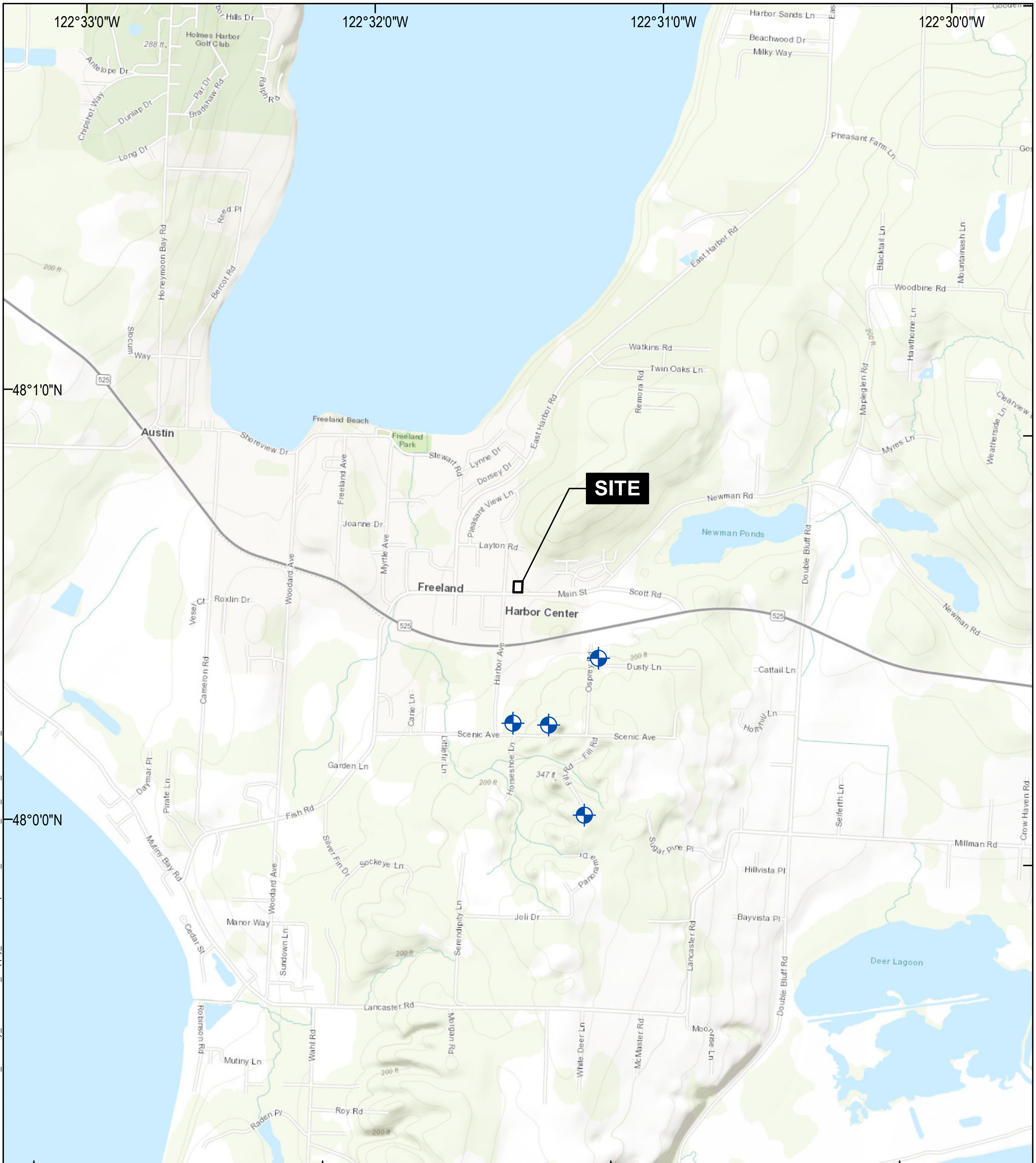
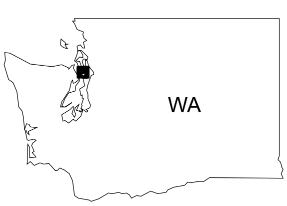
TABLE 1
MONITORING WELL CONSTRUCTION AND SOIL BORING DETAILS
WHIDBEY MARINE AND AUTO SITE
FREELAND, WASHINGTON

Monitoring Well or Boring Location	Consultant	Completion Date	TOC	Total Depth (feet)	Casing Diameter (in)	Screen Length (ft)	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet bgs)	Top of Screen Elevation (feet NAVD88)	Bottom of Screen Elevation (feet NAVD88)
MW-1S	Farallon	10/17/2007	116.41	118	2	35	30	65	86.41	51.41
MW-2S	Farallon	11/17/2007	117.49	66.5	2	10	50	60	67.49	57.49
MW-3S	Farallon	11/17/2007	117.47	61.5	2	10	50	60	67.47	57.47
MW-4S	Farallon	2/1/2007	117.27	58.0	2	10	46	56	71.27	61.27
MW-5S	Farallon	2/1/2007		65.0	2	10	53	63	-53.00	-63.00
MW-6S	Farallon	3/24/2008	116.56	64.5	2	10	51	61	65.56	55.56
MW-7S	Farallon	3/25/2008	116.82	64.5	2	10	49	59	67.82	57.82
MW-8S	Farallon	3/26/2008	117.23	75.5	2	10	51	61	66.23	56.23
MW-9D	Farallon	4/13/2009	114.79	110.0	2	10	100	110	14.79	4.79
MW-10D	Farallon	4/14/2009	113.45	110	2	10	100	110	13.45	3.45
MW-11D	Farallon	4/15/2009	114.24	110	2	10	100	110	14.24	4.24
MW-12D	Farallon	4/15/2009	114.23	110	2	10	100	110	14.23	4.23
MW-13D	Farallon	-	116.34	105	2	10	95	105	21.34	11.34
MW-14D	Farallon	--	--	--	--	--	--	--	--	--
MW-15D	Farallon	--	--	--	--	--	--	--	--	--
MW-16D	Farallon	--	--	--	--	--	--	--	--	--
MW-17D	SES	7/26/2017	115.60	-	2	15	100	115	15.60	0.60
MW-18D	SES	8/14/2017	115.68	115.5	2	15	100	115	15.68	0.68
B-1	Farallon	10/17/2005	--	--	--	--	--	--	--	--
B-2	Farallon	10/18/2005	--	--	--	--	--	--	--	--
B-3	Farallon	10/19/2005	--	--	--	--	--	--	--	--
B-4	Farallon	10/20/2005	--	--	--	--	--	--	--	--
B-5	Farallon	10/21/2005	--	--	--	--	--	--	--	--
B-6	Farallon	10/22/2005	--	--	--	--	--	--	--	--
B-7	Farallon	11/17/2006	--	--	--	--	--	--	--	--
B-8	SES	7/26/2017	--	66	--	--	--	--	--	--
B-9	SES	8/15/2017	--	71.5	--	--	--	--	--	--

Notes:
NAVD88 = North American Vertical Datum of 1988
TOC = top of well casing elevation
-- = Not Available or Not Applicable
Farallon = Farallon Consulting Inc.
SES = Sound Earth Sciences





LEGEND

DRINKING WATER WELL

MAP SOURCE: ESRI
SITE COORDINATES: 48°00'35"N, 122°31'25"W

HALEY ALDRICH

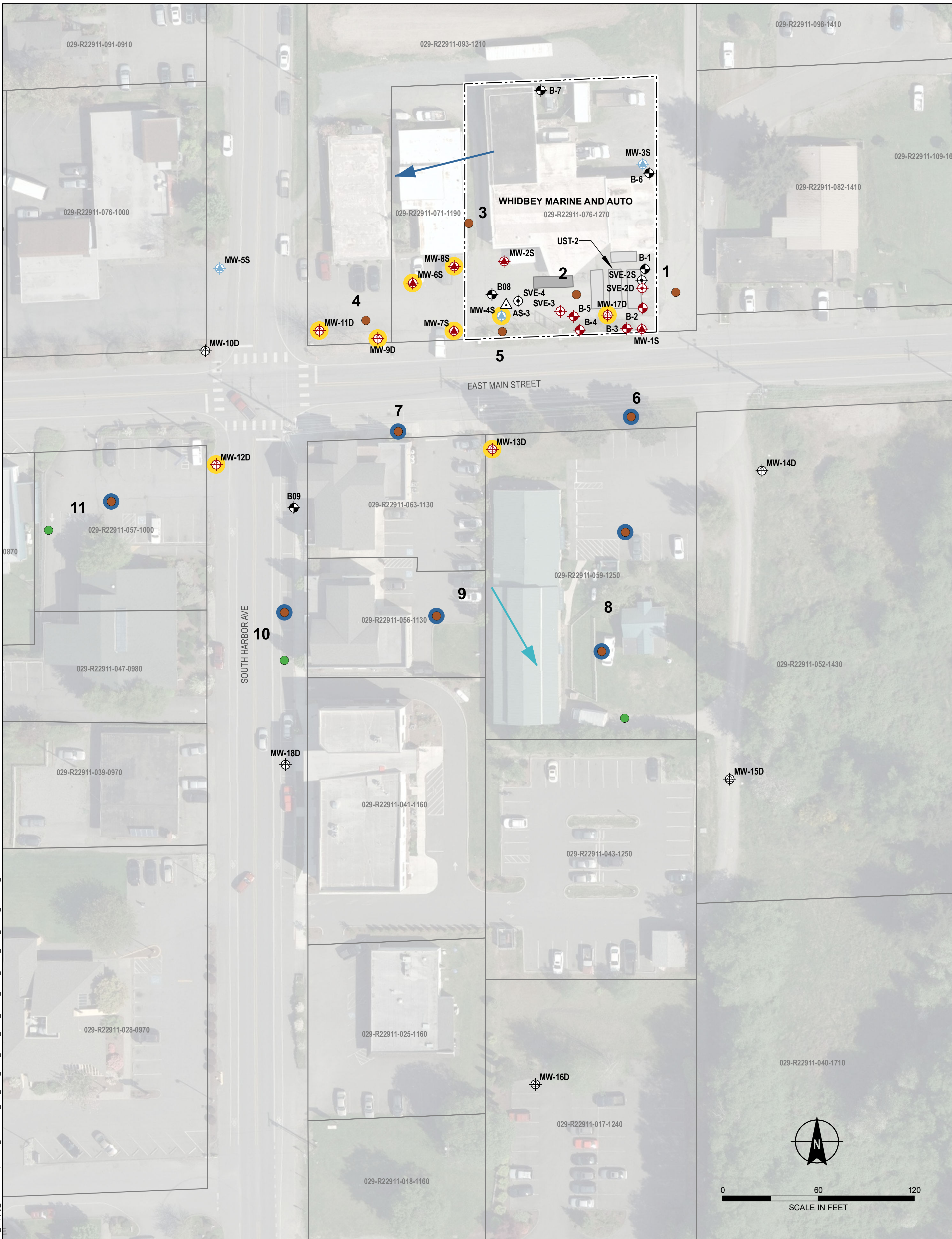
WHIDLEY MARINE & AUTO SUPPLY
1695 EAST MAIN STREET
FREELAND, WASHINGTON

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
APRIL 2022

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\sea_projects\Notebooks\0204475-000_Whidbey_Marine-Auto_Supply_Site\GIS\Maps\2022_03\0204475_000_0001_PROJECT_LOCUS.mxd — USER: khaskins — LAST SAVED: 4/29/2022 2:09:44 PM



LEGEND

- **1** PROPOSED BORING GROUP ID

PROPOSED BORINGS

- BORING
- CONTINGENCY BORING
- BORING AND POTENTIAL MONITORING WELL

EXISTING WELLS, RED SYMBOL INDICATES SOIL RESULTS EXCEEDING MTCA CLEANUP LEVELS

- PERCHED ZONE MONITORING WELL
- SEA LEVEL AQUIFER MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- AIR SPARGE WELL
- SOIL BORING
- GROUNDWATER RESULTS EXCEEDING MTCA CLEANUP LEVELS
- GROUNDWATER FLOW DIRECTION, PERCHED ZONE
- GROUNDWATER FLOW DIRECTION, SEA LEVEL AQUIFER
- FORMER PUMP ISLAND
- FORMER UNDERGROUND STORAGE TANK (UST)
- PROJECT BOUNDARY
- PARCEL BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. GROUNDWATER FLOW DIRECTIONS ARE INFERRED FROM MEASUREMENTS MADE BY SOUND EARTH STRATEGIES (SES) IN 2017.
3. GROUNDWATER RESULTS FROM THE 2017 SES SAMPLING EVENT SHOWN.
4. MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT
5. EXISTING WELLS AND SITE FEATURES DATA SOURCE: DIGITIZED FROM "FIGURE 3," PRELIMINARY PLANNING ASSESSMENT, SES, 2017
6. ASSESSOR PARCEL DATA SOURCE: WASHINGTON STATE
4. AERIAL IMAGERY SOURCE: ESRI

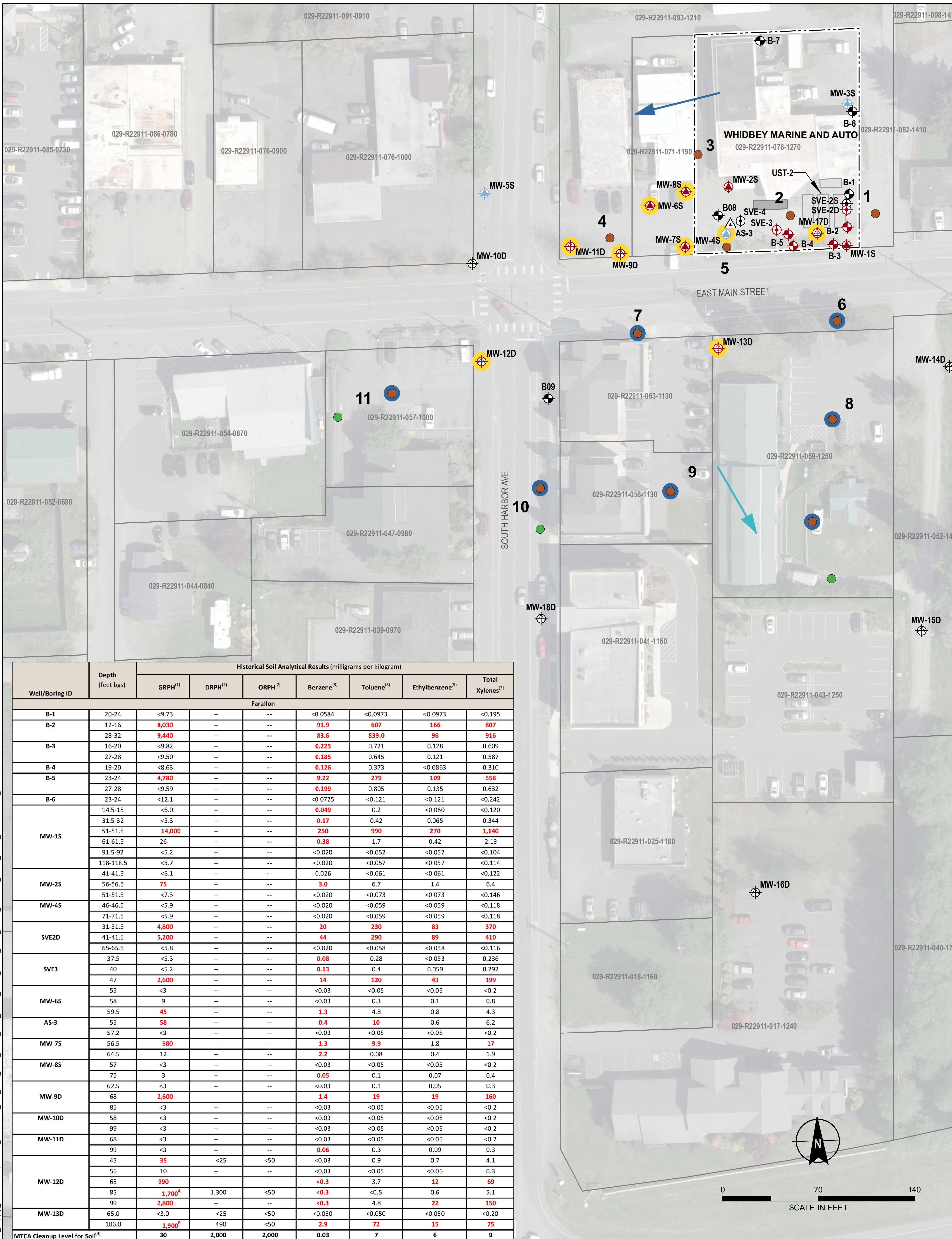
HALEY ALDRICH

WHIDLEY MARINE & AUTO SUPPLY
1695 EAST MAIN STREET
FREELAND, WASHINGTON

SITE PLAN AND PROPOSED DATA GAPS SITE CHARACTERIZATION BORING LOCATIONS

APRIL 2022

FIGURE 2



Well/Boring ID	Depth (feet bgs)	Historical Soil Analytical Results (milligrams per kilogram)						
		GRPH(1)	DRPH(2)	ORPH(2)	Benzene(3)	Toluene(3)	Ethylbenzene(3)	Total Xylenes(3)
Farallon								
B-1	20-24	<9.73	--	--	<0.0584	<0.0973	<0.0973	<0.195
B-2	12-16	8,030	--	--	91.9	607	166	807
	28-32	9,440	--	--	83.6	839.0	96	916
B-3	16-20	<9.82	--	--	0.225	0.721	0.128	0.609
	27-28	<9.50	--	--	0.185	0.645	0.121	0.587
B-4	19-20	<8.63	--	--	0.126	0.373	<0.0863	0.310
B-5	23-24	4,780	--	--	9.22	279	109	558
	27-28	<9.59	--	--	0.199	0.805	0.135	0.632
B-6	23-24	<12.1	--	--	<0.0725	<0.121	<0.121	<0.242
MW-1S	14.5-15	<6.0	--	--	0.049	0.2	<0.060	<0.120
	31.5-32	<5.3	--	--	0.17	0.42	0.065	0.344
	51-51.5	14,000	--	--	250	990	270	1,140
	61-61.5	26	--	--	0.38	1.7	0.42	2.13
	91.5-92	<5.2	--	--	<0.020	<0.052	<0.052	<0.104
	118-118.5	<5.7	--	--	<0.020	<0.057	<0.057	<0.114
MW-2S	41-41.5	<6.1	--	--	0.026	<0.061	<0.061	<0.122
	56-56.5	75	--	--	3.0	6.7	1.4	6.4
	51-51.5	<7.3	--	--	<0.020	<0.073	<0.073	<0.146
MW-4S	46-46.5	<5.9	--	--	<0.020	<0.059	<0.059	<0.118
	71-71.5	<5.9	--	--	<0.020	<0.059	<0.059	<0.118
SVE2D	31-31.5	4,800	--	--	20	230	83	370
	41-41.5	5,200	--	--	44	290	89	410
	65-65.5	<5.8	--	--	<0.020	<0.058	<0.058	<0.116
SVE3	37.5	<5.3	--	--	0.08	0.28	<0.053	0.236
	40	<5.2	--	--	0.13	0.4	0.059	0.292
	47	2,600	--	--	14	120	43	199
MW-6S	55	<3	--	--	<0.03	<0.05	<0.05	<0.2
	58	9	--	--	<0.03	0.3	0.1	0.8
	59.5	45	--	--	1.3	4.8	0.8	4.3
AS-3	55	58	--	--	0.4	10	0.6	6.2
	57.2	<3	--	--	<0.03	<0.05	<0.05	<0.2
MW-7S	56.5	580	--	--	1.3	9.9	1.8	17
	64.5	12	--	--	2.2	0.08	0.4	1.9
MW-8S	57	<3	--	--	<0.03	<0.05	<0.05	<0.2
	75	3	--	--	0.05	0.1	0.07	0.4
MW-9D	62.5	<3	--	--	<0.03	0.1	0.05	0.3
	68	2,600	--	--	1.4	19	19	160
	85	<3	--	--	<0.03	<0.05	<0.05	<0.2
MW-10D	58	<3	--	--	<0.03	<0.05	<0.05	<0.2
	99	<3	--	--	<0.03	<0.05	<0.05	<0.2
MW-11D	68	<3	--	--	<0.03	<0.05	<0.05	<0.2
	99	<3	--	--	0.06	0.3	0.09	0.3
MW-12D	45	35	<25	<50	<0.03	0.9	0.7	4.1
	56	10	--	--	<0.03	<0.05	<0.06	0.3
	65	990	--	--	<0.3	3.7	12	69
	85	1,700[A]	1,300	<50	<0.3	<0.5	0.6	5.1
	99	2,800	--	--	<0.3	4.8	22	150
MW-13D	65.0	<3.0	<25	<50	<0.030	<0.050	<0.050	<0.20
	106.0	1,900[B]	490	<50	2.9	72	15	75
MTCA Cleanup Level for Soil(4)		30	2,000	2,000	0.03	7	6	9

LEGEND

1 PROPOSED BORING GROUP ID

PROPOSED BORINGS

BORING

CONTINGENCY BORING

BORING AND POTENTIAL MONITORING WELL

EXISTING WELLS, RED SYMBOL INDICATES SOIL RESULTS EXCEEDING MTCA CLEANUP LEVELS

PERCHED ZONE MONITORING WELL

SEA LEVEL AQUIFER MONITORING WELL

SOIL VAPOR EXTRACTION WELL

AIR SPARGE WELL

SOIL BORING

GROUNDWATER RESULTS EXCEEDING MTCA CLEANUP LEVELS

GROUNDWATER FLOW DIRECTION, PERCHED ZONE

GROUNDWATER FLOW DIRECTION, SEA LEVEL AQUIFER

FORMER PUMP ISLAND

FORMER UNDERGROUND STORAGE TANK (UST)

PROJECT BOUNDARY

PARCEL BOUNDARY

ABBREVIATIONS

GRPH = GASOLINE-RANGE PETROLEUM HYDROCARBONS
DRPH = DIESEL-RANGE PETROLEUM HYDROCARBONS
ORPH = OIL-RANGE PETROLEUM HYDROCARBONS
BGS = BELOW GROUND SURFACE
< = RESULT BELOW LABORATORY REPORTING LIMIT
-- = NOT ANALYZED
MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT
SES = SOUND EARTH SCIENCE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SOIL RESULTS FROM THE 2017 SES SAMPLING EVENT SHOWN.
3. WELL MW-11 HISTORICALLY EXCEEDED GROUNDWATER MTCA CLEANUP LEVELS, BUT DID NOT EXCEED FROM THE END OF 2014 TO 2017.
4. EXISTING WELLS, SITE FEATURES, AND DATA TABLE DATA SOURCE: DIGITIZED FROM "FIGURE 3," PRELIMINARY PLANNING ASSESSMENT, SES, 2017
5. ASSESSOR PARCEL DATA SOURCE: WASHINGTON STATE
6. AERIAL IMAGERY SOURCE: ESRI

HALEY ALDRICH

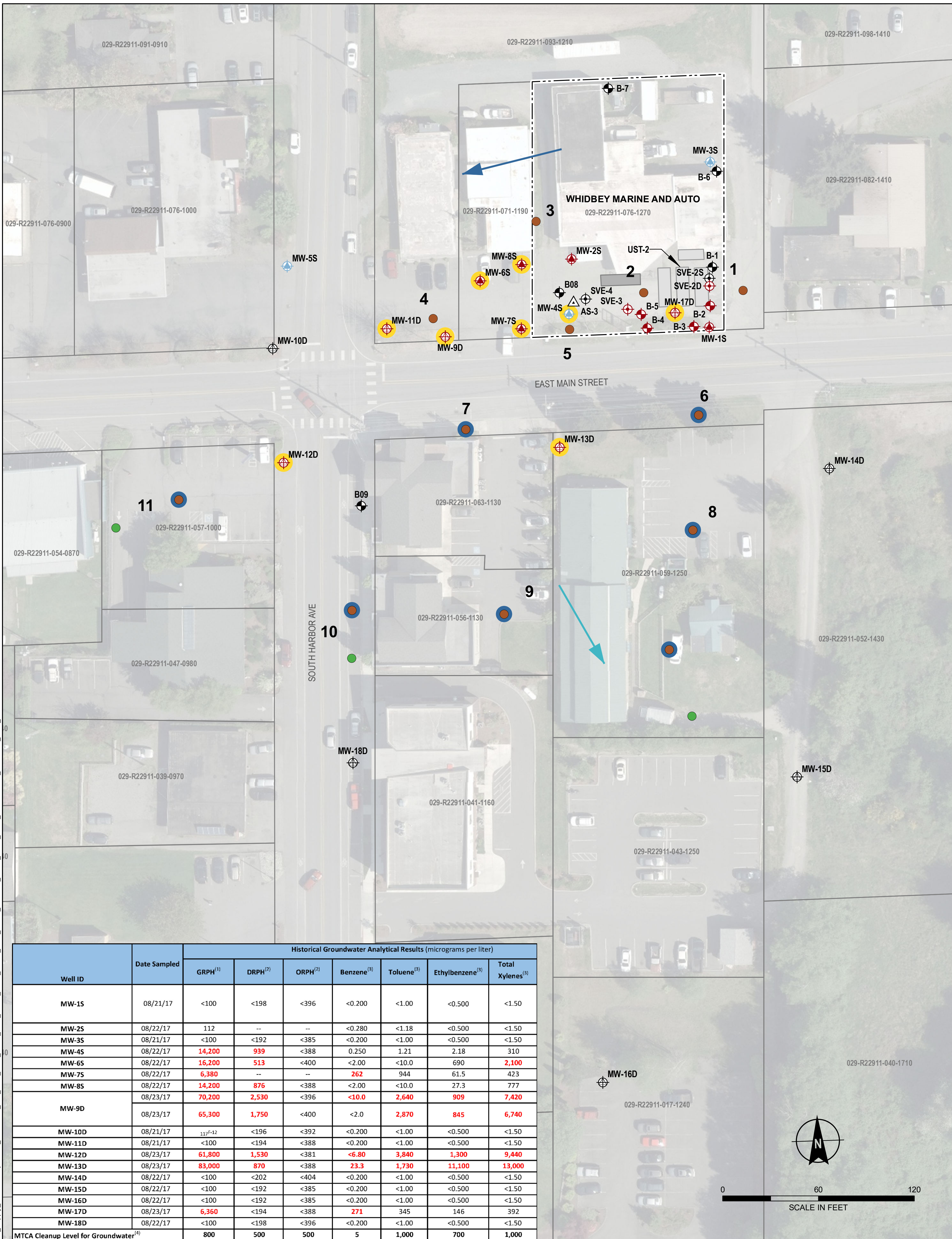
WHIDLEY MARINE & AUTO SUPPLY
1695 EAST MAIN STREET
FREELAND, WASHINGTON

SITE PLAN AND PROPOSED DATA GAPS SITE CHARACTERIZATION BORING LOCATIONS WITH HISTORICAL DATA

APRIL 2022

FIGURE 3

GIS FILE PATH: \\haleyaldrich.com\share\sea_projects\Notebooks\0204475-000_Whidbey_Marine-Auto_Supply_Site\GIS\Maps\2022_03\204475_000_0003_SITE_PLAN_AND_PROP_DATA_GAPS_SITE_CHAR_BORING_LOCS_WITH_HISTORICAL_DATA.mxd — USER: khaskins — LAST SAVED: 4/29/2022 3:25:06 PM



Well ID	Date Sampled	Historical Groundwater Analytical Results (micrograms per liter)						
		GRPH(1)	DRPH(2)	ORPH(2)	Benzene(3)	Toluene(3)	Ethylbenzene(3)	Total Xylenes(3)
MW-1S	08/21/17	<100	<198	<396	<0.200	<1.00	<0.500	<1.50
MW-2S	08/22/17	112	--	--	<0.280	<1.18	<0.500	<1.50
MW-3S	08/21/17	<100	<192	<385	<0.200	<1.00	<0.500	<1.50
MW-4S	08/22/17	**14,200**	**939**	<388	0.250	1.21	2.18	310
MW-6S	08/22/17	**16,200**	**513**	<400	<2.00	<10.0	690	**2,100**
MW-7S	08/22/17	**6,380**	--	--	**262**	944	61.5	423
MW-8S	08/22/17	**14,200**	**876**	<388	<2.00	<10.0	27.3	777
MW-9D	08/23/17	**70,200**	**2,530**	<396	**<10.0**	**2,640**	**909**	**7,420**
	08/23/17	**65,300**	**1,750**	<400	<2.0	**2,870**	**845**	**6,740**
MW-10D	08/21/17	117F-12	<196	<392	<0.200	<1.00	<0.500	<1.50
MW-11D	08/21/17	<100	<194	<388	<0.200	<1.00	<0.500	<1.50
MW-12D	08/23/17	**61,800**	**1,530**	<381	**<6.80**	**3,840**	**1,300**	**9,440**
MW-13D	08/23/17	**83,000**	**870**	<388	**23.3**	**1,730**	**11,100**	**13,000**
MW-14D	08/22/17	<100	<202	<404	<0.200	<1.00	<0.500	<1.50
MW-15D	08/22/17	<100	<192	<385	<0.200	<1.00	<0.500	<1.50
MW-16D	08/22/17	<100	<192	<385	<0.200	<1.00	<0.500	<1.50
MW-17D	08/23/17	**6,360**	<194	<388	**271**	345	146	392
MW-18D	08/22/17	<100	<198	<396	<0.200	<1.00	<0.500	<1.50
MTCA Cleanup Level for Groundwater(4)		**800**	**500**	**500**	**5**	**1,000**	**700**	**1,000**

LEGEND

1 PROPOSED BORING GROUP ID

PROPOSED BORINGS

- BORING
- CONTINGENCY BORING
- BORING AND POTENTIAL MONITORING WELL

EXISTING WELLS, RED SYMBOL INDICATES SOIL RESULTS EXCEEDING MTCA CLEANUP LEVELS

- PERCHED ZONE MONITORING WELL
- SEA LEVEL AQUIFER MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- AIR SPARGE WELL
- SOIL BORING

- GROUNDWATER RESULTS EXCEEDING MTCA CLEANUP LEVELS
- GROUNDWATER FLOW DIRECTION, PERCHED ZONE
- GROUNDWATER FLOW DIRECTION, SEA LEVEL AQUIFER
- FORMER PUMP ISLAND
- FORMER UNDERGROUND STORAGE TANK (UST)
- PROJECT BOUNDARY
- PARCEL BOUNDARY

ABBREVIATIONS

GRPH = GASOLINE-RANGE PETROLEUM HYDROCARBONS
DRPH = DIESEL-RANGE PETROLEUM HYDROCARBONS
ORPH = OIL-RANGE PETROLEUM HYDROCARBONS
BGS = BELOW GROUND SURFACE
< = RESULT BELOW LABORATORY REPORTING LIMIT
-- = NOT ANALYZED
MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT
SES = SOUND EARTH SCIENCE

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. GROUNDWATER RESULTS FROM THE 2017 SES SAMPLING EVENT SHOWN.
3. WELL MW-11D HISTORICALLY EXCEEDED GROUNDWATER MTCA CLEANUP LEVELS, BUT DID NOT EXCEED FROM THE END OF 2014 TO 2017.
4. EXISTING WELLS, SITE FEATURES, AND DATA TABLE DATA SOURCE: DIGITIZED FROM "FIGURE 3," PRELIMINARY PLANNING ASSESSMENT, SES, 2017
5. ASSESSOR PARCEL DATA SOURCE: WASHINGTON STATE
6. AERIAL IMAGERY SOURCE: ESRI

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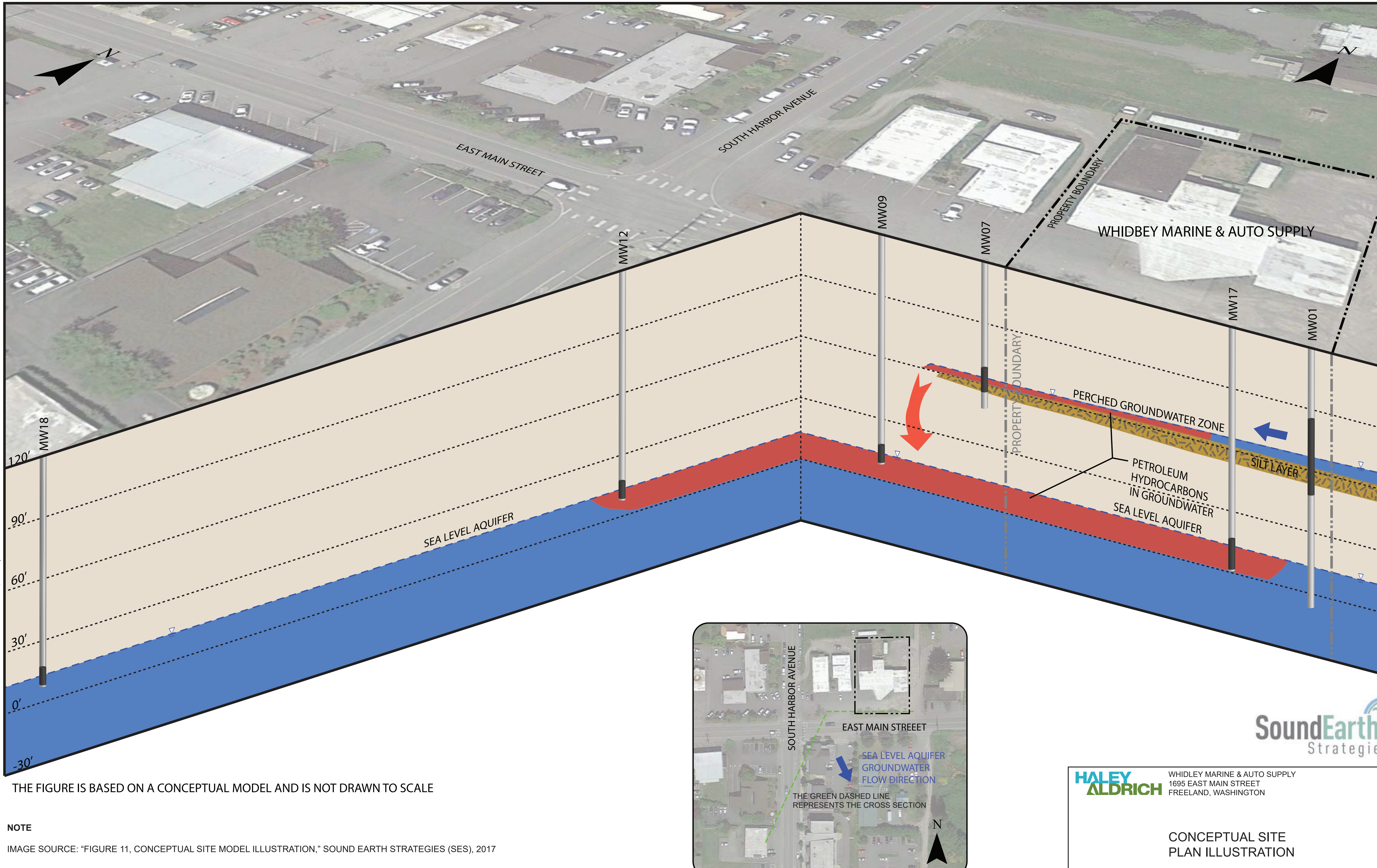
SITE PLAN AND PROPOSED DATA GAPS SITE CHARACTERIZATION BORING LOCATIONS WITH GROUNDWATER ANALYTICAL RESULTS, AUGUST 2017

APRIL 2022

FIGURE 4

GIS FILE PATH: \\haleyaldrich.com\share\sea_projects\Notebooks\0204475-000_Whidbey_Marine-Auto_Supply_Site\GIS\Maps\2022_03\204475_000_0004_SITE_PLAN_AND_PROP_DATA_GAPS_SITE_CHAR_BORING_LOCS_WITH_GRW_ANALYTICAL_RESULTS_AUG_2017.mxd — USER: khaskins — LAST SAVED: 4/29/2022 3:49:36 PM



THE FIGURE IS BASED ON A CONCEPTUAL MODEL AND IS NOT DRAWN TO SCALE

NOTE

IMAGE SOURCE: "FIGURE 11, CONCEPTUAL SITE MODEL ILLUSTRATION," SOUND EARTH STRATEGIES (SES), 2017

SoundEarth Strategies

HALEY ALDRICH

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FREELAND, WASHINGTON

CONCEPTUAL SITE PLAN ILLUSTRATION

MARCH 2022

FIGURE 5

APPENDIX A
Sampling and Analysis Plan

APPENDIX A

Sampling and Analysis Plan

1. Introduction

This Sampling and Analysis Plan (SAP) presents the proposed field activities, and sample collection procedures that will be used to complete the field work for a remedial investigation (RI) at the Whidbey Marine & Auto site (Property) in Freeland, Washington (Figure 1 of the RI Work Plan). Please refer to the attached work plan for a detailed description of the project and relevant Property background information.

2. Sampling Analysis Plan

2.1 FIELD SAMPLING PROCEDURES

2.1.1 Site Access

Access agreements will need to be obtained with the nearby property owners to perform the RI activities on the nearby properties. If borings are completed in the ROW, ROW permits and/or traffic control will likely be required. ROW permits and access agreements will be acquired, as necessary.

2.1.2 Utility Location

Prior to beginning any exploration activities, underground utilities must be located and marked, and the Washington Utility Notification Center should be contacted, who will in turn notify the various utilities in the area to mark any underground installations in the vicinity of the Site. Exploration locations will be adjusted if necessary, to avoid any underground utilities that are identified. Utility locates shall be arranged and coordinated by Ecology's selected consultant.

2.1.3 Explorations and Soil and Grab Groundwater Sampling

Twelve borings will be advanced using a sonic drilling. Most proposed borings will likely be installed to depths of approximately 130 to 140 feet below ground surface (bgs). However, if field screening indicates that contamination may be present at depth, borings can be advanced until the vertical extent of contamination has been delineated. As such, the drillers will be prepared with the necessary equipment to extend the borings to a depth of 150 feet bgs. To prevent vertical migration of contaminants, an outer steel casing will be used to isolate specific stratigraphic intervals from zones above and below, as needed.

The decision to proceed to a greater depth will be based on field observations and screening data collected using a photoionization detector (PID), and the vertical extent of contamination is considered delineated after at least two successive soil vapor head space sample readings collected over a 5-foot vertical depth range which indicate that PID readings have returned to background concentrations, and that no odor or other indication of contamination is noted.

2.1.4 Field Screening Techniques

Soils obtained from drilling explorations will be field screened for contamination through physical observation, performing sheen tests, and measuring headspace vapor using a PID. The effectiveness of field screening varies with temperature, moisture content, organic content, soil type, and age of the constituents. Soil screening tests may not be completed if limited soil volume is recovered. These techniques are discussed below.

Observation. For soil with relatively higher solvent concentrations there will likely be observable indicators of contamination. Soil may be stained or discolored so that it is visibly noticeable compared to typical soil colors. Sheens may also cause the soil to have a shiny or glossy appearance. Odors may also be present ranging from very faint to strong and from sweet smelling to pungent. Odors are usually detected inadvertently during field activities and are usually noticeably different than typical odors in air.

PID Headspace Measurements. Headspace vapor measurements will be made on soil samples using a PID with 10.4 eV lamp to assess the possible presence of volatile organic compounds (VOCs). The PID is not compound-specific and only provides a semi-quantitative indication of the presence of VOCs. The PID measures concentrations in parts per million (ppm). Soil is placed in a Ziploc® bag (filled less than half full), sealed with some air, and allowed to warm to ambient temperatures. PID measurements are made within 30 minutes of collection by opening the bag slightly and inserting the probe into the air space in the bag. The highest PID measurement for each sample is recorded on the field logs.

Sheen Tests. A sheen test is a visual test to assess if a sheen is produced on water by the soil. A small portion of the soil sample is placed in a pan partially filled with water and the water surface is observed for signs of sheen. Sheens will be classified as follows:

- No sheen (NS). No visible sheen on water surface.
- Slight sheen (SS). Light colorless film, spotty to globular; spread is irregular, not rapid; areas of no sheen remain; film dissipates rapidly.
- Moderate sheen (MS). Light to heavy film, may have some color or iridescence; globular to stringy; spread is irregular to flowing; few remaining areas of no sheen on water surface.
- Heavy sheen (HS). Heavy colorful film with iridescence; stringy; spread is rapid; sheen flows off the sample; most of the water surface may be covered with sheen.

2.1.5 Soil Sampling

Soil samples will be collected from each exploration location. In general, soil samples will be collected for possible chemical analysis every 5 feet, with a minimum of five soil samples to be submitted to the laboratory for chemical analysis. Soil samples will be collected for lithologic description, field screening, and chemical analyses, as described below. The sampling locations from within the boring may be modified in the field (based on field screening) if needed to delineate the vertical extent of impacts in soil (i.e., to bound the contamination by collecting one sample above observed impacts, one from within the impacted zone, and one from beneath the suspected impacted zone).

Soil-sampling equipment will be decontaminated before it is used at each sampling location. Where disposable (one-time use) equipment is used, it will be properly discarded after use at one sample, and a new piece will be used for the next sample. Soil samples will be obtained by hand, using a new, uncontaminated glove; or with a decontaminated stainless-steel spoon, trowel, or knife. Unless otherwise directed by the selected analytical laboratory, soil that will be analyzed for VOCs and gasoline-range organics (TPH-G) will be transferred directly from freshly exposed soil into laboratory-supplied containers using the appropriate U.S. Environmental Protection Agency (USEPA) 5035A sampling procedures. The samples will be placed in 40-milliliter vials. Depending on the soil type, 5 milligrams of soil will be added to the vials preserved with sodium bisulfate monohydrate or methanol. A soil sample will also be collected in an unpreserved glass jar for analysis of diesel- and oil-range petroleum hydrocarbons (TPH-D and TPH-O, respectively), metals, and/or polycyclic aromatic hydrocarbons (PAHs).

The following options are considered industry-standard sampling techniques and may be used for soil sample collection. Soil samples will be collected directly from the soil cores from the sonic borings. To prevent cross-contamination between samples, samples will be collected from soil material that has not come into contact with drill casings and hand tools (and other sampling equipment) will be decontaminated between samples.

During drilling, a description of soil conditions and visual and olfactory observations will be recorded on boring logs by a geologist or hydrogeologist licensed in the State of Washington, or by a person working under the direct supervision of a Washington-State-licensed geologist or hydrogeologist in accordance with American Society for Testing and Materials (ASTM) Method D2488. Soil samples will be labeled according to the boring number and the order the sample was collected (e.g., B1-S1). The soil from temporary borings will be field screened for organic vapors using a PID and sheen testing will be performed. Soil and groundwater observations and sample parameters will be recorded on field sampling data sheets.

Sample containers will be packed in iced shipping containers (coolers) with chain-of-custody documentation (as described below) and delivered or shipped to the laboratory. One duplicate soil sample will be collected for every 20 samples collected.

2.1.6 Grab Groundwater Sampling

Groundwater samples will be collected from discrete intervals during drilling to evaluate the vertical distribution of TPH in the perched and sea-level aquifers. Groundwater sample depths will be determined in the field based on soil stratigraphy observations and field screening observations. When a boring enters a highly transmissive lens, drilling will cease. The outer steel casing used by drillers to prevent vertical migration of groundwater will be lowered to the transmissive zone. This should isolate groundwater from the desired transmissive zone. Groundwater samples will be collected directly from the borehole using low-flow sampling techniques. For borings that may be completed as monitoring wells, samples will be submitted to the laboratory on an accelerated turnaround time to assist in determining the screened interval.

2.1.7 Completion and Abandonment

The borings will be abandoned in accordance with WAC and RCW rules and regulations (except those being converted to monitoring wells which are discussed in the following section). Abandonment will consist of filling the boring with granular bentonite and hydrating the bentonite with water. For paved areas, a cold asphalt or concrete patch will complete the surface seal.

2.1.8 Documentation

Observations, field screening results, and sampling activities will be documented in field notes and forms. Boring logs will include information such as the project name and location, the name of the drilling contractor, the drilling method, the sampling method, sample depths, a description of soil encountered, and screened intervals. Soils will be described using ASTM D2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). The information will be recorded on a boring log form or in field notes.

2.2 MONITORING WELL CONSTRUCTION AND DEVELOPMENT

Select borings will be completed as monitoring wells after soil screening and sampling are completed. These locations are identified in RI Work Plan Figure 2. All wells will be installed and constructed in accordance with WAC and RCW rules and regulations.

2.2.1 Construction

Each monitoring well will be constructed of a 2-inch-diameter Schedule 40 PVC casing with a 10 to 20-foot-long, 0.010-inch-slot screen placed at the appropriate screen interval as determined during field conditions. A clean silica sand pack (10/20 sand) will be placed between the boring wall and the PVC screen from the bottom of the well to approximately 1 to 2 feet above the screened interval. A minimum 3-foot bentonite seal will be placed above the sand to within 1 or 2 feet of the ground surface. A concrete surface seal will secure a flush-mounted, traffic-rated monument. A watertight locking cap and lock will secure the wellhead, and bolts will secure the monument cover. All monuments will be permanently marked with well identification numbers.

2.2.2 Elevations

To calculate subsequent groundwater level elevations and flow direction, the tops of the well casings will be surveyed/measured to the nearest 0.01 foot by a licensed surveyor.

2.2.3 Development

Following installation, monitoring wells will be developed at least 12 hours after construction. The depth to water and depth to sediment in each well will be measured using an electronic water-level probe before starting well development. Wells will be mechanically developed by fully swabbing the screen interval at 2-foot intervals at a time with a surge block, followed by surging, and then pumping until the groundwater shows minor presence of fine sediments and is not overly cloudy or dark. Development will be considered complete after the (a) water from the wells becomes visibly clear, (b) turbidity measurements stabilize to within 10 percent for three successive casing volumes, (c) a minimum of 10 well volumes are purged, or (d) the well bails dry. See Section 2.6 for well development water storage and disposal.

2.2.4 Documentation

Observations and development activities will be documented in field notes and forms. Observations will include, but are not limited to, groundwater levels, development water characteristics (e.g., color, turbidity, sheens), and development purge volumes.

2.3 MONITORING WELL SAMPLING

If new monitoring wells are installed, they will be sampled no sooner than 12 hours after development.

2.3.1 Measurement of Groundwater levels

Prior to purging, groundwater levels in the wells will be measured to the nearest 0.01 foot using an electronic water-level probe. The wells will be opened and allowed to equilibrate for up to a half hour before measurements are taken.

2.3.2 Purging

After groundwater levels are measured, each well will be purged at a low flow rate using a bladder pump or submersible pump fitted with clean, disposable tubing. The tubing inlet will be placed approximately at the middle of the well screen. Tubing will be used one time and disposed of as described in Section 2.8.3. To assess the effectiveness of purging, pH, electrical conductivity, temperature, dissolved oxygen, and oxidation-reduction potential (ORP) will be measured by means of a flow-through. Results of these measurements will be included in the field notes. Purging will be considered complete when three casing volumes of water have been removed, the well purges dry, or field parameters stabilize to within 10 percent for three consecutive readings (whichever is less). If the well is purged dry, it will be allowed to recover before sampling is performed. Purge water will be handled in accordance with Section 2.6.

2.3.3 Sampling

After purging of a well is complete, a groundwater sample will be collected using the same equipment used for purging and low-flow groundwater sampling techniques. The laboratory-supplied sample bottles will be filled directly from the polyethylene tubing. VOA containers will be filled, leaving no headspace.

Select monitoring wells will have samples analyzed for nitrate, nitrite, ammonia, total suspended solids (TSS), chloride, sulfate, alkalinity, sulfide, methane, ethylene, ethane, dissolved iron, and dissolved manganese.

2.3.4 Documentation

Observations made during groundwater sampling activities will be documented in field notes. Observations will include, but are not limited to, groundwater levels, purge water characteristics (e.g., color, turbidity, sheens), purge volumes, field parameter measurements, and sampling time.

2.4 SAMPLE MANAGEMENT

2.4.1 Containers

Clean sample containers will be provided by the analytical laboratory ready for sample collection, including preservative, if required. Specific container requirements for samples that will undergo multiple analyses will be discussed with the analytical laboratory prior to sample collection.

2.4.2 Labeling Requirements

A sample label will be affixed to each container before sample collection. All containers will be marked with the project number, a sample number, date and time of collection, sampler's initials, and preservation type. Each sample will have a unique identification number that will be referenced by entry into notes. Soil samples will be labeled according to the boring number and the order the sample was collected (e.g., B1-S1).

2.4.3 Chain of Custody Procedures

Chain of custody forms will be used to document the collection, custody, and transfer of samples from their initial collection location to the laboratory. Each sample will be entered on the custody form immediately after it is collected.

- Sample custody procedures will be followed to provide a record that can accompany a sample as it passes from collection through analysis. A sample is considered to be in custody if it meets at least one of the following conditions:
- It is in someone's physical possession or view;
- It is secured to prevent tampering (i.e., custody seals); and/or
- It is locked or secured in an area restricted to authorized personnel.

A chain of custody form will be completed in the field as samples are packaged. At a minimum, the information on the custody form will include the sample number, date and time of sample collection, sampler, analysis, and number of containers. A copy of the custody form will be placed in the cooler with its respective samples before the container is sealed for delivery to the laboratory. Another copy will be retained and placed in the project files after review by the project manager. Custody seals will be placed on each cooler containing samples so the package cannot be opened without breaking the seals.

After sample containers have been filled, they will be stored in a cooler cooled with ice or blue ice to approximately 4 degrees Celsius (°C). The coolers will be transferred to the analytical laboratory for chemical analysis. Chain of custody procedures will be maintained and documented at all times, from commencement in the field until delivery of the samples to the analytical laboratory, as discussed previously. Specific procedures are:

- Individual sample containers will be packed to prevent breakage;
- Custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler;
- Signed and dated custody seals will be placed on all coolers before shipping;
- Samples will be hand-delivered to the analytical laboratory by Hart Crowser personnel or courier;
- When sample possession is transferred to the laboratory, the custody form will be signed by the persons transferring custody of the coolers; and
- Upon receipt of samples at the laboratory, the shipping container custody seal will be broken, and the sample-receiving custodian will compare samples with information on the chain of custody form and record the condition of the samples received.

2.4.4 Laboratory Analyses and Turnaround Time

2.4.5 Soil Samples

Analyze selected soil samples for TPH-G, TPH-D, TPH-O, VOCs, VPH and EPH, EDB, EDC, MTBE, PAHs, and total metals (lead and arsenic).

Up to 25 subsurface soil samples will be analyzed on an expedited turnaround for TPH-G and TPH-Dx analyses. Following receipt and review of laboratory chromatograms, we will select roughly five samples that exceed the Method A CUL for TPH. If more than 1 petroleum type is encountered, we will have the laboratory analyze a minimum of 3 VPH/EPH tests for each product type at that sample location. For the purposes of this work plan, we have assumed a maximum of 15 VPH/EPH soil analyses will be performed.

All other soil samples will be analyzed on a standard turnaround time.

2.4.6 Groundwater Samples

Analyze selected soil samples for TPH-G, TPH-D, TPH-O, VOCs, VPH and EPH, EDB, EDC, MTBE, PAHs, and metals (lead and arsenic).

Selected groundwater samples will also be analyzed for nitrate, nitrite, ammonia, TSS, chloride, sulfate, alkalinity, sulfide, methane, ethylene, ethane, dissolved iron, and dissolved manganese.

For borings that may be completed as monitoring wells, samples will be submitted to the laboratory on an accelerated turnaround time to assist in determining the screened interval. All other groundwater samples will be analyzed on a standard turnaround time.

2.5 DECONTAMINATION PROCEUDRES

2.5.1 Sampling Equipment Decontamination

To prevent cross contamination between sampling events, clean dedicated sampling equipment (e.g., disposable gloves, groundwater sampling tubing) will be used for each sample location and discarded after use. Cleaning of non-disposable items, such as the water level indicator, will consist of washing in a detergent (Liquinox®) solution, rinsing with tap water, followed with a deionized water rinse. Decontamination water will be collected and handled as IDW as discussed in the following section.

The drilling subcontractor will use a specialized, self-contained decontamination trailer with a pressure washer and steam cleaner to clean the drilling equipment, such as drill rods and casing, prior to beginning each new boring. The IDW will be contained and transferred to drums stored on the site as discussed in the following section.

2.6 IDW MANAGEMENT

Investigation-derived waste (IDW) will be generated during drilling activities, decontamination procedures, well development, and purging and sampling during quarterly groundwater monitoring events. The handling and disposal of specific types of IDW are discussed below. Copies of all disposal documentation (e.g., manifests, weight tickets) for IDW will be provided in the final report.

Soil and water IDW will be placed in separate, labeled, 55-gallon steel drums to be temporarily stored on the Property in a secure area provided by the Property owner. Associated samples collected from the RI activities will be used to profile the soil and water IDW for disposal. As a contingency, however, IDW samples will be collected from the drummed soil and only analyzed if requested by the receiving facility. Upon receipt of the chemical analysis, the IDW will be appropriately disposed of at a permitted disposal or treatment facility.

Disposable sampling equipment (e.g., sample tubing) and personal protective equipment (e.g., nitrile gloves) will be placed in plastic bags after use and disposed of as solid waste.