Work Plan for Feasibility Pilot Study

Tiki Car Wash
Facility Site ID: 2352
Cleanup Site ID: 5096

Final

Prepared for:

Washington State Department of Ecology

Toxics Cleanup Program
Northwest Regional Office
Shoreline, Washington

March 14, 2024
Project No. M0592.06.001

Prepared by:

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MAUL FOSTER ALONGI

Work Plan for Feasibility Pilot Study

Tiki Car Wash
Facility Site ID: 2352
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The material and data in this report were prepared under the supervision and direction of the undersigned.

Maul Foster & Alongi, Inc.

This digital seal certifies the signatory and document content.

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Abbreviations

AS	air sparging
bgs	below ground surface
DPE	dual-phase extraction
Ecology	Washington State Department of Ecology
FPS	feasibility pilot study
FS	feasibility study
GRW	groundwater recirculating well
IWAS	in-well air stripping
MFA	Maul Foster & Alongi, Inc.
MNA	monitored natural attenuation
OVM	organic vapor meter
PID	photoionization detector
the Property	11909 NE 8th Street, Bellevue, Washington 98005
QAPP	quality assurance project plan
RI	remedial investigation
SAP	sampling and analysis plan
the Site	Tiki Car Wash site (Facility Site ID: 2352, Cleanup Site ID: 5096)
SPC	specific conductance
SVE	soil vapor extraction
TPH	total petroleum hydrocarbon
WAC	Washington Administrative Code
work plan	work plan for feasibility pilot study

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1 Introduction

On behalf of the Washington State Department of Ecology (Ecology), Maul Foster & Alongi, Inc. (MFA), prepared this work plan for feasibility pilot study (FPS) (collectively the work plan) for the Tiki Car Wash site (the Site), located at 11909 NE 8th Street in Bellevue, Washington (the Property) (see Figure 1-1). The Site is listed in Ecology's cleanup database as Facility Site ID 2352 and Cleanup Site ID 5096.

1.1 Regulatory Framework

On March 29, 1993, Tiki Enterprises and Ecology entered Consent Decree No. 93-2-07710-6, which outlined the remedial action to be performed to address contamination at the Site. The scope of work in the consent decree described remedial action at the Site in three phases:

- Phase I: Remedial investigation (RI) and feasibility study (FS)
- Phase II: Cleanup action plan, and
- Phase III: Implementation of the cleanup action plan

In April 2023, Leidos completed the final RI report, documenting the nature and extent of total petroleum hydrocarbon (TPH) impacts to the Site (Leidos 2023). In January 2024, MFA prepared and submitted an RI amendment to address data gaps identified by Ecology following completion of the RI (MFA 2024). This work plan supports Phase I and future development of the FS, which will be completed under the direction of Ecology and submitted for agency and public review and comment.

1.2 Purpose and Objective

The purpose of the FPS is to generate data to evaluate the viability of one remedial approach to address groundwater contamination at the Site. The objective of the FPS is to collect data for use in the forthcoming feasibility study, where an evaluation of potential cleanup alternatives will be performed. These objectives will be supported by the following activities:

- Reconnaissance and field preparation, including communication with the Property owner, locating an external power supply and access point, coordinating traffic control and diversion measures, and marking the FPS work area.
- Coordination of public and public utility locates in the FPS work area.
- Direct-push drilling and installation of a groundwater recirculating well (GRW) and three piezometer wells in the FPS work area.
- Installation of piezometers to the west and southwest of the GRW to support data collection.
- Initial and future groundwater sample collection for laboratory analysis, as described in a sampling and analysis plan (SAP) (see Appendix A).

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- Data analysis and data validation, as described in a quality assurance project plan (QAPP) (see Appendix A).
- Report preparation.

1.3 Organization

This work plan defines the approach for conducting an FPS in alignment with the purpose and objectives defined in Section 1.2. Standard field operating procedures for sample collection, analyses, equipment decontamination, and managing investigation-derived waste are described in the SAP/QAPP (see Appendix A).

The work plan is organized into the following sections:

- **Section 2** outlines the background and physical setting.
- **Section 3** discusses key FS considerations.
- **Section 4** describes the scope of work to be performed.
- **Section 5** provides the anticipated schedule.
- **Section 6** states how results will be reported.

2 Background and Physical Setting

2.1 Property Overview

The approximately 0.59-acre Property is located at 11909 NE 8th Street in Bellevue, Washington 98005 (see Figure 2-1). Since 1971, the Property has been operated as a gas station and car wash with an on-Property convenience store. Four single-walled steel underground storage tanks have historically existed at the Property: three installed in 1971 and the fourth installed in 1979.

In 1995, an air sparging (AS) and soil vapor extraction (SVE) system was installed along the west and south edges of the Property. However, the system was prone to shutdown due to water accumulation and was ultimately abandoned sometime in 2000 (EA 2008).

2.2 Geology and Hydrogeology

According to previous reports, regional geology near the Property consists of Holocene fill and Pleistocene Vashon Drift (Enviros 1993, EA 2008). The fill is composed of silt, fine-to-medium grain sand, gravel, and occasional peat deposits. The Pleistocene Vashon Drift unit varies from weathered glacial till to a stratified alluvium and comprises recessional sand and gravel, Vashon till, advance outwash, and Lawton Clay. The glacial till, ranging in thickness from 20 to 150 feet, is an unsorted, unstratified, compact assortment of boulders, cobbles, pebbles, sand, silt, and clay.

The Property is underlain by 3 to 5 feet of fill material and at least 16 feet of weathered till (Enviros 1993). Generally, the fill unit comprises fine-to-medium-grained gravelly sand with intermittent stiff

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clay deposits. The gravelly silty sands become denser and resemble glacial till with increasing depth. Sand and gravel are occasionally encountered in the weathered till unit.

Regional hydrology records indicate that the Property and surrounding area are underlain by three aquifers: (1) a shallow aquifer approximately 5 feet below ground surface (bgs), associated with impermeable glacial till with thin beds of sand and gravel; (2) an intermediate aquifer beneath the glacial till with an average water depth around 38 feet bgs; and (3) a deep aquifer segregated from the intermediate aquifer by an impermeable clay unit, with an average water depth around 45 feet bgs.

2.3 Conceptual Site Model

2.3.1 Contaminants of Concern

In the RI, Leidos developed a conceptual site model for the Site (Leidos 2023). The conceptual site model identified gasoline-range TPH and benzene, toluene, ethylbenzene, and total xylenes as contaminants of concern in soil, groundwater, and soil vapor for the Site. MFA added diesel- and heavy-oil-range TPH as additional contaminants of concern in soil at the Site (MFA 2024).

2.3.2 Exposure Pathways

The RI identified potential exposure pathways for each impacted environmental media (i.e., soil, groundwater, and soil vapor) at the Site (Leidos 2023). The incidental ingestion/dermal contact pathway was considered limited because impacts in soil and groundwater are generally between 5 to 15 feet bgs. However, impacted soil and groundwater could be encountered during future investigation or construction activities at the Site. Further, the shallow aquifer is not used as a drinking water supply at or near the Site.

3 Feasibility Study Considerations

Leidos prepared a draft FS for the Site in May 2023 (Leidos 2023). This draft FS evaluated the following five remedial action alternatives:

- Alternative 1: AS/SVE and monitored natural attenuation (MNA)
- Alternative 2: Partial excavation, institutional controls, and MNA
- Alternative 3: Dual-phase extraction (DPE) and MNA
- Alternative 4: Enhanced aerobic biodegradation and MNA
- Alternative 5: Institutional controls and MNA

The draft FS selected DPE and MNA as the recommended alternative. MFA noted several potential issues with the alternative rankings.

Washington Administrative Code (WAC) 173-340-360 outlines the procedures for the evaluation of and selection of a cleanup action, including conducting a disproportionate cost analysis. Leidos

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ranked all alternatives the same for permanence given the assumption that petroleum hydrocarbons are expected to eventually biodegrade. MFA would disagree that Alternative 5 (institutional controls and MNA) provides a reasonable restoration time frame, especially since Ecology has made clear that a conditional point of compliance would not extend beyond the source property. Alternative 5 should then be eliminated from further evaluation.

Assuming the four remaining alternatives are similarly permanent, WAC 173-340-360(5)(c)(iii)(B) requires that less-cost effective, permanent cleanup action alternatives be eliminated from further consideration. This would lead to the selection of Alternative 4 (enhanced aerobic biodegradation and MNA) instead of the more costly Alternative 3 (DPE and MNA). Given the significant concerns with the draft FS conclusions, MFA and Akana propose that a reconsideration of the cleanup action alternatives and the prioritization of a pilot study prior to finalizing the FS. Based on the likely high groundwater volume that would need to be extracted, treated, and discharged using DPE technologies, an alternative of in-situ treatment was proposed to Ecology. MFA and Akana have proposed in-well air stripping (IWAS) as a technology potentially appropriate for the site conditions.

3.1 Space Considerations and Disruption to Site Operations

A primary consideration for the selection of the cleanup action alternative is that the cleanup action minimizes disruption of the gas station and car wash business operations at the Site. The cleanup action will need to effectively remediate contamination and provide for a short installation period and minimal treatment equipment footprint.

By definition, DPE requires the treatment of both liquid phase and vapor phase streams. Given the relatively shallow groundwater at the site, this would require significant groundwater extraction to avoid the same issues with water accumulation in the SVE system that plagued the previous AS/SVE system.

While DPE could be implemented, a groundwater treatment technology that liberates petroleum hydrocarbons to the vapor phase would significantly reduce costs, installation timeline, and the equipment footprint required. IWAS provides just such a system without the reliance on separate air sparging wells and concern for expansion of the plume. The IWAS process uses specially designed wells to allow air injection in the same well as the vapor extraction. As a result, the vacuum applied can be set at a lower suction but still ensure the capture of the vapors. This helps reduce the potential for groundwater removal by the SVE system as condensate.

In addition to contaminant mass removal by AS/SVE, IWAS would include elements of enhanced aerobic biodegradation. IAWS uses two screened intervals within the well and the density gradient induced by the air injection to drive a three-dimensional recirculation pattern in groundwater around the well (FRTR 2024). This recirculation current returns groundwater with low concentrations of dissolved fuels and high concentrations of dissolved oxygen to the aquifer, both enhancing biodegradation and physical removal of contaminant mass from source zones by dissolution to groundwater (for later air stripping within the well).

MFA and Akana proposed to Ecology the piloting of an IWAS system to inform future refinement of the FS. Ecology approved the development of this work plan for FPS to inform the scope of that effort. In addition to evaluation of the performance of the IAWS technology, the equipment would allow for the separate evaluation of SVE by itself. The proposed IAWS pilot system is described in detail in the following section.

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4 Scope of Work

4.1 Site Preparation

Field personnel from MFA and Akana will coordinate access with the owner before mobilizing to the Property. The initial reconnaissance will aim to achieve the following:

- Identify and mark the FPS work area in the northeast corner of the Property (see Figure 4-1).
- Mark the planned locations for the GRW and nearby piezometer wells.
- Locate a nearby power supply, which is currently assumed to be between the car wash on the Property and the adjacent Bartell Drugs property to the east. If there is sufficient capacity remaining on the electrical panel serving the car wash, a circuit for the FPS equipment could be added directly to this panel.
- Coordinate traffic control measures to divert automobile traffic exiting the car wash away from the FPS work area (see Figure 4-1).

4.2 Groundwater Recirculating Well and Piezometer Installation and Development

The GRW and three downgradient wells fitted with piezometers (PZ-10, PZ-15, and PZ-25) will be advanced using push-probe drilling to depths of 20 feet below ground surface (bgs) and 15 feet bgs, respectively. The GRW and piezometer well locations are shown on Figure 4-1. Drilling, well installation, and well development will be performed consistent with MFA standard operating procedures (see Appendix C). All wells will be constructed according to the Washington State well construction standards (WAC 173-160, Minimum Standards for Construction and Maintenance of Wells). Details are provided below.

- The GRW will be constructed with 4-inch-diameter polyvinyl chloride or stainless-steel riser pipes and screened sections consisting of 0.101-inch machine slots. The GRW may be constructed with prepacked well screen with 10 x 20 washed silica sand or by placing materials downhole, following WAC 173-160. The GRW will be screened between 3 and 25 feet bgs.
- The three piezometer wells will be constructed with 2-inch diameter polyvinyl chloride or stainless-steel riser pipes and screened sections consisting of 0.101-inch machine slots. All wells may be constructed with prepacked well screen with 10 x 20 washed silica sand or by placing materials downhole, following WAC 173-160. The piezometer wells will be screened between 3 and 15 feet bgs.
- Additional filter pack may be placed around the prepacked screen, if used. The additional filter pack will consist of graded 10 x 20 washed silica sand and will extend a maximum of 1 foot below the bottom of the screen and 3 feet above the top of the screen. A weighted line may be used to monitor the level of the filter pack during installation. The filter pack may be surged during installation.

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- Bentonite grout or chips hydrated with potable water (e.g., 0.75-inch minus) will be used to seal the annulus above the filter pack. A weighted line may be used to measure the top of the bentonite chips as they are poured into place.[1]
- At least 24 hours after well installation, each well will be developed by surging, bailing, or pumping to remove sediment that may have accumulated during installation and to improve the hydraulic connection with the water-bearing zone.
- Water quality field parameters such as specific conductance (SPC), pH, temperature, and turbidity will be measured during well development, as deemed appropriate. The wells will be developed until the turbidity measurements are 10 nephelometric turbidity units or less, or until there is a noticeable decrease in turbidity. To the extent practical, water quality field parameters will be considered stable when the SPC is within 10 percent of the previous reading, pH is within 0.1 standard unit of the previous reading, and temperature is within 0.1 degree Celsius of the previous reading.
- Development methods, purge volumes, and water quality parameters will be recorded on well development field forms.

4.3 Groundwater Parameter Monitoring

To reduce the impact on the operation of the gas station and car wash, the testing equipment is located on the northeast portion of the site (see Figure 4-1). The chemical response to the additional energy and oxygen may take many days to be observed outside of the GRW. To collect consistent and reliable data, certain groundwater parameters will be continuously monitored (see Appendix A).

4.4 *In-Situ* Air Sparging and Soil Vapor Extraction

Once developed, the GRW will be outfitted for AS/SVE as follows:

- An insert will be placed in the GRW to allow for groundwater aeration (i.e., air injection). An air injection line will be placed, with centralizers, at approximately 18 to 20 feet bgs, leaving 5 feet of screen at the bottom of the well and a minimum of 2 feet of blank casing for air injection.
- The air injection system will be installed in the GRW. The air injection line will be attached to an air compressor/blower unit located within the work area. A vacuum line will be manifolded to remove soil vapor from the outer annulus of the GRW to the well head and connected to a vacuum pump system.

Operation of the GRW outfitted for AS/SVE is shown in a process flow diagram (see Figure 4-2). The SVE system will be started and removed soil vapors will be monitored at the exhaust point with a photoionization detector (PID) or organic vapor meter (OVM) continuously for the first four hours of operation. Once the vacuum rate is set and the operator confirms that well condensate is not being drawn into the system, the AS equipment will be started, and the exhaust will be monitored with the PID or OVM. The maximum air pressure applied will be the break-pressure needed to overcome the submerged depth based on the depth to water. The air injection rate will not exceed five cubic feet per minute and the pressure will be set to allow air flow but not produce excessive condensate in the extracted air stream.

[1] The top of the GRW casing will be fitted to allow for SVE prior to seal placement.

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4.5 SVE System Exhaust Sampling

The extracted air at the exhaust point of the SVE system will be sampled according to the procedures described in the SAP/QAPP (see Appendix A). The final day of testing will be the final air sample to be collected.

4.6 Groundwater Sampling

Initial and follow-up groundwater sampling will be performed according to the procedures described in the SAP/QAPP (see Appendix A).

4.7 Equipment Decommissioning and Removal

Upon FPS test completion, all AS/SVE equipment will be removed. Down well data loggers will be left in the piezometer wells for 30 days additional days following FPS test completion. At that point, the piezometer wells will be decommissioned.

4.8 Investigation-Derived Waste

Purge water from GRW development will be containerized in Department of Transportation-approved 55-gallon drums for characterization prior to off-Property disposal by an approved subcontractor.

5 Schedule

The project schedule will be determined based on communication with the Property owner and Ecology. MFA anticipates that the GRW and supporting equipment will be installed in March/April 2024 and that sampling will be complete by June 2024. Samples will be submitted to the analytical laboratory on a standard turnaround time. It is expected that analytical data validation and a draft report will be submitted to Ecology in July 2024 and that the final report will be submitted to Ecology in August 2024.

Upon completion of the test, the equipment will be dismantled and removed from the Site. Groundwater will be allowed to equilibrate for approximately one week before samples will be collected and sent to the laboratory for analysis. The final testing duration may be modified based on Site conditions or access constraints as identified and agreed upon by MFA and Ecology.

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6 Reporting

MFA will prepare and submit to Ecology a report describing the work completed, water quality parameter data, field sampling data, laboratory analytical data, and a summary of our findings and recommendations.

MFA will provide documentation of the fieldwork, data validation and quality assurance/quality control, and evaluation of the analytical results of the FPS, including a summary of baseline and GRW process results for comparative purposes. The results of the FPS will be used to inform the remedial options considered in the future feasibility study. The report will evaluate the radius of influence for the GRW, which may be used to inform future full-scale remedial design, as well as the potential for enhanced microbial activity as a means for achieving further soil and groundwater remediation.

Groundwater analytical data will be screened against Model Toxics Control Act Method A (Tables 740-1 and 720-1 of WAC 173-340-900, respectively), consistent with data screening performed in the RI (Leidos 2023) and RI Addendum (MFA 2024).

Per Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), all data collected from the Property by MFA will be uploaded to Ecology's Environmental Information Management system database. Consistent with WAC 173-340-840(5) and Policy 840, data generated will be submitted in both written and electronic format.

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MFA. 2024. *Remedial Investigation Amendment, Tiki Car Wash, Facility Site ID: 2352, Cleanup Site ID: 5096.* Prepared for the Washington State Department of Ecology, Toxics Cleanup Program, Northwest Regional Office, Shoreline, Washington. Maul Foster & Alongi, Inc.: Seattle, WA. January 26.

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Limitations

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

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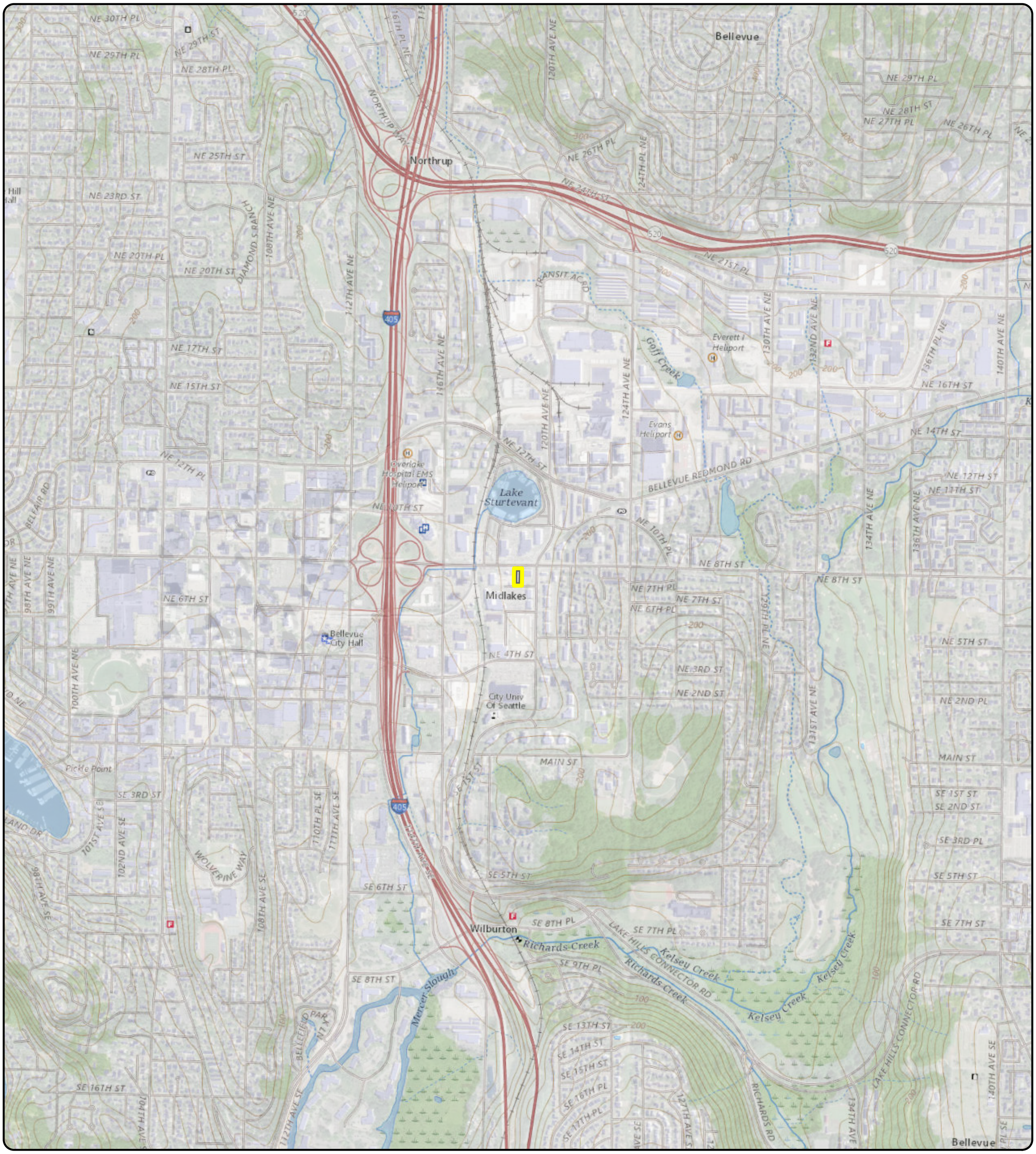
Figures



Notes
U.S. Geological Survey 7.5-minute topographic quadrangle (2020): Mercer Island.
Township 25 north, range 5 east, section 33.

Data Source
Boundary for parcel 3325059180 obtained from King County.

Legend

Property Boundary

Figure 1-1
Vicinity Map

Tiki Car Wash
11909 NE 8th Street
Bellevue, WA

0 1,000 2,000
Feet

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Path: X:\0_MFA_Projects\M0592\06\001\Pro\M0592_06_001_001.aprx\Fig 1-1 Vicinity Map
Print Date: 12/12/2023
Reviewed By: jhansen
Produced By: jroberts
Project: M0592.06.001

Figure 2-1
Property Features

Tiki Car Wash
11909 NE 8th Street
Bellevue, WA

Legend

- UST (Approximate)
- Property Boundary
- Parcel

Note
UST = underground storage tank.

Data Sources
Aerial photograph obtained from Microsoft Bing; parcel data obtained from King County; approximate UST locations obtained from *Report of May 1996 Groundwater Sampling and Analysis* (Enviros 1996).

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Path: X:\0_MFA_Projects\M0592\06\001\Pro\M0592_06_001_001.aprx\Fig 2-1 Property Features
Print Date: 2/5/2024
Reviewed By: jhansen
Produced By: jelstrott
Project: M0592.06.001

Figure 4-1
Proposed Groundwater Recirculating Well Location

Tiki Car Wash
11909 NE 8th Street
Bellevue, WA

Legend

- Monitoring Well
- Proposed Recirculating Well
- Piezometer
- Work Area
- Property Boundary
- Parcel

0 10
Feet

Data Sources
Aerial photograph obtained from Microsoft Bing; parcel data obtained from King County.

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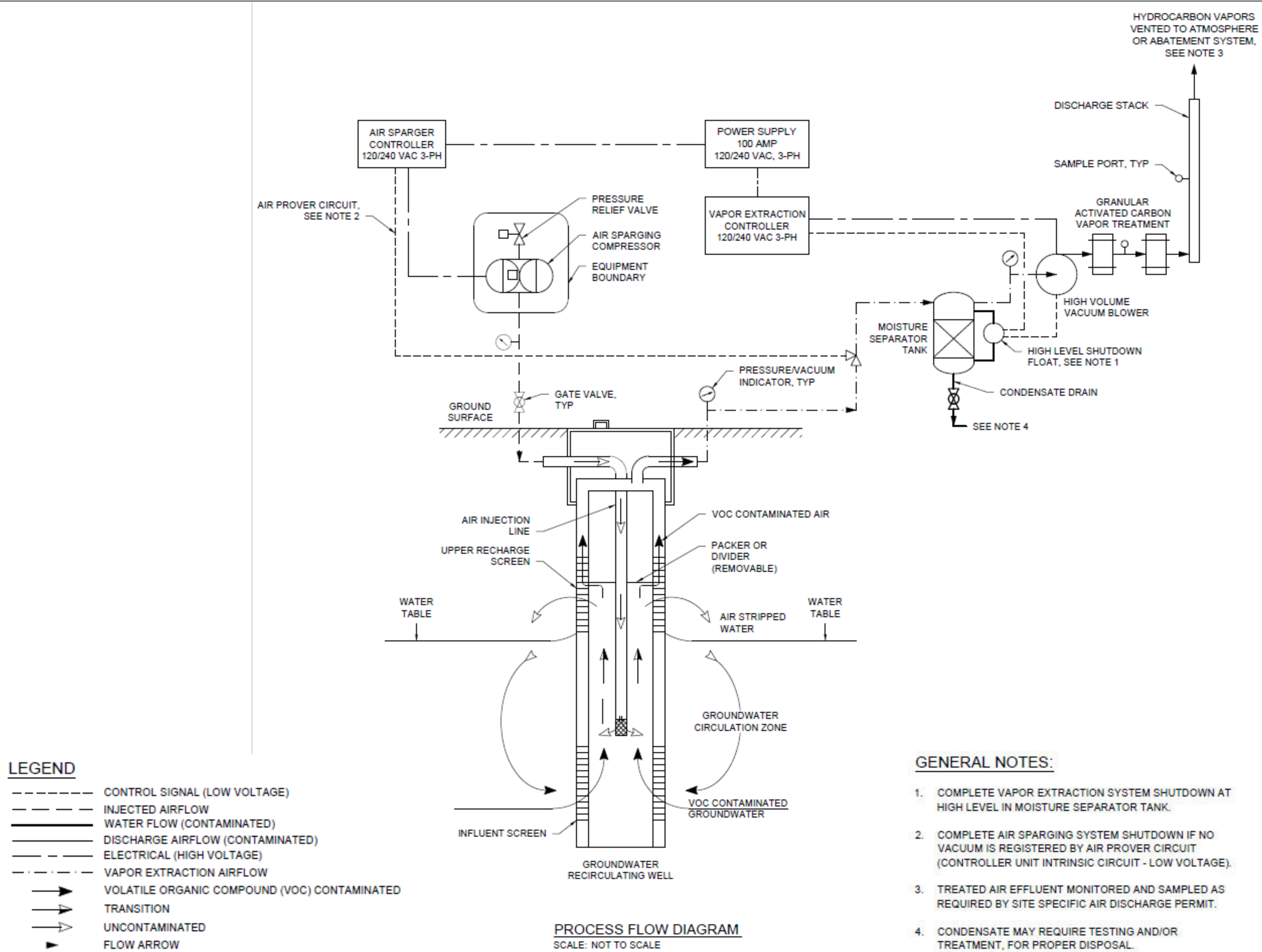
Path: X:\0_MFA_Projects\M0592.06.001\Pro\M0592_06_001_001.aprx\Fig 4-1 Prop Groundwater Recirculating Well Location
Print Date: 2/5/2024
Reviewed By: jhansen
Produced By: jelstrott
Project: M0592.06.001

Figure 4-2
Groundwater Recirculating Well Process Flow Diagram

Tiki Car Wash
11909 NE 8th Street
Bellevue, WA



GENERAL NOTES:

1. COMPLETE VAPOR EXTRACTION SYSTEM SHUTDOWN AT HIGH LEVEL IN MOISTURE SEPARATOR TANK.
2. COMPLETE AIR SPARGING SYSTEM SHUTDOWN IF NO VACUUM IS REGISTERED BY AIR PROVER CIRCUIT (CONTROLLER UNIT INTRINSIC CIRCUIT - LOW VOLTAGE).
3. TREATED AIR EFFLUENT MONITORED AND SAMPLED AS REQUIRED BY SITE SPECIFIC AIR DISCHARGE PERMIT.
4. CONDENSATE MAY REQUIRE TESTING AND/OR TREATMENT, FOR PROPER DISPOSAL.

Image Source:
Process flow diagram developed by Akana.

AKANA

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Path: X:\0_MFA_Projects\M0592\06\001\Pro\M0592_06_001_001.aprx\Fig 4-2 Groundwater Recirculating Well Process Flow Diagram
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Produced By: jroberts
Project: M0592.06.001

Appendix A

Sampling and Analysis Plan and Quality Assurance Project Plan

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Sampling and Analysis Plan Quality Assurance Project Plan

Tiki Car Wash
Facility Site ID: 2352
Cleanup Site ID: 5096

Final

Prepared for:

Washington State Department of Ecology

Toxics Cleanup Program
Northwest Regional Office
Shoreline, Washington

March 14, 2024
Project No. M0592.06.001

Prepared by:

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Sampling and Analysis Plan
Quality Assurance Project Plan

Tiki Car Wash
Facility Site ID: 2352
Cleanup Site ID: 5096

The material and data in this report were prepared under the supervision and direction of the undersigned.

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Abbreviations

bgs	below ground surface
COC	chain of custody
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FBI	Friedman & Bruya, Inc.
FPS	feasibility pilot study
GRW	groundwater recirculating well
IDW	investigation-derived waste
LCS	laboratory control sample
LDS	laboratory duplicate sample
MFA	Maul Foster & Alongi, Inc.
MS	matrix spike
MSD	matrix spike duplicate
NWTPH	Northwest Total Petroleum Hydrocarbons
the Property	11909 NE 8th Street, Bellevue, Washington 98005
QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
ROI	radius of influence
RPD	relative percent difference
SAP	sampling and analysis plan
SAP/QAPP	sampling and analysis plan and quality assurance project plan
the Site	Tiki Car Wash site (Facility Site ID: 2352, Cleanup Site ID: 5096)
SOP	standard operating procedure
SVE	soil vapor extraction

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1 Introduction

On behalf of the Washington State Department of Ecology (Ecology), Maul Foster & Alongi, Inc. (MFA), prepared this sampling and analysis plan (SAP) and quality assurance project plan (QAPP) (collectively SAP/QAPP) to support the work plan for feasibility pilot study (FPS) for the Tiki Car Wash site (the Site), located at 11909 NE 8th Street in Bellevue, Washington (the Property). The purpose and objective of the SAP/QAPP is to generate data to support the evaluation of a remedial approach to address groundwater contamination at the Site. The QAPP defines the laboratory and analytical quality procedures and quality control (QC) and quality assurance (QA) requirements for the sampling and analysis.

2 Scope of Work

This section describes the planned FPS field activities at the Property.

2.1 Project Scope

The scope of the FPS includes installation, development, and sampling of a groundwater recirculating well (GRW) on the northeast portion of the Property. The proposed GRW location is shown on Figure 4-1 of the work plan for FPS.

2.2 Planning Components

Locating underground utilities. Before drilling and installation of the GRW, a public utility locate will be requested and a private utility locate contractor will attempt to locate on-Property utilities, including the orientation of any water and sewer mains or side sewer lines at the Property. GRW placement may be adjusted based on information obtained from the utility locates.

2.3 Field Measurements

Down well data loggers will be placed in the three piezometer wells (PZ-10, PZ-15, and PZ-25) as well as the existing groundwater monitoring well MW-34 (once they are developed). The down well data loggers will be installed and started as soon as practical to continuously measure selected groundwater parameters, which are indicators of enhanced bioremediation, and assist in establishing the GRW radius of influence (ROI). Specific sensors for the following parameters will be used to collect baseline points and will be used for the duration of the testing:

- Depth to water, measured in feet, and used to calculate the relative water elevation changes. This will show if recirculation mounding can be measured at specific distances away from the

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GRW. Water level measurements will be performed according to MFA standard operating procedure (SOP) 13 (see Appendix A).

- Specific conductance, measured in milliSiemens per centimeter, and electrical conductivity are good indicators of water salinity or the presence of conductive particles. If recirculation can be established, this parameter may change over time within the ROI of the GRW.
- Turbidity, measured in nephelometric turbidity units, is a basic measurement of water clarity and apparent suspended solids. If recirculation can be established, this parameter may change over time within the ROI of the GRW.
- Dissolved oxygen, measured in milligrams per liter, is a metric for dissolved-phase oxygen present in the water column.
- Temperature, measured in degrees Celsius, will monitor excess heat applied by the air sparging equipment, and may provide an indication of biological activity within the wells.
- Oxidation reduction potential, measured in millivolts, is a measure of the ability of an aquifer to cleanse itself or break down organics. When the oxidation reduction potential is high, there is more oxygen available, and aerobic bacteria can more readily breakdown petroleum contamination.

The initial testing duration is 30 days of GRW operation with both injection and extraction energy added, followed by groundwater sampling after allowing the system to return to static baseline. The data loggers will be left in-place until all testing is complete and will be removed 30 days after completion of the initial testing. All field measurements will be recorded on water field sampling data sheets (see Appendix B) and in notebooks by field personnel.

2.4 Groundwater Sampling

MFA will collect low-flow groundwater samples from the GRW, three piezometer wells, and existing monitoring wells MW-32 and MW-34 to evaluate contaminant concentrations before and after completion of the FPS. Groundwater sampling will be guided by MFA SOP 09 (see Appendix A). One groundwater sample from each well will be collected after GRW installation and development but before starting the *in-situ* air stripping and soil vapor extraction system. Follow-up groundwater samples from each of the wells will be collected 30 days after initiation of the in-situ air stripping and soil vapor extraction system.

2.5 Soil Vapor Extraction System Exhaust Sampling

Extracted air at the exhaust point of the soil vapor extraction (SVE) system will be sampled at the end of the startup day and at the completion of the FPS. SVE system exhaust samples will be collected directly into 1-liter Summa canisters[1] for laboratory analysis. Exhaust vapors will be monitored once per week after startup with a photoionization detector.

2.6 Laboratory Analysis

Groundwater samples will be analyzed for the following:

[1] Tedlar bags may be used if Summa canisters are not compatible with the SVE exhaust sampling port.

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- Gasoline-range hydrocarbons by Method Northwest Total Petroleum Hydrocarbons (NWTPH)-Gx
- Diesel- and lube-oil-range hydrocarbons by Method NWTPH-Dx
- Benzene, ethylbenzene, toluene, and total xylenes by U.S. Environmental Protection Agency (EPA) Method 8260D.
- Heterotropic plate count by Standard Methods for the Examination of Water and Wastewater 8215D

SVE exhaust air samples will be analyzed for the following:

- Gasoline-range hydrocarbons by EPA Method Toxic Organics 15
- Benzene, ethylbenzene, toluene, and total xylenes by EPA Method Toxic Organics 15

3 Project Personnel and Schedule

The following describes the roles of key personnel on the project.

3.1 Key Project Personnel

Key project personnel are listed in Appendix C.

3.2 Schedule

The project schedule will be determined based on communication with the Property owner and Ecology. MFA anticipates that the GRW and supporting equipment will be installed in March/April 2024 and that sampling will be complete by June 2024. Samples will be submitted to the analytical laboratory on a standard turnaround time. It is expected that analytical data validation and a draft report will be submitted to Ecology in July 2024 and that the final report will be submitted to Ecology in August 2024.

4 Data Generation and Acquisition

4.1 Data Quality Objectives and Decision Criteria

The data quality objectives (DQO) process establishes the performance and acceptance criteria that serve as the basis for designing a plan for collecting data of sufficient quality and quantity. This SAP/QAPP presents performance metrics for the collection and analysis of groundwater collected from the Property.

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4.2 Sample Process Design

The sample process design targets petroleum groundwater contamination identified in previous site investigations at the Property. Data collection activities will be designed to investigate and evaluate contaminant concentrations before and after the FPS is complete.

4.3 Sampling and Analysis Methods

Samples will be collected consistent with applicable MFA SOPs (see Appendix A) for groundwater sampling. Groundwater and soil gas samples will be collected in containers provided by the analytical laboratory to ensure that the container has been properly cleaned and that sufficient sample material is collected. Sample container and preservation requirements are listed in Table 4-1. Friedman & Bruya, Inc. (FBI) will be the analytical laboratory contracted for this scope of work. FBI holds accreditation in the State of Washington (see Appendix D) and with Ecology under accreditation number C578-24. FBI reporting limits and laboratory control limit criteria typical of water and soil vapor analyses are provided in Table 4-2a and 4-2b, respectively.

4.4 Management of Investigation-Derived Waste

Investigation-derived wastes (IDW) will include purged groundwater and decontamination fluids. Field decontamination will be performed consistent with MFA SOP 01 (see Appendix A). IDW will be collected in Department of Transportation-approved drums with appropriate labels on the top and sides reporting the contents, volume of material, date of collection, and origin of the material. Drums will be sealed and transferred to a designated portion of the work area pending waste profiling, transport, and off-site disposal at a permitted facility. IDW will be characterized via in-situ data obtained during GRW sampling. IDW that is characterized as hazardous waste will be transported off the Property within 90 days of generation. All other IDW will be transported off Property expeditiously.

4.5 Sample Handling and Custody

Field personnel will be responsible for collection, labeling, description, documentation, handling, packaging, storage, and shipping of samples. Sample handling and custody procedures are required to retain sample integrity, from field collection through laboratory analysis and reporting.

4.5.1 Sample Identification

Field personnel will be responsible for labeling samples and establishing identification. All data will be keyed to the sample's unique sample designation. The unique sample designation will be used on sample containers and associated field data forms and will be used as the sample identification in the project database. Field personnel will clearly label each container using permanent ink on a waterproof sample label as soon as possible following collection. At a minimum, sample labels will contain:

- Unique sample identification code
- Date and time of collection
- Project number

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- Preservative, if appropriate

To maintain sample identification consistency, the unique sample identification code will follow this convention:

- GRW-01-YYYYMMDD

For example, a groundwater sample collected from the GRW on April 21, 2024, would have the following sample ID: GRW-01-20240421. Field duplicates will have -DUP appended to the end of the sample ID.

4.5.2 Sample Custody

Field staff and analytical laboratory contractors will be responsible for following sample custody procedures during sampling and analysis, and they will provide sample tracking. Sample custody procedures will include documentation of the history of samples from the time of collection through shipment, analysis, and disposal. Samples and sample documentation will be maintained in the physical possession of field personnel or under control in a secure location.

4.5.2.1 Sample Custody in the Field

Field personnel will be responsible for completing chain-of-custody (COC) forms upon sample collection. Each COC form will contain the following:

- Project name and number
- MFA project manager
- Unique sample identification code
- Date and time of sample collection
- Field sampler's name
- Signature, printed name, organization name, date, and time of transfer of all persons having custody of the samples
- Sample matrix (i.e., groundwater
- Sample preservation, if any
- Quantity of sample containers
- Requested analyses for each sample
- Requested analytical turnaround times (i.e., standard turnaround time)
- Any additional information (e.g., holding times)

4.5.2.2 Sample Packaging and Shipment

Persons in possession of samples will be required to sign and date the COC form whenever samples are transferred between individuals or organizations (except for freight carriers). Samples will be delivered to the laboratory by courier or by field personnel, and the following custody procedures will be followed.

- Samples will be packed in the appropriate shipping containers.

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- The top copy of the COC form will accompany the samples.
- If samples are transported by courier, the laboratory courier will retain a second copy of the COC form.
- The COC form will accompany the samples from point of release from the Property to the laboratory.
- If transported to the laboratory by field personnel, COC forms will be signed, and copies will be distributed upon sample delivery to the laboratory.
- The laboratory will implement in-house custody procedures that begin when the sample custody is transferred to laboratory personnel.

4.5.2.3 Sample Custody in the Laboratory

The analytical laboratory's sample custodian will be responsible for handling and documentation of samples received at the laboratory. The sample custodian will accept custody of the samples and will verify that the COC form matches the samples received. The shipping container will be given a laboratory identification number, and each sample will be assigned a unique sequential identification number.

4.5.3 Sample Documentation and Records

4.5.3.1 Field Logbooks and Forms

Field personnel will maintain a daily record of significant events, observations, and measurements during field investigation. Field records may be kept in a bound logbook, on paper, or in electronic field data sheets. Field sampling data sheets are provided in Appendix B. Field forms will be included as an attachment to the report and the end of field activities.

4.5.3.2 Equipment Calibration

Instruments (e.g., a photoionization detector) will be calibrated before each sampling event. Calibration records will be recorded in field logbooks. Any rental equipment will be calibrated by the rental company immediately prior to the sampling event.

4.6 Analytical Methods

Analytical methods are included in Section 2.5.

4.7 Quality Control

Data quality will be monitored and verified by maintenance logs, documentation of field activities, and collection and analysis of field and laboratory QC samples. Table 4-3 provides a summary of field QC samples with required collection frequency. Table 4-4 provides field parameter QC requirements.

4.7.1 Field Quality Control Samples

Field QC samples will be used to assess the accuracy and precision of field sample collection and handling activities.

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4.7.1.1 Trip Blanks

Trip blanks are collected for volatile organic compound sample analysis to assess the contamination of samples during transport to the Property, sample collection, and transport from the Property to the laboratory. Trip blanks are prepared in the laboratory, using analyte-free water. Trip blanks should be inspected for air bubbles by both the laboratory (before shipping) and the field team. Any vials containing visible air bubbles should be discarded. One trip blank is included for each sample cooler that contains samples collected for analysis of VOCs. For trip blanks, target analyte concentrations must be below the method reporting limits. Analytical results for investigative samples will be qualified if the target analyte is detected in the trip blank.

4.7.1.2 Field Duplicate Samples

Field duplicate samples are collected to assess reproducibility of field procedures. One duplicate groundwater sample will be collected per event.

4.7.1.3 Temperature Blank

Temperature blanks are prepared by the laboratory, using analyte-free (reagent) water. The laboratory uses temperature blanks to record the temperature of each cooler used to transport samples from the field to the laboratory. Each cooler that contains samples requiring temperature preservation will contain a temperature blank. The laboratory will verify that the temperature blank measurement is within the acceptable range specific to the analytical method.

4.7.2 Laboratory Quality Control Samples

Laboratory QC samples will be used to assess the accuracy and precision of the field sample collection and handling activities. Laboratory QC samples will be analyzed at the required frequency described in Tables 4-3 and 4-4, as applicable, based on the analytical method.

4.7.2.1 Calibration Verification

Instruments will initially be calibrated at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Calibration will be continued as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications. Any project samples analyzed while the instrument was outside of control limits will be reanalyzed.

4.7.2.2 Matrix Spike/Matrix Spike Duplicate

Matrix spike (MS) samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. MS/matrix spike duplicate (MSD) samples will be prepared by spiking investigative samples with known amounts of analytes before extraction and preparation and analysis. The recoveries for the MS/MSD samples will be used to assess the accuracy and precision in the analytical method by measuring how well the analytical method recovers the target compounds in the investigative matrices. For each matrix type, at least one set of MS/MSD samples will be analyzed for each batch (e.g., 20 or fewer) of samples received. The MS/MSD samples will be designated on the COC form. The criteria for acceptable percent recovery and relative percent difference (RPD) for MS/MSD samples are presented in Tables 4-2a and 4-2b.

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4.7.2.3 Surrogate Spikes

Surrogate spiking consists of adding reference compounds to samples before sample preparation for organic analysis. Surrogate compound spiking is used to assess method accuracy on a sample-specific basis. Surrogate compounds will be added to samples in accordance with the analytical method requirements.

4.7.2.4 Method Blanks

Method blanks are prepared using analyte-free (reagent) water and are processed with the same methodology (e.g., extraction, digestion) as the associated investigative samples. Method blanks are used to document contamination resulting from the analytical process in the laboratory. A method blank shall be prepared and analyzed in every analytical batch. The method blank results are used to verify that reagents and preparation do not impart unacceptable bias to the investigative sample results. The presence of analytes in the method blank sample will be evaluated against method-specific thresholds. If analytes are present in the method blank above the method-specific threshold, corrective action will be taken to eliminate the source of contamination before proceeding with analysis. Investigative samples of an analytical batch associated with method blank results outside acceptance limits will be qualified as appropriate.

4.7.2.5 Laboratory Control Samples

Laboratory control samples (LCSs) are prepared by spiking laboratory-certified, reagent-grade water with the analytes of interest or a certified reference material that is prepared and analyzed. The result for percent recovery of the LCS is a data quality indicator of the accuracy of the analytical method and laboratory performance. The criteria for acceptable percent recovery of LCSs for aqueous media are presented in Tables 4-2a and 4-2b.

4.7.2.6 Laboratory Duplicate Samples

Laboratory duplicate samples (LDS) are prepared by the laboratory by splitting an investigative sample into two separate aliquots and performing separate sample preparation and analysis on each aliquot. The results for RPD of the primary investigative sample and the LDS are used to measure precision in the analytical method and laboratory performance. For nonaqueous matrices, sample heterogeneity may affect the measured precision for the LDS. The criteria for acceptable RPDs of LDS for aqueous media are presented in Tables 4-2a and 4-2b.

4.8 Data Quality Measurements

As a QA/QC requirement, the following data quality measurements will be made during the data validation and verification procedures. These measurements will be made before samples are submitted to the laboratory, as appropriate. Field and laboratory QA/QC requirements are summarized in Tables 4-3.

4.8.1 Data Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions, calculated as either the range or the standard deviation (EPA 2002). Precision is measured by making repeated analyses on the same analytical instrument (e.g., LDS) or replicate collections of samples in the field (field duplicates). Precision criteria are

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expressed as the RPD between the primary and duplicate samples. The acceptance limits for RPD are based on the sample matrix and the analytical method used.

The RPD is calculated using the equation:

$$RPD = \frac{|x_s - x_d|}{(x_s + x_{d)}/2} \times 100\%$$

Where:

x_s = result for primary sample

x_d = result for duplicate sample

Non-detects and results at or near the method reporting limit will be considered when interpreting data precision.

4.8.2 Data Bias

Bias is defined as the systematic or persistent distortion of a measurement process that causes error in one direction (EPA 2002). Data bias is addressed in the field and the laboratory by calibrating equipment, through collection and analysis of QC blank samples, and through the analysis of QC standard samples.

4.8.3 Data Accuracy

Accuracy is defined as the measure of the overall agreement of a measurement to a known value and includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations (EPA, 2002). Inasmuch as the “true” concentration of sampled media is not known, the degree of accuracy in the measurement is inferred from recovery data determined by sample spiking and/or the analyses of reference standards. The criterion for accuracy is expressed as the percent recovery of the sample spiking. The acceptance limits for percent recovery are based on the analytical method used.

Percent recovery is calculated using the equation:

$$Percent\ Recovery = \frac{x_{ss} - x_s}{T} \times 100\%$$

Where:

x_{ss} = result for spiked sample

x_s = result for sample

T = true value of added spike

4.8.4 Data Completeness

Data completeness is defined as a measure of the amount of valid data needed from a measurement system (EPA 2002). It is measured as the total number of samples collected for which the valid analytical data are obtained divided by the total number of samples collected and multiplied by 100.

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4.8.5 Data Representativeness

Data representativeness is a qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition (EPA 2002). Data representativeness is evaluated by assessing the accuracy and precision of the sampling program. The criterion for evaluating representativeness will be satisfied by confirming that the sample collection procedures are consistently followed.

4.8.6 Data Comparability

Data comparability is a qualitative term that expresses the measure of confidence with which one data set can be compared to another or combined with another for decision-making (EPA 2002). Data comparability will be achieved by using standard sampling and operating procedures and analytical methods. Data comparability will be assessed through documentation of QA/QC procedures.

4.8.7 Data Sensitivity

Data sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA 2002). The method reporting limits specified through the DQO process are provided in Table 4-2 for aqueous media and 4-2b for soil vapor. Results measured between the reporting limits and the method or estimated detection limits will be reported for all analytes and assigned the appropriate qualifiers.

4.9 Instrument and Equipment Testing, Inspection, and Maintenance

Instruments for field parameter measurements will follow the manufacturers' recommendations for testing, inspection, and maintenance. Logbooks will be maintained for each field meter. Field equipment used for obtaining samples will be decontaminated as required and stored in a clean and secure location. Laboratory instruments and equipment will comply with the contracted laboratories' QA/QC procedures for testing, inspection, and maintenance.

4.10 Instrument and Equipment Calibration and Frequency

Instruments for field parameter measurements will follow the manufacturers' recommendations for calibration. Calibration will be conducted at the beginning of each day of sampling. Calibration records will be recorded in the field logbooks.

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4.11 Inspection and Acceptance of Supplies and Consumables

The supplies and consumables that will be used during field operations include, but are not limited to, the following: decontamination fluids, preservatives, reagent water for equipment blanks, and equipment tubing. No materials will be used after the manufacturers' expiration dates. If contamination is visible in materials, the item will be discarded. The analytical laboratory will inspect supplies and consumables before their use in analysis. The materials description in the analytical methods will be used as a guideline for establishing acceptance criteria. Purity of reagents will be evaluated through analysis of LCSs and method blank samples. The laboratory shall maintain an inventory of supplies and consumables.

4.12 Data Management

Data managed includes field and laboratory data as described in the following sections.

4.12.1 Field Data

Field data may be recorded in a bound logbook or on paper or electronic field data sheets. Hard copies of all field data will be scanned and saved electronically. Field data collected on paper or electronic field data sheets may be imported into a project database. Should field data require hand-entry into an electronic format prior to importation into the project database, the data will subsequently be reviewed for data entry errors by different, qualified individuals.

4.12.2 Laboratory Data

The laboratory shall record the results of each analysis in their own internal database in accordance with the contracted laboratory's QA plan. The laboratory will report data with both method detection limits and method reporting limits provided. Data will be provided to the MFA's database manager as electronic data deliverables and will be imported directly into a project database used for data storage. Validated laboratory results will be exported and provided as part of the final report for each project. Laboratory data deliverables are listed below:

- Transmittal cover letter
- Case narrative
- Analytical results
- COC forms
- Surrogate and internal standard recoveries
- Method blank results
- LCS results
- MS/MSD results
- Laboratory duplicate results

5 Data Validation and Verification

5.1 Data Review, Verification, and Validation

Data validation is the process of evaluating the completeness, correctness, and compliance of a specific data set against the method, procedural, or contractual specifications (EPA 2002). Data validation is confirmation by examination and provision of objective evidence that the particular requirements for specific intended use have been fulfilled (EPA 2001) and is an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to the analytical quality of a specific data set (EPA 2002). Data review, verification, and validation will be conducted consistent with this SAP/QAPP.

5.2 Data Verification Methods

5.2.1 Laboratory Data Verification Methods

The laboratory analyst will be responsible for the reduction of raw data generated at the laboratory bench and verification that data reduction performed by the laboratory instrument or laboratory information management system is correct. Data verification QC checks that will be performed for all generated data are as follows:

- Verify that batch QC were analyzed at the specified frequency.
- Verify that calibrations and calibration checks comply with laboratory criteria.
- Verify that holding times for extraction and analyses and sample preservation were met.
- Verify that the quantitation limits and method detection limits were met.
- Verify that all project and QC sample results were properly reported and flagged appropriately for any failing laboratory QC or as necessary to address other data quality issues.
- Review COC documentation to verify completeness of the sample set for each data package submitted.
- Assess the impact of laboratory and field QC results.

These QC checks will be performed by laboratory analysts, the assigned laboratory project manager or supervisor, laboratory QC specialists, or a combination of these personnel. After the data reports have been reviewed and verified, the laboratory reports will be signed and released for distribution.

5.2.2 Field Data Verification Methods

Field data collected during field activities will be evaluated for usability by a QA review that consists of checking procedures followed and comparing the data to previous measurements. Field QC samples will be evaluated to ensure that field measurements and sampling protocols have been observed and followed.

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The field data verification process will be performed at two levels. The first level will be conducted at the time of collection and consists of following standard procedures and QC checks. The second level will be performed during compilation of field data and will include checks for data anomalies. Anomalies or inconsistent data will be resolved by seeking clarification from field personnel responsible for collecting the data and will be documented during the data verification process.

5.3 Data Validation Methods

Validation of the analytical data produced under this SAP/QAPP will be performed by the project chemist unless otherwise specified. The project chemist will review laboratory-performance criteria and sample-specific criteria consistent with Sections 4.7 and 4.8 of this SAP/QAPP. Validation reports and corresponding laboratory reports will be made available with site-specific project reports and upon Ecology's request. Validation will be performed for 100 percent of the data report packages for each analysis type generated by each analytical laboratory contractor unless otherwise specified. The independent data validation review will include review of the following items from the Stage 2B validation manual (S2BVM, also referred to as Stage II) laboratory data reports: consistency with the COC procedures, holding times, instrument calibration checks, surrogate recoveries, MS recoveries, field duplicate agreement, MSD and laboratory duplicate precision, equipment blanks, and method blank analyses and items identified in Sections 4.7 and 4.8 of this SAP/QAPP. Refer to EPA for S2BVM level data validation and verification requirements (EPA 2009).

Data validation reports will provide the appropriate data validation label (e.g., S2BVM). The data validator will review data and assign data qualifiers to sample results, following method-specific guidelines (EPA 1986) and sections of the EPA procedures for review of inorganic data (EPA 2020a) and organic data (EPA 2020b). All other analyses will be reviewed and validated based on criteria of the analytical methods performed and on the requirements of this SAP/QAPP and site-specific documents. Data qualifiers are used to classify sample data as to their conformance to QC requirements. The most common qualifiers are:

- J—Estimate, qualitatively correct but quantitatively suspect
- R—Reject, data not suitable for any purpose
- U—Not detected at a specified detection limit

Poor surrogate, blank contamination, or calibration problems, among other things, can require qualification of the sample data. Whenever sample data are qualified, the reasons for the qualifications will be stated in the data validation report.

6 Assessment and Oversight

6.1 Quality Assurance Assessment and Response Actions

For each project, the MFA project manager and database manager (see Appendix C) are responsible for developing and initiating corrective action if the data verification and validation identifies

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unacceptable data or conditions. The MFA project manager will notify the database manager if the project issues are significant.

Corrective action may include:

- Reanalyzing samples if holding time criteria permit
- Resampling and analyzing
- Amending sampling procedures

6.2 Quality Assurance Reports to Management

The database manager will be responsible for completion of QA progress reports to provide a summary of the project performance and data quality for the program as QA issues are identified. The QA progress reports will focus on a summary of specific QA problems encountered and the implemented corrective actions. The QA progress reports may include the following:

- QA issues requiring corrective actions and status of corrective actions
- Assessment of completeness of measurement data, including a summary of data qualified as rejected during data verification and validation
- Assessment of representativeness of measurement data and compliance with project DQOs

A summary of QA issues and implemented corrective actions will also be provided in the final reports for each project. The program will generate field sampling reports summarizing the investigative samples and QC samples collected, data reports summarizing sampling, field measurement data, and results of the data verification and validation.

6.3 Sample Plan Alteration

Significant changes to the SAP/QAPP will be communicated with Ecology prior to implementation. Prior to the commencement of field work, MFA will coordinate with Ecology via email to request approval for modifications to the SAP/QAPP. In the field, MFA will coordinate with Ecology via telephone to request approval for modifications to the SAP/QAPP.

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Limitations

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

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Tables

Table 4-1
Containers, Preservation, and Holding Times
Tiki Car Wash
Bellevue, Washington

MAUL FOSTER ALONGI

Matrix	Preferred Method	Analysis	Field Container Preservative	Holding Time (Days)	Sample Container
Water	NWTPH-Gx	Gasoline-Range Organics	HCl to pH < 2, 4 deg C	14	3, 40-mL VOA bottle
	NWTPH-Dx	Diesel-Range Organics and Lube-Oil-Range Organics	HCl to pH < 2, 4 deg C	14	1-L amber glass
	EPA 8260D	BTEX	HCl to pH < 2, 4 deg C	14	3, 40-mL VOA bottle
	SM 8215D	Heterotropic plate count	EDTA/NaThio	1	250mL sterile bottle
Air	TO-15	Gasoline-Range Organics	Ambient Temperature	30 days	1-L Summa Canister
		BTEX			

Notes

ASTM = ASTM International.

BTEX = benzene, ethylbenzene, toluene, and total xylenes.

deg C = degrees Celsius.

EDTA/NaThio = ethylenediaminetetraacetic acid/sodium thiosulfate.

EPA = U.S. Environmental Protection Agency.

HCl = hydrochloric acid.

L = liter.

mL = milliliter.

NWTPH = Northwest Total Petroleum Hydrocarbon.

SM = Standard Methods for the Examination of Water and Wastewater.

TO = toxic organics.

VOA = volatile organic analysis.

Table 4-2A
Preferred Aqueous Analytical Methods and Performance Criteria
Tiki Car Wash
Bellevue, Washington

MAUL FOSTER ALONGI

Analyte	Reporting Limit	MTCA Method A[1] (ug/L)	Preferred Analytical Method	MS Accuracy (%)[a]	Precision (RPD)[a]	LCS Accuracy (%)[a]	Completeness (%)
Petroleum Hydrocarbons							
Gasoline-range hydrocarbons	100 ug/L	800[b]/1,000[c]	NWTPH-Gx	50-150	20	70-130	90
Diesel-range hydrocarbons	50 ug/L	500	NWTPH-Dx	50-150	20	65-151	90
Lube-oil-range hydrocarbons	250 ug/L	500	NWTPH-Dx	50-150	20	65-151	90
VOCs							
Benzene	0.3 ug/L	5	EPA 8260D	50-150	20	70-130	90
Ethylbenzene	1 ug/L	700	EPA 8260D	50-150	20	70-130	90
m,p-Xylenes	2 ug/L	NV	EPA 8260D	50-150	20	70-130	90
Toluene	1 ug/L	1,000	EPA 8260D	50-150	20	70-130	90
o-Xylenes	1 ug/L	NV	EPA 8260D	50-150	20	70-130	90
Xylenes (total)	3 ug/L	1,000	EPA 8260D	50-150	20	70-130	90
Bacterial							
Heterotropic plate count	1 CFU/mL	NV	SM 8215D	NA	NA	NA	NA

Notes

CFU/mL = colony-forming unit per milliliter.

EPA = U.S. Environmental Protection Agency.

LCS = laboratory control sample.

MS = matrix spike.

MTCA = Model Toxics Control Act.

NA = not applicable.

NV = no value.

NWTPH = Northwest Total Petroleum Hydrocarbons method.

RPD = relative percent difference.

SM = Standard Methods for the Examination of Water and Wastewater.

ug/L = micrograms per liter.

VOC = volatile organic compound.

[a]Control limits are periodically updated by the laboratory based on performance criteria.

[b] Value when benzene is present.

[c]Value with no detectable benzene.

Reference

[1]Ecology. 2024. *Cleanup Levels and Risk Calculation (CLARC)* table. Washington State Department of Ecology—Toxics Cleanup Program. February.

Table 4-2B
Preferred Soil Vapor Analytical Methods and Performance Criteria
Tiki Car Wash
Bellevue, Washington

Analyte	Reporting Limit	MTCA Method B, VI, Sub-slab Soil Gas[(a)(1)]	Preferred Analytical Method	Precision (RPD)[(b)]	LCS Accuracy (%)	Completeness (%)
Petroleum Hydrocarbons						
Gasoline-range hydrocarbons	130 ug/m^3	1,500	EPA TO-15	30	70-130	90
VOCs						
Benzene	1.7 ug/m^3	11	EPA TO-15	30	70-130	90
Ethylbenzene	2.3 ug/m^3	15,000	EPA TO-15	30	70-130	90
m,p-Xylenes	4.4 ug/m^3	NV	EPA TO-15	30	70-130	90
Toluene	40 ug/m^3	2,300	EPA TO-15	30	70-130	90
o-Xylenes	2.3 ug/m^3	46	EPA TO-15	30	70-130	90

Notes

% = percent.

ASTM = ASTM International.

EPA = U.S. Environmental Protection Agency.

LCS = laboratory control sample.

MTCA = Model Toxics Control Act.

NA = not applicable.

NV = no value.

RPD = relative percent difference.

TO = toxic organics.

ug/m^3 = micrograms per cubic meter.

VI = vapor intrusion.

VOC = volatile organic compound.

[(a)]The lower or cancer and noncancer values are shown.

[(b)]Control limits are periodically updated by the laboratory based on performance criteria.

Reference

[(1)]Ecology. 2024. *Cleanup Levels and Risk Calculation (CLARC)* table. Washington State Department of Ecology—Toxics Cleanup Program. February.

Table 4-3
Quality Control Sample Requirement Summary
Tiki Car Wash
Bellevue, Washington

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Quality Control Sample[a]	Frequency	Acceptance Criteria
Field Quality Control Samples		
Trip Blanks	One per sample cooler (for VOC analysis only)	Below MRL[b]
Field Duplicate Samples	One duplicate groundwater sample will be collected	20% RPD[b][c]
Temperature Blank	One per sample cooler	4°C (±2°C)
Laboratory Quality Control Samples		
Matrix Spike/Matrix Spike Duplicate	Each analytical batch of samples for every 20 (or fewer) samples received	See Table 4-2
Method Blanks	Each analytical batch of samples for every 20 (or fewer) samples received	Below MRL[b]
Laboratory Control Sample	Each analytical batch of samples for every 20 (or fewer) samples received	See Table 4-2
Laboratory Control Sample Duplicate	Each analytical batch of samples for every 20 (or fewer) samples received	See Table 4-2
Laboratory Duplicate Sample	Each analytical batch of samples for every 20 (or fewer) samples received	See Table 4-2

Notes

± = plus or minus.

°C = degrees Celsius.

MRL = method reporting limit.

RPD = relative percent difference.

VOC = volatile organic compound.

[a]Not all quality control samples are applicable to every sampling event or analytical method.

[b]Control limits are periodically updated by the laboratory based on performance criteria.

[c]RPD not evaluated for samples less than five times the MRL.

Table 4-4
Field Parameter Requirements
Tiki Car Wash
Bellevue, Washington

MAUL FOSTER ALONGI

Analyte	Method	Units	Accuracy	Detection Ranges
pH	Multiparameter instrument	pH units	±0.1	0 to 14
Temperature	Multiparameter instrument	°C	±0.1°C	0 to 75°C
Specific conductance	Multiparameter instrument	uS/cm	±0.5%	0 to 4,999 uS/cm
Turbidity	Multiparameter instrument	NTU	±5%	0 to 2,000 NTU
Dissolved oxygen	Multiparameter instrument	mg/L	±0.2	0 to 19.99 mg/L
Depth to groundwater	Water level meter	ft	0.01 ft	NA
Organic vapors	photoionization detector	ppm	±10%	0.01 to 10,000 ppm

Notes

± = plus or minus.

°C = degrees Celsius.

ft = feet.

mg/L= milligrams per liter.

NA = not applicable.

NTU = nephelometric turbidity unit.

ppm = parts per million.

uS/cm = microsiemens per centimeter.

Appendix A

Standard Operating Procedures

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Scope and Application

This standard operating procedure (SOP) describes the decontamination procedure for field equipment that may come in contact with contaminated media and that Maul Foster & Alongi, Inc. (MFA) staff may reuse at multiple sample locations or sites. Decontamination is performed to reduce the potential for cross-contamination of samples that will be collected with multiuse equipment and that will undergo physical or chemical analyses. Other equipment that is multiuse—not used specifically for sample collection (e.g., water level meter, pump used for well development)—also requires decontamination. Finally, decontamination is necessary to minimize the potential for MFA staff's exposure to chemicals.

Typically, decontamination is not necessary for field equipment that is disposable and intended to be used only once (e.g., disposable bailer). Additionally, this SOP does not apply to equipment used by subcontractors, such as drilling equipment. However, MFA staff should confirm that subcontractors are implementing appropriate decontamination procedures to minimize the potential for cross-contamination of samples or MFA staff's exposure to chemicals.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Nonphosphate detergent solution (e.g., Alconox, Liquinox)
- Distilled and potable water
- Personal protective equipment (as specified in the site-specific health and safety plan)
- Buckets to contain rinsate, brushes, paper towels

Depending on the site conditions and the types of contaminants that may be present, the use of other decontamination materials, such as deionized water, methanol, hexane, or isopropyl alcohol, may be necessary. The need for other materials should be determined prior to fieldwork. The decontamination procedures using other materials should be described in a site-specific sampling and analysis plan (SAP).

Methodology

When the site-specific SAP specifies additional or different requirements for decontamination, it takes precedence over this SOP. In the absence of a SAP, the following procedures shall be used.

General Sampling Procedure:

1. Rinse the equipment with potable water to remove visible soil, petroleum sheen, or contamination.

2. Scrub the equipment with a brush and solution of distilled water and nonphosphate detergent.

3. Rinse the equipment with distilled water.

4. Allow equipment to air dry, or dry it with paper towels.

5. At all times, ensure that the decontaminated equipment is stored so as to prevent it from becoming contaminated while not in use. Depending on the size of the equipment, it can be wrapped with new aluminum foil or placed in a new plastic bag.

Rinsate Storage:

All fluids resulting from equipment decontamination shall initially be contained in a bucket and then transferred to a Department of Transportation-approved container (e.g., 55-gallon drum) stored on site at a location that does not interfere with on-site activities (e.g., vehicle traffic, pedestrian areas). Place a label on each container and include the following information:

- The date on which fluids were placed in the container
- Contents (e.g., “water from equipment decontamination”)
- Contact information, including MFA staff or client phone number

Note that labels on containers exposed to sunlight or precipitation are prone to fading. Use a waterproof, indelible ink pen (e.g., Sharpie®) whenever possible. In the field notebook, keep a detailed inventory of all containers, including the number of containers, the approximate quantity of liquids generated, and a description of the source of the fluids. Provide this information to the MFA project manager. For future reference, take photographs of (1) each drum label, (2) the drum(s), and (3) the drum storage vicinity on site.

Note that some clients and site owners have specific requirements for labeling and storage of containers. The requirements should be determined in advance of the fieldwork.

Scope and Application

This standard operating procedure (SOP) describes use of the low-flow sampling method for collection of reconnaissance groundwater samples from borings and groundwater samples from monitoring wells. The method uses low pumping rates during purging and sample collection to minimize water-level drawdown and hydraulic stress at the well-aquifer interface.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Water quality meter (e.g., Oakton, YSI Inc. multiparameter meter)
- Turbidity meter
- Water-level meter
- Peristaltic pump and tubing
- Laboratory-supplied sample containers
- Laboratory chain-of-custody form and cooler with ice
- Filter if dissolved analyses will be performed
- Well construction logs documenting the screen depth and interval for all wells to be sampled
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- 5-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Groundwater field sampling datasheet and notebook

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for low-flow groundwater sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure (Heading 3 No Number Style):

Water Level Measurement

- Water-level measurement procedures are described in detail in SOP 13.

- Open the well cap to allow the water level to equilibrate (approximately ten minutes).
- Measure the water level in the well, using an electronic water-level meter to the nearest 0.01 foot to determine the depth to groundwater below the top of the well casing.
- If light nonaqueous-phase liquid (LNAPL)is present (typically indicated by a dark, oily sheen on the top of the water level meter), discuss with the MFA project manager how to proceed.

Purging

- If the water level is above the top of the well screen, place the end of the sample tubing in the middle of the well screen interval. If the water level is below the top of the screen, place the end of the sample tubing at the midpoint between the water level and the bottom of the well screen.
- Typical low-flow sampling pumping rates range from 0.1 to 0.5 liters per minute, depending on the hydrogeologic characteristics at the site. The objective of the rate selected is to minimize excessive drawdown (<0.3 feet) of the water level.
- Measure water quality parameters (dissolved oxygen, pH, electrical conductivity, turbidity, and temperature) using a flow-through cell connected to the discharge end of the peristaltic pump tubing. Purging will be considered complete when the water quality parameters stabilize per the following for three consecutive readings taken over 3-minute intervals (consistent with EPA guidance)[1]:

Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

- Document the purge procedures, including pumping rates, water quality parameter measurements, and the water level during purging, on the groundwater field sampling datasheet.
- Place purge water in Department of Transportation-approved containers (e.g., 55-gallon drum) stored on site. See SOP 1 for drum storage, labeling, and documentation procedures.

Sample Collection

- Following the purging process, collect groundwater samples in laboratory-supplied containers.
- Confirm the laboratory analytical methods and sample container requirement with the MFA project manager or project chemist. If analysis for gasoline-range petroleum hydrocarbons or volatile organic compounds (VOCs) is proposed, fill the sample containers for gasoline and VOC analysis before filling sample containers for other analytical methods. Sample containers for gasoline and VOC analysis shall be filled to capacity without overfilling and capped so that no headspace or air bubbles remain in the container.

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[1] EPA. 2017. Low stress (low flow) purging and sampling procedure for the collection of groundwater samples from monitoring wells. September 19.

Low Yield (Alternate Method)

- If drawdown of the water table cannot be avoided by reducing the pumping rate, and the well goes dry during purging, discontinue pumping and water quality parameter measurements.
- Collect the groundwater sample after the water level above the well bottom recovers to 90 percent of the prepurge water level. For example, if the water level was 10 feet above the well bottom before purging, begin sampling when the water level has recovered to 9 feet or more above the well bottom.
- If the water column volume is insufficient to meet the sample volume requirement, allow the water level to again recover to 90 percent before continuing sampling. Repeat this procedure until all sample containers are filled.

Scope and Application

This standard operating procedure (SOP) describes the methods for obtaining groundwater level measurements and light nonaqueous-phase liquid (LNAPL) measurements from monitoring wells. Measurement may be collected as an independent event or in conjunction with groundwater sampling or sampling of removed LNAPL.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Equipment decontamination supplies if equipment will be reused between well locations (see SOP 1 for equipment decontamination procedures)
- Field notebook
- Water-level meter or oil/water interface probe if water levels and LNAPL levels will be measured
- Bailers or tape/paste to confirm LNAPL detections if required; see SOP 10 for procedures for managing LNAPL when removing LNAPL from a well

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for water-level and LNAPL measurements, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure:

Review well construction details and historical groundwater and LNAPL levels and thicknesses if available.

During groundwater sampling events, measurements should be collected before, during, and after purging and sampling. During purging and low-flow sampling, water-level measurements are conducted to ensure that drawdown is not occurring. Low-flow sampling methods are described in SOP 9. The following procedures should be followed when collecting groundwater-level and LNAPL measurements from wells.

Water Level Measurement

1. Test the water-level meter to ensure proper instrument response. This can be accomplished by immersing the probe tip in a small container of water.
2. Open the well cover and cap and allow the water level to equilibrate with atmospheric pressure for several minutes so that a static water level is attained. Audible air movement into or out of

the well upon loosening of the well cap is an indication that the water level is not in equilibrium with atmospheric pressure.

3. Locate the measurement reference point at the top of the well casing. Typically, this is a small notch in the casing or a point marked with a pen. If no measure point is present, measure the water level from the north side of the casing and note the result in the field notebook.
4. Lower the water-level meter probe into the well casing until the probe signal indicates that water has been contacted.
5. Observe the depth-to-water (DTW) reading from the measurement reference point at the top of the well casing to the nearest 0.01 foot. Over the course of about a minute, raise and re-lower the probe and observe the resulting DTW reading. If the reading remains unchanged to within 0.01 foot, this is an indication that the water level has equilibrated with atmospheric pressure; the reading can then be recorded in the field notebook as the static water level reading. If the reading changes, allow more time for the water level to become static.
6. If the work scope or SAP requires measurement of the depth-to-bottom (DTB), lower the probe to the bottom of the well and record the DTB reading from the reference point to the nearest 0.01 foot.
7. Remove the probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Water Level and LNAPL Measurement

1. Repeat above steps 1 through 7.
2. Lower the interface probe into the well casing until the probe signal indicates that LNAPL has been contacted. Typically, the interface probe will signal by a repeating beep when LNAPL is present. A steady signal indicates that LNAPL is absent and that the probe is recording the DTW.
3. Observe the LNAPL reading as described in step 5 above until a static reading to the nearest 0.01 foot is achieved, and record the reading in the field notebook.
4. Lower the probe until a steady signal indicates that water has been contacted. Observe the water-level reading as described in step 5 above to confirm a static water level, and record the reading in the field notebook.
5. If LNAPL is detected in a well with no prior history of LNAPL presence, or the LNAPL thickness is greater than in prior observations, verify the presence and thickness using an alternative technique (e.g., bailer, tape, and water/petroleum colorimetric paste). See SOP 10 for procedures for managing LNAPL when removing LNAPL from a well.
6. Remove the interface probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Appendix B

Water Field Sampling Data Sheets

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109 East 13th Street, Vancouver, WA 98660 (360) 694-2691 www.maulfoster.com

Water Field Sampling Data Sheet

Client Name		Sample Location	
Project #		Sampler	
Project Name		Sampling Date	
Sampling Event		Sample Name	
Sub Area		Sample Depth	
FSDS QA:		Easting / Northing / TOC	

Hydrology/Level Measurements

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW (Product Thickness)	DTB-DTW (Water Column)	Pore Volume (Gallons/ft x Water Column)

(0.75" = 0.023 gal/ft) (1" = 0.041 gal/ft) (1.5" = 0.092 gal/ft) (2" = 0.163 gal/ft) (3" = 0.367 gal/ft) (4" = 0.653 gal/ft) (6" = 1.469 gal/ft) (8" = 2.611 gal/ft)

Water Quality Data

Purge Method	Time	Purge Vol (gal)	Flowrate l/min	pH	Temp (C)	E Cond (uS/cm)	DO (mg/L)	ORP	Turbidity	Water Level
Final Field Parameters										

Methods: (1) Submersible Pump (2) Peristaltic Pump (3) Disposable Bailer (4) Vacuum Pump (5) Dedicated Bailer (6) Inertia Pump (7) Other (specify)

Water Quality Observations:

Sample Information

Sampling Method	Sample Type	Sampling Time	Container Code/Preservative	#	Filtered
	Groundwater		VOA-Glass		
			Amber Glass		
			White Poly		
			Yellow Poly		
			Green Poly		
			Red Total Poly		
			Red Dissolved Poly		
			Total Bottles		

General Sampling Comments

Began purging at

Signature ______________________

Appendix C

Contact List

Table 3-1
Contact List
Tiki Car Wash
Bellevue, Washington

Contact Name	Title	Organization	Email	Telephone
Dale Myers	Ecology Site Manager	Ecology	damy461@ecy.wa.gov	425-389-2521
Tanner Bushnell	Ecology Technical Adviser	Ecology	tbus461@ecy.wa.gov	
Erik Bakkom	MFA Program Manager	MFA	ebakkom@maulfoster.com	503-501-5217
Josh Elliott	MFA Project Manager/Project Engineer	MFA	jelliott@maulfoster.com	503-501-5236
Charlie Swift	Project Engineer	Akana	charlie.swift@akana.us	503-652-9090
Justin Hansen	Project Scientist/Field Lead	MFA	jhansen@maulfoster.com	206-556-2022
Fiona Bellows	Database Manager/Project Chemist	MFA	fbellows@maulfoster.com	206-556-2020

Notes

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Appendix D

Laboratory Accreditation

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 488 • Manchester, WA 98353-0488 • (360) 871-8840

January 12, 2024

James Bruya
Friedman & Bruya, Inc.
5500 4th AVE S
Seattle, WA 98108

Dear James Bruya:

Thank you for your application for renewal in the Environmental Laboratory Accreditation Program. Attached is a Certificate of Accreditation covering the one-year period beginning January 10, 2024 and a current Scope of Accreditation.

Your WA accreditation is based in part on recognition of your ORELAP accreditation.

The State of Washington no longer accredits Selected Ion Monitoring as a separate accreditation listing. SIM mode is a valid technique within the parent methods EPA 8260D and EPA 8270E. Accreditation for the parent method is sufficient for analysis by SIM.

The following parameters were Withdrawn from your Scope of Accreditation at your request:

- Mercury by EPA 200.8_5.4_1994 in Non-Potable Water
- 1,2-Dibromoethane (EDB, Ethylene dibromide) by EPA 8011-92 in Solid and Chemical Materials

Total Suspended Solids by SM 2540 D-2011 in Non-Potable Water has been placed into Provisional status since the most recent PT was unacceptable. Two acceptable PTs must be done by your next renewal to return the parameter to Good Standing.

Renewal of accreditation is based in part on review of your lab's performance over the past year as evidenced by participation in proficiency testing (PT) studies. In general, full accreditation is awarded for those parameters for which the two most recent PT results, if applicable, were rated satisfactory. Provisional accreditation is awarded if the latest of the two most recent PT results was rated "Not Acceptable" or only one PT result was submitted during the past twelve months. Accreditation is withheld for those parameters for which the two most recent PT results were rated "Not Acceptable" or no PT results were submitted during the past twelve-months.

As a reminder, continued participation in the Ecology Lab Accreditation Program requires the lab to:

- Submit a renewal application and fees annually
- Report significant changes in facility, personnel, analytical methods, equipment, the lab's quality assurance (QA) manual or QA procedures as they occur
- **Participate in proficiency testing studies semi-annually, with the following exception: For each parameter where all PT results were satisfactory, you are required to submit only one PT result over this next year, and in subsequent years, as long as the results are satisfactory.**
- Submit copies of current third-party Scopes of Accreditation when they are available.

Your Right To Appeal

You have a right to appeal Ecology's decision to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this decision letter. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this decision:

- File your appeal and a copy of this decision with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this decision on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

Address And Location Information

Street Addresses:

Department of Ecology
Attn: Appeals Processing Desk
300 Desmond Drive SE
Lacey, WA 98503

Pollution Control Hearings Board
1111 Israel RD SW
STE 301
Tumwater, WA 98501

Mailing Addresses:

Department of Ecology
Attn: Appeals Processing Desk
PO Box 47608
Olympia, WA 98504-7608

Pollution Control Hearings Board
PO Box 40903
Olympia, WA 98504-0903

E-Mail Address:

Department of Ecology
Not currently available (see WAC 371-08)

Pollution Control Hearings Board
Pchb-shbappeals@eluho.wa.gov

If you have any questions concerning the accreditation of your lab, please contact Ryan Zboralski at (360) 764-9364, fax (360) 871-8849, or by e-mail at ryan.zboralski@ecy.wa.gov.

Sincerely,

Rebecca Wood
Lab Accreditation Unit Supervisor

RW:ERZ:erz
Enclosures

The State of Washington
Department of Ecology

THE SEAL OF THE STATE OF WASHINGTON 1889

Friedman & Bruya, Inc.
Seattle, WA

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation.

This certificate is effective January 10, 2024 and shall expire January 9, 2025.

Witnessed under my hand on January 12, 2024.

Rebecca Wood
Lab Accreditation Unit Supervisor

Laboratory ID
C578

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

SCOPE OF ACCREDITATION

Friedman & Bruya, Inc.

Seattle, WA

is accredited for the analytes listed below using the methods indicated. Full accreditation is granted unless stated otherwise in a note. EPA is the U.S. Environmental Protection Agency. SM is "Standard Methods for the Examination of Water and Wastewater." SM refers to EPA approved method versions. ASTM is the American Society for Testing and Materials. USGS is the U.S. Geological Survey. AOAC is the Association of Official Analytical Chemists. Other references are described in notes.

Matrix/Analyte	Method	Notes
Air		
1,1,1-Trichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1,2,2-Tetrachloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-15 Rev. 2 (1999)	1
1,1,2-Trichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1-Dichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
1,2,4-Trichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,2,4-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloropropane	EPA TO-15 Rev. 2 (1999)	1
1,3,5-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	1
1,3-Butadiene	EPA TO-15 Rev. 2 (1999)	1
1,3-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,4-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-15 Rev. 2 (1999)	1
1-Propene	EPA TO-15 Rev. 2 (1999)	1
2,2,4-Trimethylpentane	EPA TO-15 Rev. 2 (1999)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15 Rev. 2 (1999)	1
2-Chlorotoluene	EPA TO-15 Rev. 2 (1999)	1
2-Hexanone	EPA TO-15 Rev. 2 (1999)	1
2-Propanol	EPA TO-15 Rev. 2 (1999)	1
4-Ethyltoluene	EPA TO-15 Rev. 2 (1999)	1
4-Methyl-2-pentanone (MIBK)	EPA TO-15 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
Air		
Acetone	EPA TO-15 Rev. 2 (1999)	1
Acrolein (Propenal)	EPA TO-15 Rev. 2 (1999)	1
Allyl chloride (3-Chloropropene)	EPA TO-15 Rev. 2 (1999)	1
Benzene	EPA TO-15 Rev. 2 (1999)	1
Benzyl chloride	EPA TO-15 Rev. 2 (1999)	1
Bromodichloromethane	EPA TO-15 Rev. 2 (1999)	1
Bromoform	EPA TO-15 Rev. 2 (1999)	1
Carbon disulfide	EPA TO-15 Rev. 2 (1999)	1
Carbon tetrachloride	EPA TO-15 Rev. 2 (1999)	1
Chlorobenzene	EPA TO-15 Rev. 2 (1999)	1
Chlorodibromomethane	EPA TO-15 Rev. 2 (1999)	1
Chloroform	EPA TO-15 Rev. 2 (1999)	1
cis-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
cis-1,3-Dichloropropene	EPA TO-15 Rev. 2 (1999)	1
Cyclohexane	EPA TO-15 Rev. 2 (1999)	1
Dichlorodifluoromethane (Freon-12)	EPA TO-15 Rev. 2 (1999)	1
Ethanol	EPA TO-15 Rev. 2 (1999)	1
Ethyl acetate	EPA TO-15 Rev. 2 (1999)	1
Ethyl chloride	EPA TO-15 Rev. 2 (1999)	1
Ethylbenzene	EPA TO-15 Rev. 2 (1999)	1
Gasoline range organics (GRO)	EPA TO-15 Rev. 2 (1999)	1
Hexachlorobutadiene	EPA TO-15 Rev. 2 (1999)	1
Isopropylbenzene	EPA TO-15 Rev. 2 (1999)	1
m+p-xylene	EPA TO-15 Rev. 2 (1999)	1
Methyl bromide (Bromomethane)	EPA TO-15 Rev. 2 (1999)	1
Methyl chloride (Chloromethane)	EPA TO-15 Rev. 2 (1999)	1
Methyl methacrylate	EPA TO-15 Rev. 2 (1999)	1
Methyl tert-butyl ether (MTBE)	EPA TO-15 Rev. 2 (1999)	1
Methylene chloride (Dichloromethane)	EPA TO-15 Rev. 2 (1999)	1
Naphthalene	EPA TO-15 Rev. 2 (1999)	1
n-Butane	EPA TO-15 Rev. 2 (1999)	1
n-Heptane	EPA TO-15 Rev. 2 (1999)	1
n-Hexane	EPA TO-15 Rev. 2 (1999)	1
n-Nonane	EPA TO-15 Rev. 2 (1999)	1
n-Pentane	EPA TO-15 Rev. 2 (1999)	1
n-Propylbenzene	EPA TO-15 Rev. 2 (1999)	1
o-Xylene	EPA TO-15 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
Air		
Styrene	EPA TO-15 Rev. 2 (1999)	1
tert-Butyl alcohol	EPA TO-15 Rev. 2 (1999)	1
Tetrachloroethylene (Perchloroethylene)	EPA TO-15 Rev. 2 (1999)	1
Tetrahydrofuran (THF)	EPA TO-15 Rev. 2 (1999)	1
Toluene	EPA TO-15 Rev. 2 (1999)	1
trans-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
trans-1,3-Dichloropropylene	EPA TO-15 Rev. 2 (1999)	1
Trichloroethene (Trichloroethylene)	EPA TO-15 Rev. 2 (1999)	1
Trichlorofluoromethane (Freon 11)	EPA TO-15 Rev. 2 (1999)	1
Vinyl acetate	EPA TO-15 Rev. 2 (1999)	1
Vinyl bromide	EPA TO-15 Rev. 2 (1999)	1
Vinyl chloride	EPA TO-15 Rev. 2 (1999)	1
1,1,1,2-Tetrachloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,1-Trichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,2,2-Tetrachloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,2-Trichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloropropene	EPA TO-17 Rev. 2 (1999)	1
1,2,3-Trichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2,3-Trichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,2,4-Trichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2,4-Trimethylbenzene	EPA TO-17 Rev. 2 (1999)	1
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,3,5-Trimethylbenzene	EPA TO-17 Rev. 2 (1999)	1
1,3-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,3-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,4-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1-Methylnaphthalene	EPA TO-17 Rev. 2 (1999)	1
2,2-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-17 Rev. 2 (1999)	1
2-Chlorotoluene	EPA TO-17 Rev. 2 (1999)	1
2-Hexanone	EPA TO-17 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
Air		
2-Methylnaphthalene	EPA TO-17 Rev. 2 (1999)	1
4-Chlorotoluene	EPA TO-17 Rev. 2 (1999)	1
4-Isopropyltoluene (p-Cymene)	EPA TO-17 Rev. 2 (1999)	1
4-Methyl-2-pentanone (MIBK)	EPA TO-17 Rev. 2 (1999)	1
Benzene	EPA TO-17 Rev. 2 (1999)	1
Bromobenzene	EPA TO-17 Rev. 2 (1999)	1
Bromodichloromethane	EPA TO-17 Rev. 2 (1999)	1
Bromoform	EPA TO-17 Rev. 2 (1999)	1
Carbon tetrachloride	EPA TO-17 Rev. 2 (1999)	1
Chlorobenzene	EPA TO-17 Rev. 2 (1999)	1
Chlorodibromomethane	EPA TO-17 Rev. 2 (1999)	1
Chloroform	EPA TO-17 Rev. 2 (1999)	1
cis-1,2-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
cis-1,3-Dichloropropene	EPA TO-17 Rev. 2 (1999)	1
Dibromomethane	EPA TO-17 Rev. 2 (1999)	1
Dichlorodifluoromethane (Freon-12)	EPA TO-17 Rev. 2 (1999)	1
Ethylbenzene	EPA TO-17 Rev. 2 (1999)	1
Hexachlorobutadiene	EPA TO-17 Rev. 2 (1999)	1
Isopropyl alcohol (2-Propanol, Isopropanol)	EPA TO-17 Rev. 2 (1999)	1
Isopropylbenzene	EPA TO-17 Rev. 2 (1999)	1
m+p-xylene	EPA TO-17 Rev. 2 (1999)	1
Methyl tert-butyl ether (MTBE)	EPA TO-17 Rev. 2 (1999)	1
Naphthalene	EPA TO-17 Rev. 2 (1999)	1
n-Hexane	EPA TO-17 Rev. 2 (1999)	1
n-Propylbenzene	EPA TO-17 Rev. 2 (1999)	1
o-Xylene	EPA TO-17 Rev. 2 (1999)	1
sec-Butylbenzene	EPA TO-17 Rev. 2 (1999)	1
Styrene	EPA TO-17 Rev. 2 (1999)	1
tert-Butyl alcohol	EPA TO-17 Rev. 2 (1999)	1
tert-Butylbenzene	EPA TO-17 Rev. 2 (1999)	1
Tetrachloroethylene (Perchloroethylene)	EPA TO-17 Rev. 2 (1999)	1
Toluene	EPA TO-17 Rev. 2 (1999)	1
trans-1,2-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
trans-1,3-Dichloropropylene	EPA TO-17 Rev. 2 (1999)	1
Trichloroethene (Trichloroethylene)	EPA TO-17 Rev. 2 (1999)	1
Vinyl chloride	EPA TO-17 Rev. 2 (1999)	1
Xylene (total)	EPA TO-17 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
Air		
APH Aliphatics C5-C8	MADEP APH WSC-CAM-IX_July 2010	1,5
APH Aliphatics C9-C12	MADEP APH WSC-CAM-IX_July 2010	1,5
APH Aromatics C9-C10	MADEP APH WSC-CAM-IX_July 2010	1,5
Non-Potable Water		
n-Hexane Extractable Material (O&G)	EPA 1664B -10 (HEM)	4
Turbidity	EPA 180.1_2_1993	4
Hardness (calc.)	SM 2340 B-2011	1
Solids, Total Suspended	SM 2540 D-2011	2
Mercury	EPA 1631 E-02	1
Antimony	EPA 200.8_5.4_1994	1
Arsenic	EPA 200.8_5.4_1994	1
Barium	EPA 200.8_5.4_1994	1
Beryllium	EPA 200.8_5.4_1994	1
Cadmium	EPA 200.8_5.4_1994	1
Chromium	EPA 200.8_5.4_1994	1
Cobalt	EPA 200.8_5.4_1994	1
Copper	EPA 200.8_5.4_1994	1
Iron	EPA 200.8_5.4_1994	1
Lead	EPA 200.8_5.4_1994	1
Manganese	EPA 200.8_5.4_1994	1
Molybdenum	EPA 200.8_5.4_1994	1
Nickel	EPA 200.8_5.4_1994	1
Selenium	EPA 200.8_5.4_1994	1
Silver	EPA 200.8_5.4_1994	1
Thallium	EPA 200.8_5.4_1994	1
Vanadium	EPA 200.8_5.4_1994	1
Zinc	EPA 200.8_5.4_1994	1
Solid and Chemical Materials		
pH	EPA 150.2_1971	3,4
pH	EPA 9045 D_2004	4
Mercury	EPA 1631 E-02	1
Antimony	EPA 200.8_5.4_1994	1
Arsenic	EPA 200.8_5.4_1994	1
Barium	EPA 200.8_5.4_1994	1
Beryllium	EPA 200.8_5.4_1994	1
Cadmium	EPA 200.8_5.4_1994	1
Chromium	EPA 200.8_5.4_1994	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Cobalt	EPA 200.8_5.4_1994	1
Copper	EPA 200.8_5.4_1994	1
Lead	EPA 200.8_5.4_1994	1
Manganese	EPA 200.8_5.4_1994	1
Mercury	EPA 200.8_5.4_1994	1
Molybdenum	EPA 200.8_5.4_1994	1
Nickel	EPA 200.8_5.4_1994	1
Selenium	EPA 200.8_5.4_1994	1
Silver	EPA 200.8_5.4_1994	1
Thallium	EPA 200.8_5.4_1994	1
Vanadium	EPA 200.8_5.4_1994	1
Zinc	EPA 200.8_5.4_1994	1
Antimony	EPA 6020B_(7/14)	1
Arsenic	EPA 6020B_(7/14)	1
Barium	EPA 6020B_(7/14)	1
Beryllium	EPA 6020B_(7/14)	1
Cadmium	EPA 6020B_(7/14)	1
Chromium	EPA 6020B_(7/14)	1
Cobalt	EPA 6020B_(7/14)	1
Copper	EPA 6020B_(7/14)	1
Lead	EPA 6020B_(7/14)	1
Manganese	EPA 6020B_(7/14)	1
Mercury	EPA 6020B_(7/14)	1
Molybdenum	EPA 6020B_(7/14)	1
Nickel	EPA 6020B_(7/14)	1
Selenium	EPA 6020B_(7/14)	1
Silver	EPA 6020B_(7/14)	1
Thallium	EPA 6020B_(7/14)	1
Vanadium	EPA 6020B_(7/14)	1
Zinc	EPA 6020B_(7/14)	1
Benzene	EPA 8021B_2_(12/96)	1
Ethylbenzene	EPA 8021B_2_(12/96)	1
Toluene	EPA 8021B_2_(12/96)	1
Xylene (total)	EPA 8021B_2_(12/96)	1
4,4'-DDD	EPA 8081B_(2/07)	1
4,4'-DDE	EPA 8081B_(2/07)	1
4,4'-DDT	EPA 8081B_(2/07)	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Aldrin	EPA 8081B_(2/07)	1
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
alpha-Chlordane	EPA 8081B_(2/07)	1
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
delta-BHC	EPA 8081B_(2/07)	1
Dieldrin	EPA 8081B_(2/07)	1
Endosulfan I	EPA 8081B_(2/07)	1
Endosulfan II	EPA 8081B_(2/07)	1
Endosulfan sulfate	EPA 8081B_(2/07)	1
Endrin	EPA 8081B_(2/07)	1
Endrin aldehyde	EPA 8081B_(2/07)	1
Endrin ketone	EPA 8081B_(2/07)	1
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
gamma-Chlordane	EPA 8081B_(2/07)	1
Heptachlor	EPA 8081B_(2/07)	1
Heptachlor epoxide	EPA 8081B_(2/07)	1
Methoxychlor	EPA 8081B_(2/07)	1
Toxaphene (Chlorinated camphene)	EPA 8081B_(2/07)	1
Aroclor-1016 (PCB-1016)	EPA 8082A_(2/07)	1
Aroclor-1221 (PCB-1221)	EPA 8082A_(2/07)	1
Aroclor-1232 (PCB-1232)	EPA 8082A_(2/07)	1
Aroclor-1242 (PCB-1242)	EPA 8082A_(2/07)	1
Aroclor-1248 (PCB-1248)	EPA 8082A_(2/07)	1
Aroclor-1254 (PCB-1254)	EPA 8082A_(2/07)	1
Aroclor-1260 (PCB-1260)	EPA 8082A_(2/07)	1
Aroclor-1262 (PCB-1262)	EPA 8082A_(2/07)	1
Aroclor-1268 (PCB-1268)	EPA 8082A_(2/07)	1
Diesel range organics (DRO)	WDOE NWTPH-Dx_(1997)	1
Gasoline range organics (GRO)	WDOE NWTPH-Gx_(1997)	1
1,1,1,2-Tetrachloroethane	EPA 8260D_4_(6/18)	1
1,1,1-Trichloroethane	EPA 8260D_4_(6/18)	1
1,1,2,2-Tetrachloroethane	EPA 8260D_4_(6/18)	1
1,1,2-Trichloroethane	EPA 8260D_4_(6/18)	1
1,1-Dichloroethane	EPA 8260D_4_(6/18)	1
1,1-Dichloroethylene	EPA 8260D_4_(6/18)	1
1,1-Dichloropropene	EPA 8260D_4_(6/18)	1
1,2,3-Trichlorobenzene	EPA 8260D_4_(6/18)	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
1,2,3-Trichloropropane	EPA 8260D_4_(6/18)	1
1,2,4-Trichlorobenzene	EPA 8260D_4_(6/18)	1
1,2,4-Trimethylbenzene	EPA 8260D_4_(6/18)	1
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D_4_(6/18)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D_4_(6/18)	1
1,2-Dichlorobenzene	EPA 8260D_4_(6/18)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA 8260D_4_(6/18)	1
1,2-Dichloropropane	EPA 8260D_4_(6/18)	1
1,3,5-Trimethylbenzene	EPA 8260D_4_(6/18)	1
1,3-Dichlorobenzene	EPA 8260D_4_(6/18)	1
1,3-Dichloropropane	EPA 8260D_4_(6/18)	1
1,4-Dichlorobenzene	EPA 8260D_4_(6/18)	1
2,2-Dichloropropane	EPA 8260D_4_(6/18)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D_4_(6/18)	1
2-Chlorotoluene	EPA 8260D_4_(6/18)	1
2-Hexanone	EPA 8260D_4_(6/18)	1
4-Chlorotoluene	EPA 8260D_4_(6/18)	1
4-Isopropyltoluene (p-Cymene)	EPA 8260D_4_(6/18)	1
4-Methyl-2-pentanone (MIBK)	EPA 8260D_4_(6/18)	1
Acetone	EPA 8260D_4_(6/18)	1
Benzene	EPA 8260D_4_(6/18)	1
Bromobenzene	EPA 8260D_4_(6/18)	1
Bromodichloromethane	EPA 8260D_4_(6/18)	1
Bromoform	EPA 8260D_4_(6/18)	1
Carbon tetrachloride	EPA 8260D_4_(6/18)	1
Chlorobenzene	EPA 8260D_4_(6/18)	1
Chlorodibromomethane	EPA 8260D_4_(6/18)	1
Chloroethane (Ethyl chloride)	EPA 8260D_4_(6/18)	1
Chloroform	EPA 8260D_4_(6/18)	1
cis-1,2-Dichloroethylene	EPA 8260D_4_(6/18)	1
cis-1,3-Dichloropropene	EPA 8260D_4_(6/18)	1
Dibromomethane	EPA 8260D_4_(6/18)	1
Dichlorodifluoromethane (Freon-12)	EPA 8260D_4_(6/18)	1
Di-isopropylether (DIPE)	EPA 8260D_4_(6/18)	1
Ethylbenzene	EPA 8260D_4_(6/18)	1
Ethyl-t-butylether (ETBE)	EPA 8260D_4_(6/18)	1
Hexachlorobutadiene	EPA 8260D_4_(6/18)	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Isopropylbenzene	EPA 8260D_4_(6/18)	1
m+p-xylene	EPA 8260D_4_(6/18)	1
Methyl bromide (Bromomethane)	EPA 8260D_4_(6/18)	1
Methyl chloride (Chloromethane)	EPA 8260D_4_(6/18)	1
Methyl tert-butyl ether (MTBE)	EPA 8260D_4_(6/18)	1
Methylene chloride (Dichloromethane)	EPA 8260D_4_(6/18)	1
Naphthalene	EPA 8260D_4_(6/18)	1
n-Hexane	EPA 8260D_4_(6/18)	1
n-Propylbenzene	EPA 8260D_4_(6/18)	1
o-Xylene	EPA 8260D_4_(6/18)	1
sec-Butylbenzene	EPA 8260D_4_(6/18)	1
Styrene	EPA 8260D_4_(6/18)	1
tert-amylmethylether (TAME)	EPA 8260D_4_(6/18)	1
tert-Butyl alcohol	EPA 8260D_4_(6/18)	1
tert-Butylbenzene	EPA 8260D_4_(6/18)	1
Tetrachloroethylene (Perchloroethylene)	EPA 8260D_4_(6/18)	1
Toluene	EPA 8260D_4_(6/18)	1
trans-1,2-Dichloroethylene	EPA 8260D_4_(6/18)	1
trans-1,3-Dichloropropylene	EPA 8260D_4_(6/18)	1
Trichloroethene (Trichloroethylene)	EPA 8260D_4_(6/18)	1
Trichlorofluoromethane (Freon 11)	EPA 8260D_4_(6/18)	1
Vinyl chloride	EPA 8260D_4_(6/18)	1
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260D_SIM_4_(6/18)	1
1,2,4-Trichlorobenzene	EPA 8270E_6_(6/18)	1
1,2-Dichlorobenzene	EPA 8270E_6_(6/18)	1
1,2-Diphenylhydrazine	EPA 8270E_6_(6/18)	1
1,3-Dichlorobenzene	EPA 8270E_6_(6/18)	1
1,4-Dichlorobenzene	EPA 8270E_6_(6/18)	1
1-Methylnaphthalene	EPA 8270E_6_(6/18)	1
2,2'-Oxybis(1-chloropropane)	EPA 8270E_6_(6/18)	1
2,4,5-Trichlorophenol	EPA 8270E_6_(6/18)	1
2,4,6-Trichlorophenol	EPA 8270E_6_(6/18)	1
2,4-Dichlorophenol	EPA 8270E_6_(6/18)	1
2,4-Dimethylphenol	EPA 8270E_6_(6/18)	1
2,4-Dinitrophenol	EPA 8270E_6_(6/18)	1
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E_6_(6/18)	1
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E_6_(6/18)	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
2-Chloronaphthalene	EPA 8270E_6_(6/18)	1
2-Chlorophenol	EPA 8270E_6_(6/18)	1
2-Methylnaphthalene	EPA 8270E_6_(6/18)	1
2-Methylphenol (o-Cresol)	EPA 8270E_6_(6/18)	1
2-Nitroaniline	EPA 8270E_6_(6/18)	1
2-Nitrophenol	EPA 8270E_6_(6/18)	1
3,3'-Dichlorobenzidine	EPA 8270E_6_(6/18)	1
3-Nitroaniline	EPA 8270E_6_(6/18)	1
4,6-Dinitro-2-methylphenol	EPA 8270E_6_(6/18)	1
4-Bromophenyl phenyl ether (BDE-3)	EPA 8270E_6_(6/18)	1
4-Chloro-3-methylphenol	EPA 8270E_6_(6/18)	1
4-Chloroaniline	EPA 8270E_6_(6/18)	1
4-Chlorophenyl phenylether	EPA 8270E_6_(6/18)	1
4-Nitroaniline	EPA 8270E_6_(6/18)	1
4-Nitrophenol	EPA 8270E_6_(6/18)	1
Acenaphthene	EPA 8270E_6_(6/18)	1
Acenaphthylene	EPA 8270E_6_(6/18)	1
Anthracene	EPA 8270E_6_(6/18)	1
Benzo(a)anthracene	EPA 8270E_6_(6/18)	1
Benzo(a)pyrene	EPA 8270E_6_(6/18)	1
Benzo(g,h,i)perylene	EPA 8270E_6_(6/18)	1
Benzo(k)fluoranthene	EPA 8270E_6_(6/18)	1
Benzo[b]fluoranthene	EPA 8270E_6_(6/18)	1
Benzoic acid	EPA 8270E_6_(6/18)	1
Benzyl alcohol	EPA 8270E_6_(6/18)	1
bis(2-Chloroethoxy)methane	EPA 8270E_6_(6/18)	1
bis(2-Chloroethyl) ether	EPA 8270E_6_(6/18)	1
Butyl benzyl phthalate	EPA 8270E_6_(6/18)	1
Carbazole	EPA 8270E_6_(6/18)	1
Chrysene	EPA 8270E_6_(6/18)	1
Di(2-ethylhexyl)phthalate	EPA 8270E_6_(6/18)	1
Dibenz(a,h) anthracene	EPA 8270E_6_(6/18)	1
Dibenzofuran	EPA 8270E_6_(6/18)	1
Diethyl phthalate	EPA 8270E_6_(6/18)	1
Dimethyl phthalate	EPA 8270E_6_(6/18)	1
Di-n-butyl phthalate	EPA 8270E_6_(6/18)	1
Di-n-octyl phthalate	EPA 8270E_6_(6/18)	1

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Fluoranthene	EPA 8270E_6_(6/18)	1
Fluorene	EPA 8270E_6_(6/18)	1
Hexachlorobenzene	EPA 8270E_6_(6/18)	1
Hexachlorobutadiene	EPA 8270E_6_(6/18)	1
Hexachlorocyclopentadiene	EPA 8270E_6_(6/18)	1
Hexachloroethane	EPA 8270E_6_(6/18)	1
Indeno(1,2,3-cd) pyrene	EPA 8270E_6_(6/18)	1
Isophorone	EPA 8270E_6_(6/18)	1
m+p Cresol	EPA 8270E_6_(6/18)	1
Methamphetamine	EPA 8270E_6_(6/18)	
Naphthalene	EPA 8270E_6_(6/18)	1
Nitrobenzene	EPA 8270E_6_(6/18)	1
n-Nitrosodimethylamine	EPA 8270E_6_(6/18)	1
N-Nitroso-di-n-propylamine	EPA 8270E_6_(6/18)	1
n-Nitrosodiphenylamine	EPA 8270E_6_(6/18)	1
Pentachlorophenol	EPA 8270E_6_(6/18)	1
Phenanthrene	EPA 8270E_6_(6/18)	1
Phenol	EPA 8270E_6_(6/18)	1
Pyrene	EPA 8270E_6_(6/18)	1

Accredited Parameter Note Detail

(1) Accreditation based in part on recognition of Oregon NELAP accreditation. (2) Provisional accreditation pending submittal of acceptable Proficiency Testing (PT) results (WAC 173-50-110). (3) Accreditation is limited to liquid matrix only. (4) Interim accreditation pending the successful completion of an on-site audit to verify method capabilities (WAC 173-50-100). (5) Toxics Cleanup Program Implementation Memo#18 ECY Publication #17-09-043 (January 2018). (6) Method not approved for NPDES testing.

Rebecca Wood

Authentication Signature
Rebecca Wood, Lab Accreditation Unit Supervisor

01/12/2024

Date

Appendix B

Health and Safety Plan

MAUL
FOSTER
ALONGI

Health and Safety Plan

Tiki Car Wash

11909 NE 8th Street

Bellevue, Washington

Facility Site ID: 2352

Cleanup Site ID: 5096

Final

Prepared for:

Washington State Department of Ecology

Toxics Cleanup Program
Northwest Regional Office
Shoreline, Washington

March 14, 2024
Project No. M0592.06.001

Prepared by:

Maul Foster & Alongi, Inc.
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MAUL
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Health and Safety Plan

Tiki Car Wash
11909 NE 8th Street
Bellevue, Washington

The material and data in this plan were prepared under the supervision and direction of the undersigned.

Maul Foster & Alongi, Inc.

Joshua Elliott, PE
Principal Engineer

Justin Hansen
Project Environmental Scientist

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Contents

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Appendixes

© 2024 Maul Foster & Alongi, Inc.

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Abbreviations

AED	automated external defibrillator
bgs	below ground surface
CFR	Code of Federal Regulations
COPC	chemical of potential concern
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSC	health and safety coordinator
JHA	job hazard analysis
MFA	Maul Foster & Alongi, Inc.
PIC	principal in charge
PPE	personal protective equipment
the Property	11909 NE 8th Street, Bellevue, Washington
the Site	Tiki Car Wash Site, Facility Site ID: 2352, Cleanup Site ID: 5096
SSO	site safety officer

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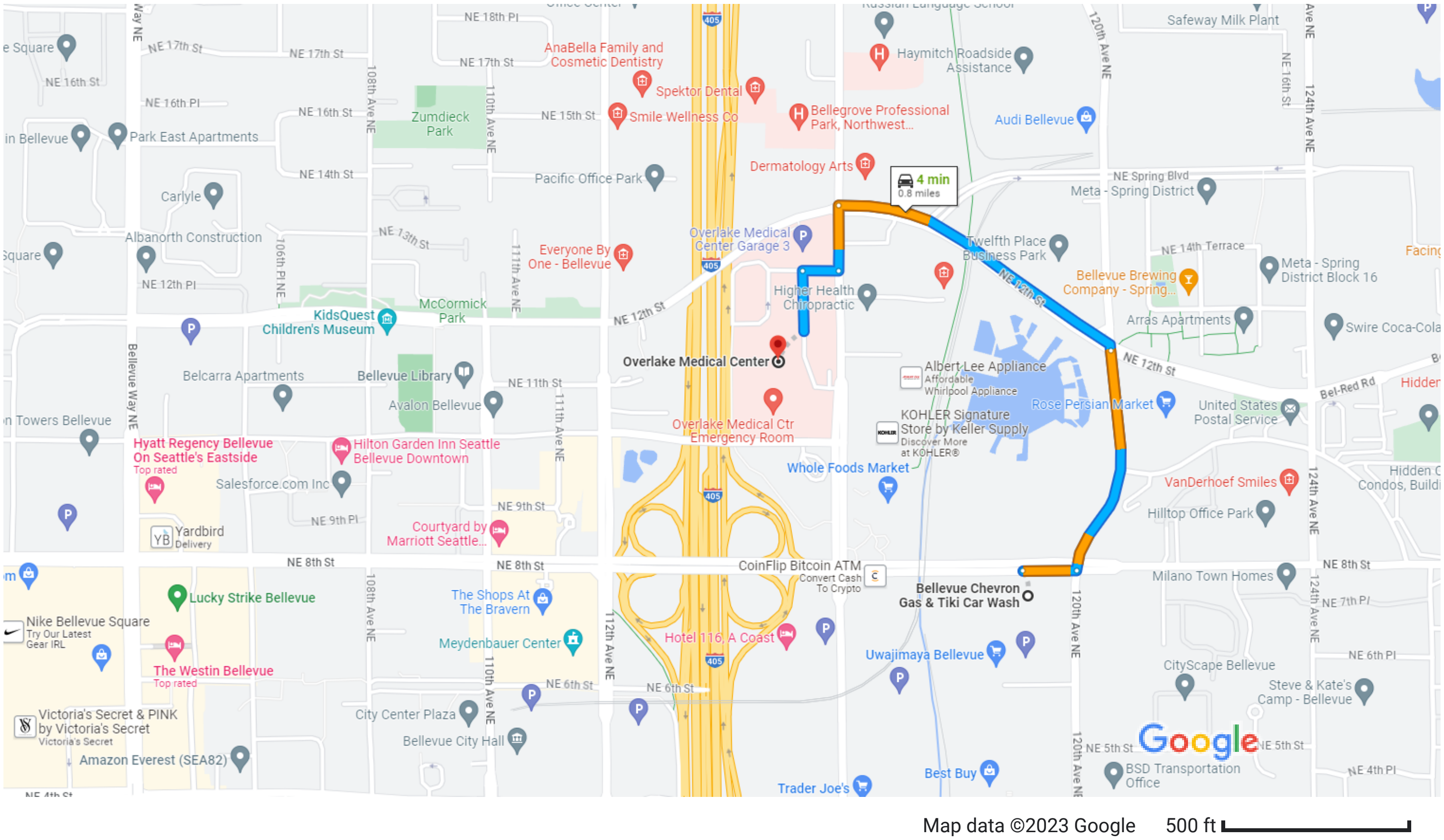
Google Maps

Bellevue Chevron Gas & Tiki Car Wash, 11909 NE 8th St, Bellevue, WA 98005 to Overlake Medical Center

Drive 0.8 mile, 4 min



Bellevue Chevron Gas & Tiki Car Wash

11909 NE 8th St, Bellevue, WA 98005

1. Head east on NE 8th St toward 120th Ave NE

   295 ft

2. Use the left 2 lanes to turn left at the 1st cross street onto 120th Ave NE

   0.2 mi

3. Turn left onto NE 12th St

   0.3 mi

4. Turn left onto 116th Ave NE

   364 ft

5. Turn right toward Felix Terry Swistak Dr NE

   200 ft

6. Turn left onto Felix Terry Swistak Dr NE

   338 ft

Overlake Medical Ctr

1035 116th Ave NE, Bellevue, WA 98004

1 Nearest Hospital/Emergency Medical Center

1.1 Nearest Hospital

Overlake Medical Center

1035 116th Avenue NE

Bellevue, WA 98004

Phone: (425) 688-5000

Distance: 0.8 miles

Travel Time: 4 minutes

1.2 Route to Hospital from Site

See the map on the first page of this document.

1.2.1 Driving Directions to Hospital from Site

1. From the Site, turn east on NE 8th Street (295 ft)
2. Turn left on 120th Avenue NE (0.2 mi)
3. Turn left on NE 12th Street (0.3 mi)
4. Turn left on 116th Avenue NE, then turn right into hospital (364 ft)

1.3 Emergency Phone Numbers

Ambulance, Police, Fire	Dial 911
Josh Elliott Project Manager	Phone: (503) 501-5236 Cell: (503) 953-6067
Erik Bakkom Principal in Charge (PIC)	Phone: (503) 501-5217 Cell: (503) 312-0094
Nicole Bruneel Health and Safety Coordinator (HSC)	Phone: (208) 784-1090 Cell: (208) 949-3981

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2 Plan Summary

This health and safety plan (HASP) was developed to describe the procedures and practices necessary for protecting the health and safety of Maul Foster & Alongi, Inc. (MFA), employees conducting activities at the Tiki Car Wash property (the Property) located at 11909 NE 8th Street in Bellevue, WA. The Property is associated with Washington State Department of Ecology Facility Site ID 2352 and Cleanup Site ID 5096 (the Site). Other employers, including contractors and subcontractors, are expected to develop and implement their own HASPs to manage the health and safety of their personnel.

MFA personnel conducting activities at the Site are responsible for understanding and adhering to this HASP. Before fieldwork begins, the on-Site personnel will designate a site safety officer (SSO) who is familiar with health and safety procedures and with the Site. Safety deficiencies should be immediately communicated to the SSO and, if necessary, to the project manager, principal in charge (PIC)/program manager, or MFA's health and safety coordinator (HSC).

All contractors and subcontractors have the primary responsibility for the safety of their own personnel on the Site. All personnel on the Site have stop work authority if they observe conditions that they believe create an imminent danger.

If MFA employees work on the Site for more than a year, this HASP will be reviewed at least annually. Additionally, this HASP will be updated as new or changed conditions are encountered to ensure that it reflects the current known hazards and requirements associated with the Site.

MFA personnel who will be working on the Site are required to read and understand this HASP. MFA personnel entering the work area must sign the personnel acknowledgment sheet (Section 17), certifying that they have read and that they understand this HASP and agree to abide by it.

3 Key Project Personnel

Name	Responsibility
Erik Bakkom	PIC or Program Manager
Josh Elliott	Project Manager
Justin Hansen	Field Personnel
Julia Fudge	Field Personnel
Nicole Bruneel	HSC

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4 Emergency Supplies and Equipment List

Equipment	Location and Notes
First Aid Kit	Inside work vehicle.
Fire Extinguishers	Inside work vehicle.
Mobile Phones	On MFA staff.
Traffic Cones	Inside work vehicle.
Radios	On MFA staff and inside work vehicle.
Water and Other Fluid Replenishment	Inside work vehicle, inside food-only cooler in work vehicle.
Eyewash	In work vehicle.
Spill Kit	In work vehicle.
Health and Safety Plan	On MFA staff, in work vehicle, on MFA iPad.
Dust Meter	In action packer in work vehicle.

5 Site Description and Background

5.1 Type of Site

The approximately 0.59-acre Property is located at 11909 NE 8th Street in Bellevue, Washington. Since 1971, the Property has been operated as a gas station and car wash with an on-Property convenience store.

5.2 Buildings/Structures

Three buildings/structures are present on the Property: a fuel island with pumps on the central portion of the Property, an open-ended car wash on the northeastern portion of the Property, and a convenience store on the southeastern portion of the Property.

Commercial buildings are present on the adjacent Bartell Drugs and Willburton Crossing properties. An open-sided structure is present on the Infinity of Bellevue property.

5.3 Topography

In general, the Property slopes to the southwest.

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5.4 General Geologic/Hydrologic Setting

Regional geology near the Property consists of Holocene fill and Pleistocene Vashon Drift. The Property is underlain by 3 to 5 feet of fill material and at least 16 feet of weathered till. Generally, the fill unit comprises fine-to-medium-grained gravelly sand with intermittent stiff clay deposits. The gravelly silt sands become denser and resemble glacial till with increasing depth.

Regional hydrology records indicate that the Property and surrounding area are underlain by three aquifers: (1) a shallow aquifer approximately 5 feet below ground surface (bgs), associated with impermeable glacial till with thin beds of sand and gravel; (2) an intermediate aquifer beneath the glacial till with an average water depth around 38 feet bgs; and (3) a deep aquifer segregated from the intermediate aquifer by an impermeable clay unit, with an average water depth around 45 feet bgs.

5.5 Site Status

The Property is currently operated as a gas station and car wash. The surrounding area comprises commercial businesses.

5.6 General Site History

Since 1971, the Property has been operated as a gas station and car wash with an on-Property convenience store. Four single-walled steel underground storage tanks have historically existed at the Property: three installed in 1971 and the fourth installed in 1979.

In 1995, an air sparging and soil vapor extraction system was installed along the west and south edges of the Property. However, the system was prone to shutdown due to water accumulation and was abandoned sometime in 2000. Historically, several investigations have documented soil and groundwater contamination associated with operations and releases at the Property.

6 Hazard Evaluation

6.1 Site Tasks and Operations

MFA has completed job hazard analyses (JHAs) for specific tasks that may be conducted on the Site, depending on the scope of work. JHAs are provided in Appendix A. The following list summarizes planned tasks and operations:

- General work near heavy equipment
- Collecting soil samples
- Collecting groundwater samples
- Collecting soil gas samples

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- Collecting air samples
- Collecting sub-slab samples
- Working in or near a public right-of-way or near vehicle traffic

The control measures that field personnel must implement to eliminate or minimize these hazards, such as air monitoring, personal protective equipment (PPE), engineering controls, and decontamination procedures, are detailed in the JHAs and in subsequent sections of this HASP.

6.2 Chemical Hazard Evaluation

Chemicals of potential concern (COPCs), including concentrations detected on the Site, are summarized in Appendix B. Air monitoring action levels and associated controls are specified in Appendix C.

6.3 Physical Hazards

The specific physical hazards and associated controls for work on the Site are described in the JHAs provided in Appendix A.

7 Site-Control Measures

Control of access to the Site will be established before the work begins. Control measures may include fencing, caution tape, cones, and signs limiting access to everyone except authorized personnel. The exclusion zone is defined as the area of known or suspected contamination (e.g., the area where a well is being installed), and the contaminant reduction zone is where support activities take place (e.g., packing sample coolers, decontamination activities).

MFA requires the buddy system if personnel conducting the work may potentially be exposed to chemical or physical hazards that would require immediate medical attention or rescue. The buddy system may involve working with non-MFA personnel.

8 Health and Safety Training

MFA personnel who could be exposed to COPCs while conducting work on the Site will have completed training consistent with the Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements in 29 Code of Federal Regulations (CFR) 1910.120(e) before beginning work on the Site. The training will include the following:

- Identification of an SSO, and other safety and health personnel, if applicable
- Identification of safety and health hazards specific to work being conducted

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- Proper use of required PPE
- Safe work practices required (e.g., fall protection, confined-space entry procedures, hot-work permits, general safety rules)
- Safe use of engineering controls and equipment
- Medical surveillance requirements, including the recognition of signs and symptoms that might indicate overexposure to hazards
- The project-specific emergency response plan/spill containment plan

The HSC will oversee training for MFA personnel conducting fieldwork. Training records, including an outline, signoffs, and competency records, will be maintained by the HSC.

While the HSC is responsible for maintaining training records, the project manager is responsible for verifying that the training status of field personnel is current before these personnel deploy to the field.

9 Safety Equipment

9.1 Personal Protective Equipment

Individuals on the Site must wear PPE to protect against physical hazards. PPE required on the Site is typically modified Level D, which consists of the following:

- Hard hat (to be worn when working around heavy equipment)
- High-visibility vest
- Work boots
- Safety glasses with side shields
- Nitrile gloves or equivalent if handling media potentially impacted or known to be impacted
- Work gloves (if handling materials that might have sharp edges, protrusions, or splinters)

Additional PPE may be necessary for specific tasks with additional hazards. The SSO will be responsible for designating additional PPE for specific tasks. Depending on the activity, additional PPE may include the following:

- Hearing protection (to be worn during high-noise tasks)
- Chemical-resistant clothing, (e.g., Tyvek coveralls)
- Chemical-resistant boots
- Chemical-resistant goggles
- Chemical-resistant gloves
- Faceshield

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- Respiratory protection

Additional PPE may be required if workers discover unexpected contamination. Characteristics of unexpected contamination could include unusual odors, discolored media, or a visible sheen. MFA employees should contact the SSO and, if necessary, the project manager and/or the HSC as soon as possible after the discovery of unexpected contamination. The SSO and, if applicable, the project manager and/or HSC will determine any need for additional controls and/or training.

PPE used at the Site must meet the requirements of recognized consensus standards (e.g., American National Standards Institute, National Institute for Occupational Safety and Health), and respiratory protection will comply with the requirements set forth in 29 CFR 1910.134.

Project personnel are not permitted to reduce the specified level of required PPE without approval from the SSO or the project manager and/or HSC.

9.2 Safety Equipment

The SSO will be responsible for ensuring that the following safety equipment is available during fieldwork and is properly inspected and maintained:

- Soap and water for decontamination
- Caution tape, traffic cones, and/or barriers
- First aid kit
- Automated external defibrillator (AED)
- Fire extinguisher
- Fluids for hydration, (e.g., drinking water or sports drink)
- Canopy for shade
- Hand-washing station
- Eye-flushing station

9.3 Air Monitoring Equipment

The following air monitoring equipment will be available to identify conditions that may require additional controls. See Appendix C for specified action levels and follow-up response actions.

- Photoionization detector
- Colorimetric indicator tubes (e.g., Dräger tubes)
- Confined-space or combustible-gas monitor (e.g., for detecting oxygen, lower explosive limit, carbon monoxide, hydrogen sulfide)
- Dust meter

9.4 Communications Equipment

MFA personnel should have a mobile phone or a radio available in case of emergency.

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10 Decontamination Procedures

10.1 Partial Decontamination Procedures

MFA employees will implement the following partial decontamination procedures when exiting the work/exclusion zone but remaining on the Site.

- Wash and rinse boots and outer gloves (if wearing two pairs) in containers in the contamination-reduction zone.
- Inspect Tyvek suit, if worn, for stains, rips, or tears. If the suit is contaminated but is to be reused, full decontamination will be performed as described in Section 9.2. If the suit is damaged, it should not be reused; discard it in a container labeled for disposable items.
- Remove and inspect outer gloves. If they are ripped or otherwise damaged, discard them in a container labeled for disposable items.
- Remove respirator, if worn, and clean with premoistened alcohol wipes. Discard used cartridges at the frequency established by the SSO, project manager, or HSC.
- Wash hands and face with soap and water.

10.2 Full Decontamination Procedures

When exiting the exclusion zone and leaving the Site (e.g., at the end of the work shift), MFA employees will follow the full decontamination procedures listed below.

- Wash and rinse boots and outer gloves in containers in the contamination-reduction zone.
- Remove outer gloves and Tyvek suit, if worn, and deposit in a container labeled for disposable items.
- Remove respirator and discard used cartridges at the frequency dictated by the SSO, project manager, or HSC.
- Wash and rinse respirator in decontamination container labeled “respirators only.”
- Remove work boots and put on street shoes. Place work boots in a plastic bag or container.
- Remove inner gloves and deposit in a container labeled for disposable items.
- Wash hands and face with soap and water.
- Shower as soon as possible after the work shift as practicable.

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11 Medical Surveillance

MFA will ensure that its employees who meet the following criteria are enrolled in a medical surveillance program consistent with 29 CFR 1910.120(f):

- The employees are, or may be, exposed to hazardous substances or health hazards at or above established permissible exposure limits for 30 or more days per year.
- The employees are required to wear a respirator for 30 or more days per year.

MFA employees who exhibit signs or symptoms consistent with overexposure to COPCs will be offered medical surveillance consistent with HAZWOPER requirements.

MFA will ensure that its employees who are authorized to wear respirators are medically evaluated and approved for respirator use, consistent with the respiratory protection standard (29 CFR 1910.134). The HSC or administrative designee (e.g., human resources manager) will maintain medical evaluation records, including respirator clearance documentation.

Personnel medically cleared for respirator use will undergo an annual qualitative fit test. The MFA HSC or administrative designee will conduct the annual qualitative fit tests and will manage the documentation.

If employees are required to wear a respirator on the Site, the project manager will verify that the employee has a current annual respirator fit test.

12 Air Monitoring

Based on Site conditions, it is not anticipated that air monitoring will be necessary; however, air monitoring equipment will be available in case workers encounter conditions, such as unusual odors, discolored media, or a visible sheen, that indicate the presence of unexpected contamination. If such conditions are discovered, workers will exit the area and contact the SSO and, as needed, the project manager or the HSC. If necessary, MFA will use the air monitoring equipment to evaluate the conditions and determine whether additional controls and/or training are required. Action levels and follow-up actions are provided in Appendix C.

A water truck or similar controls for minimizing dust generation may be used during project work. If controls do not prevent significant visible dust generation, MFA will take measurements with a real-time dust monitor and compare results to the action levels provided in Appendix C.

If air monitoring is necessary, it must be performed by individuals familiar with the calibration, use, and care of the required instruments. Measurements will be documented, and the records must include the following information:

- The name of the person conducting the measurements
- The identity of workers, if any, who have exposure indicated by the measurement results

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- Information about the instrument (e.g., type, make, model, serial number)
- The location where the measurement was taken
- The measurement date and start/stop time
- Conditions represented by the measurement, including applicable activities, work practices, weather conditions, Site conditions, and controls in place
- Measurement results
- Other relevant observations or notes

12.1 Air Monitoring Action Levels

If air monitoring is conducted, the results will be compared to the action levels provided in Appendix C. These levels have been established to comply with Occupational Safety and Health Administration permissible exposure limits, American Conference of Governmental Industrial Hygienists threshold limit values, and National Institute for Occupational Safety and Health recommendations for the chemicals that may be encountered on the Site. The action levels have been adjusted for the relative response of common photoionization detection instruments to motor-fuel vapors.

12.2 Explosion Hazard Action Levels

MFA employees will take measurements when working near known or suspected sources of explosive gases or vapors. The instrument alarm should be set to sound at 10 percent of the lower explosive limit. When measurements exceed this level, MFA employees will:

1. Extinguish ignition sources and shut down powered equipment in the work area.
2. Move personnel at least 100 feet away from the work area.
3. Contact the SSO, the project manager, and/or the HSC as applicable.
4. At the instruction of the project manager and/or the HSC and after waiting 15 minutes for explosive gases to dissipate, the SSO may use the combustible-gas meter to safely approach the work site to measure combustible gases in the work area. The SSO will not enter (or allow any personnel to enter) any area where the combustible-gas meter readings exceed the explosivity action level, nor will the SSO approach if there is a potential for fire or explosion.
5. The SSO may authorize personnel to reenter the work area after the source of the combustible gases has been identified and controlled.

12.3 Instrument Calibrations

Instruments will be calibrated consistent with manufacturers' recommendations. Calibrations will be coordinated by the SSO and the project manager. Calibration and monitoring records will be maintained by the SSO and/or the project manager.

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13 Emergency Response, Spill Containment, and Confined Space

MFA employees will follow the emergency response, spill response, and confined-space procedures described in the MFA Policies and Procedures Manual. Incidents will be documented on the incident report form included as Appendix D.

14 Pre-entry Briefing

MFA employees will conduct pre-entry briefings prior to beginning work on the Site (e.g., tailgate meetings; see the checklist provided as Appendix E). Additional briefings shall be conducted as the scope of work or conditions change throughout the project to ensure that employees are familiar with and are adhering to the appropriate safety and health protocol. Attendance and discussion topics will be documented on sign-in sheets that will be maintained by the SSO.

15 Periodic Evaluation

The project manager or designee will evaluate the effectiveness of this HASP by conducting periodic HASP audits. A HASP audit form is included as Appendix F. In addition, HASP effectiveness will be evaluated by tracking ongoing health and safety feedback from field personnel working on the project. This feedback will be reviewed and incorporated into either immediate or annual updates of this HASP, as appropriate. This HASP will be reviewed and updated at least annually. Updating this HASP as necessary ensures that it reflects the known hazards, conditions, and requirements associated with the project. MFA will maintain HASP audit or other periodic evaluation records and track all revisions to this HASP.

16 Safe Work Practices

The following safe work practices are provided to supplement the other information in this HASP.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in areas with potentially contaminated materials.

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2. Whenever practicable, field personnel will remain upwind of drilling rigs, open excavations, and other ground-disturbing activities.
3. Subsurface work will not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

17 Acknowledgment

MFA cannot guarantee the health or safety of any person entering the Site. Because of the potentially hazardous nature of active sites, it is not possible to discover, evaluate, and provide protection against all possible hazards that may be encountered at the Site. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness. The health and safety guidelines in this HASP were prepared specifically for the Site should not be used on any other site without prior evaluation by trained health and safety personnel.

MFA personnel who will work at the Site are to read, understand, and agree to comply with the specific practices and guidelines described in this HASP regarding field safety and health hazards.

This HASP has been developed for the exclusive use of MFA personnel. MFA may make this HASP available for review by contracted or subcontracted personnel for information only. This HASP does not cover the activities performed by employees of any other employer on the project. All contracted or subcontracted personnel are responsible for implementing their own health and safety program, including generating and using their own HASP.

I have read and I understand this HASP and all attachments, and agree to comply with the requirements described herein:

Name	Title	Date

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Appendix A

Job Hazard Analyses

Job Hazard Analysis

<table>
<tr><th colspan="3">Task/Operation: Conducting Fieldwork</th></tr>
<tr><td colspan="1">Project Number:
M0592.06.001</td><td colspan="2">Location/Site Where Task/Operation Performed:
Tiki Car Wash Site</td></tr>
<tr><td>Date Prepared:
02/29/2024
Date Reviewed:
03/05/2024</td><td colspan="2">Employee Preparing this Job Hazard Analysis (JHA):
Justin Hansen
Employee Reviewing and Certifying this JHA:
Kieron Crossley</td></tr>
<tr><th colspan="3">Job/Task Description</th></tr>
<tr><td colspan="3">This JHA describes hazards and required safe-work practices that are common to most types of fieldwork. See the separate task-specific JHA for hazards and safe-work practices that are unique to certain tasks (e.g., sampling contaminated media, working in remote areas).</td></tr>
<tr><th colspan="3">Physical Hazards</th></tr>
<tr><td>Hazard/Risk</td><td>Source of Hazard/Risk</td><td>Hazard/Risk Mitigation</td></tr>
<tr><td>Heat/cold/sunburn</td><td>Weather.</td><td>Be aware of seasonal dangers, including frostbite, hypothermia, snow blindness, trench foot, and heat stress.
Drink plenty of fluids, especially when perspiring. Wear sunscreen on exposed skin. Stop work if an employee feels symptoms of dehydration, overheating, or heat stroke. Move to a shaded area and drink water. During cold or wet conditions, wear adequate clothing to reduce the potential for hypothermia.
If there is lightning in the area, seek indoor shelter immediately, if possible. If outdoors, get into a hard-topped vehicle and away from trees. Turn off all radios and electronic equipment.</td></tr>
<tr><td>Eye injury</td><td>Debris (e.g., soil, water, injection fluids) coming into contact with eyes; working in areas with low, dense vegetation.</td><td>Wear eye protection with side shields. If there is a splash hazard, wear tight-fitting chemical goggles. If chemicals come into contact with eyes, immediately wash chemicals out with water. Identify the location of the eyewash station before beginning the work.</td></tr>
</table>

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Task/Operation: Conducting Fieldwork		
Head injury	Heavy equipment, tools, overhead hazards impacting the head.	Wear a hard hat. Do not work near moving or heavy equipment or under overhead hazards.
Foot injury	Sharp objects that could be stepped on; large objects falling on feet.	Wear protective boots (composite or steel-toe).
Hand injury	Pinch points, sharp objects, stress from pulling rope, dermal contact with chemicals and contaminated media.	Wear protective gloves. Appropriate gloves should be identified in the HASP or Safe Work Plan. Avoid placing hands near operating equipment.
Hearing loss	Noise generated by heavy equipment/machinery.	Wear hearing protection such as earplugs or earmuffs.
Bodily harm, including to bystanders and the public and pedestrians in the locality of work	Heavy equipment, drilling rigs, support vehicles, traffic and public rights-of-way; potential to be struck, crushed, or impacted by moving objects.	Wear a safety vest for enhanced visibility. Use cones and caution tape to cordon off the immediate work area. Watch for and escort pedestrians away from the work area. Pause work if necessary. Ensure traffic control measures (e.g., traffic cones, signage) are in place. Do not work near moving or heavy equipment or under overhead hazards. Maintain eye contact with equipment operators. When working around vehicles or heavy equipment, know the locations of emergency equipment (e.g., fire extinguishers, emergency shutoff features).
	Potential to be struck by pressurized equipment and hoses	Install cable guards to prevent a suddenly disconnected hose from striking an individual or confirm with subcontractor that such safeguards are in place. Ensure pressurized tanks have safety relief valves. Do not work around pressurized equipment or within the radius of pressurized hoses.
Physical stress	Lifting heavy equipment and objects; conducting strenuous activities; kneeling on hard or gravel surfaces.	Use proper lifting techniques, i.e., bending and lifting with the legs and not the back. Do not twist at the waist when turning. Use the buddy system for heavy objects. Use knee pads or a kneeling pad. Take breaks and rest as needed.

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Task/Operation: Conducting Fieldwork		
Accidents with equipment/tools	Sample-collection equipment/tools.	Verify that you have the appropriate equipment/tools for your tasks. Use equipment/tools as intended by the manufacturer. Only use open blades or sharp-edged tools for their intended purposes. Stow tools in the vehicle properly; use appropriate cases and bags. Secure equipment (including compressed-gas cylinders) in the vehicle with netting and straps; do not leave loose—it can cause property damage or serious injuries to others or yourself.
Slips, trips, and falls	Uneven or unstable ground.	Maintain good housekeeping in work areas to minimize or eliminate slip/trip/fall hazards from equipment and supplies. Walk around rather than over hazards on the ground. Use caution when walking on uneven ground or in snowy and/or icy conditions. Dense vegetation may obscure dangerous features, including biological hazards, riverbanks, cliffs, unstable/steep slopes, excavations, and mine adits. Flagging or marking dangerous areas can help reduce the likelihood of injury.
Biological/Chemical Hazards		
Biological/Chemical Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Biological—animals	Biting or stinging insects and spiders; animal feces.	Use bug repellent. Insect nests should never be disturbed. Employees who are allergic to stings should not work in areas where there is a high risk of encountering stinging insects. Use a bar to clear spiders and/or snakes from objects and/or vegetation. Check well vaults and security lids for insects; use caution when opening. Avoid contact with animal feces. When working indoors, remove animal feces from the work area—if possible, without creating dust.

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Task/Operation: Conducting Fieldwork		
Biological—plants	Poisonous plants and other irritant vegetation (e.g., blackberry canes).	Do not touch or approach poisonous or irritant vegetation. Wear long pants and a long-sleeved shirt while on the site if poisonous plants and other irritant vegetation is present.
Exposure to chemicals in environmental media	Chemicals or hazardous materials in soil, sediment, surface water, groundwater, NAPL, stormwater, building materials, indoor air, outdoor air, soil vapors, monitoring wells, borings, excavations, and manholes.	See the task-specific JHA.
Additional Control Measures and Guidance		
Engineering Controls: No engineering controls specified. The need for engineering controls should be discussed with the project manager, health and safety coordinator, and subcontractors, and identified in the HASP or Safe Work Plan.		
General Safe-Work Practices and Guidance: • Employees should not eat or drink in the immediate area where sampling is being conducted. Employees should wash their hands and faces before eating or drinking. If used, nitrile gloves should be disposed of in a container labeled for disposable items. • Cones, barrier tape, or equivalent methods will be used to establish the work area, if feasible. • Tasks that must be conducted in the work area must be coordinated with equipment operators before work begins. Methods of communication, such as direct eye contact, hand signals, and/or verbal communication, will be established before work begins. • Employees should carry a cellular phone and/or a security radio.		
PPE: Hard hat (when working around heavy equipment, including drill rigs, or overhead hazards), work boots (protective composite or steel-toe boots when working around heavy equipment), high-visibility vest or outer garment, safety glasses with side shields, nitrile gloves (or other hand protection appropriate for the type of physical or chemical hazards present), hearing protection (earplugs or earmuffs) as needed. Use chemical goggles if there is a chemical splash hazard.		

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Job Hazard Analysis

Task/Operation: Task-Specific Hazards	
Project Number: M0592.06.001	**Location/Site Where Task/Operation Performed:** Tiki Car Wash Site
Date Prepared: 02/29/2024	**Employee Preparing this Job Hazard Analysis (JHA):** Justin Hansen
Date Reviewed: 03/05/2024	**Employee Reviewing and Certifying this JHA:** Kieron Crossley

Job/Task Description

This JHA is specific to certain elements of fieldwork that have unique hazards and require specific safe-work practices to mitigate those hazards. See the separate General Fieldwork Hazards JHA for hazards and safe-work practices that are common to most types of fieldwork.

Sampling Contaminated Solid and Liquid Media

Hazard/Risk	Source of Hazard/Risk	Hazard/Risk Mitigation
Exposure to chemicals or hazardous substances (e.g., asbestos) via direct contact and inhalation	Chemicals or hazardous materials in soil, sediment, surface water, groundwater, NAPL, stormwater, injection fluids, and building materials.	See the chemical hazards summary table for applicable chemical hazards.
		Consult the HASP to identify the required PPE for preventing direct contact with contaminated media. Chemical-resistant Tyvek (yellow/coated) is strongly recommended for projects that include potential exposure to NAPL.
		Consult the HASP to identify required air monitoring equipment, respiratory protection, and action for preventing inhalation of contaminated dust and vapors.
		When around monitoring wells, avoid working with your breathing zone directly above the opening of the well casing. When possible, work upwind of the well casing. Keep your face away from the monument when removing the well cap.
		Ensure field staff have up-to-date AHERA certifications for asbestos sampling.

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Task/Operation: Task-Specific Hazards		
		Use plastic garbage bags or plastic sheeting to cover the work area. It is preferable to roll/berm the edges to catch any drips/spills. If it is raining, work under a rain canopy.
Sampling and/or Monitoring Vapors		
Exposure to chemicals via inhalation	Chemicals in indoor air, outdoor air, soil vapors, monitoring wells, borings, excavations, and manholes.	See the chemical hazards summary table for applicable chemical hazards.
		Consult the HASP to identify required PPE for preventing inhalation of contaminated or hazardous vapors.
		The HASP identifies required air monitoring equipment, monitoring locations, respiratory protection, and action levels for preventing inhalation of vapors.
		If action levels are exceeded, cease activities, notify other site workers and subcontractors, move away from or upwind of the point of exceedance, and continue to monitor your breathing zone. Contact the health and safety coordinator and the project manager as soon as possible.
Explosion	Potential presence of flammable/explosive vapors at concentrations above 10 percent of the lower explosive limit.	Use a calibrated four-gas meter and specify action levels as indicated in the HASP.
		Determine monitoring locations (e.g., work area, inside monitoring well casing or drill stem, container, excavation, manhole).
		If lower explosive limit readings are at or above 10 percent, cease activities; eliminate or turn off sources of ignition, including electronic devices; notify other site workers and subcontractors; evacuate the area; and continue to monitor your breathing zone. Contact the health and safety coordinator and the project manager as soon as possible.

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Task/Operation: Task-Specific Hazards		
Inhalation, explosion, asphyxiation	Inadvertent release of calibration gas (four-gas mixture of carbon dioxide, hydrogen sulfide, methane, and oxygen) into work area. Exposure to helium gas when vapor sampling.	Calibrate combustible-gas meter in a well-ventilated area (e.g., not in a vehicle with doors closed).
		After calibration of equipment, remove regulator from compressed-gas cylinders.
		Properly secure compressed-gas cylinders during transport and use.
Working around Manholes		
Bodily harm or death	Confined-space entry.	Manholes are considered confined spaces. Contact the health and safety coordinator and the project manager if work in manholes will be necessary.
	Falling into a manhole.	Ensure the HASP or Safe Work Plan identifies project-specific procedures and engineering controls to mitigate risk of falling.
		Place a manhole guard around the manhole before opening it. Close the manhole lid as much as possible during sampling (i.e., leave only a gap for sample tubing and equipment). Close the lid immediately after sampling and before beginning other activities that require work around but not in the manhole (taking notes, labeling containers, loading equipment into field vehicle, etc.).
	Exposure to chemicals in stormwater or air.	See the “Sampling Contaminated Solid and Liquid Media” and “Sampling and/or Monitoring Vapors” task-specific hazards above.
Hand and foot injury	Being crushed by manhole lid.	Use a manhole hook to open manholes. Drag the lid horizontally out of the manhole and onto the adjacent ground. Never prop up the lid on the manhole rim. Wear protective composite or steel-toed boots.
Back injury	Strains from lifting manhole lid.	Keep your back and arms straight; use your legs to lift.

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Task/Operation: Task-Specific Hazards
Additional Control Measures and Guidance
Engineering Controls: No engineering controls specified. The need for engineering controls should be discussed with the project manager, health and safety coordinator, and subcontractors, and identified in the HASP or Safe Work Plan.
General Safe-Work Practices and Guidance: • See the General Fieldwork Hazards JHA for safe-work practices and guidance common to most types of fieldwork. • If additional safe-work practices are needed to address unique, task-specific hazards, these should be specified in the HASP or Safe Work Plan.

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Appendix B

Chemicals of Potential Concern

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Table
Chemical Hazards

Analyte	Soil Range (mg/kg)		Groundwater Range (ppb)		OSHA PEL (TWA)	ACGIH TLV (TWA)	NIOSH IDLH[1]	LEL (%)	IP (eV)	Other Hazard
	Low	High	Low	High						
TPH										
Gasoline-range organics	0.203	4,730	19	227,000	NA	300 ppm	NA	1.4	NA	C, E, F, P
Diesel-range organics	4	2,000	52.8	149,000	NA	100 mg/m^3	NA	NA	NA	E, F, P
Residual-range organics	10	2,000	101	10,900	NA	NA	NA	NA	NA	E, F, P
Additional										
Benzene	0.0004	118.4	0.3	25,700	1 ppm	5 ppm	500 ppm	1.2	9.24	F, C, P, R
Ethylbenzene	0.0003	58.2	0.2	3,690	100 ppm	125 ppm	800 ppm	0.8	8.76	F, P
Toluene	0.0004	438.4	0.2	36,400	100 ppm	150 ppm	500 ppm	1.1	8.82	E, F, P, R
Xylenes	0.001	327	0.4	22,600	100 ppm	150 ppm	900 ppm	0.9	8.44–8.56	F, P

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Notes

ACGIH = American Conference of Governmental Industrial Hygienists.
C = carcinogen.
cc = cubic centimeter.
CE = ceiling concentration.
E = explosive.
F = flammable.
IDLH = immediately dangerous to life and health.
IP (eV) = ionization potential.
LEL = lower explosive limit.
mg/kg = milligrams per kilogram.
mg/m^3 = milligrams per cubic meter.
NA = not available.
NE = not established.
NIOSH = National Institute for Occupational Safety and Health.
OSHA = Occupational Safety and Health Administration.
P = poison.
PAH = polycyclic aromatic hydrocarbon.
PEL = permissible exposure level.
ppb = parts per billion.
ppm = parts per million.
R = reactive.
SC = suspected carcinogen.
TLV = threshold limit value.
TPH = total petroleum hydrocarbons.
TWA = time-weighted average.
VOC = volatile organic compound.

Reference

(1)CDC. 2019. "Immediately Dangerous to Life or Health (IDLH) Values." Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH). October 8. Accessed September 13, 2022. http://www.cdc.gov/niosh/idlh/intridl4.html.

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Appendix C

Air Monitoring Action Levels

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Air Monitoring Procedures and Toxicity Action Levels

Instrument	Action Level	Initial Action	Follow-Up Action
PID[a]	Detection of 1 ppm (above ambient) or greater in breathing zone sustained for two minutes.	Dräger tube test for benzene. If 1 ppm benzene detected with Dräger tube, upgrade to level C.	Ventilate area; always work upwind.
PID[a]	Detection of 10 ppm (above ambient) in breathing zone and determined not to be benzene.	Upgrade to Level C and continue to monitor breathing zone with Dräger tube. If 50 ppm, leave exclusion zone. Return only if levels decrease to below 50 ppm.	Ventilate area; always work upwind.
Dust meter	0.05 milligrams per cubic meter of air.	Dust suppression, e.g., misting.	Adjust operations.

Notes
PID = photoionization detector.
ppm = parts per million.
[a]Some PIDs do not work in high (e.g., greater than 90%) humidity or rainy weather. Under these atmospheric conditions, only PIDs certified for use in high humidity should be used.

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Appendix D

Incident Report Form

Health and Safety Incident Report

This report must be completed in full and submitted within 24 hours to the MFA health and safety coordinator.

Project Name:	Tiki Car Wash
Project Number:	M0592.06.001
Date and Time of Incident:	
Location:	

Type of Incident (check all applicable items):

- ☐ Illness
- ☐ Health and safety infraction
- ☐ Vehicular accident
- ☐ Injury
- ☐ Fire, explosion, flash
- ☐ Electric shock
- ☐ Property damage or theft
- ☐ Chemical exposure
- ☐ Near miss
- ☐ Spill
- ☐ Other (describe):

Description of Incident

Describe what happened and the possible cause of the incident. If reporting a spill, include the quantity or estimated quantity. Identify individual(s) involved, witnesses, and their affiliations. Describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.

Incident Reporter:

Name ____________ Signature ____________ Date ____________

Health and Safety Coordinator:

Name ____________ Signature ____________ Date ____________

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Appendix E

Tailgate Safety Meeting Checklist

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Tailgate Safety Meeting Checklist

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Client Name:	Washington State Department of Ecology
Project No.:	M0592.06.001
Communicated By:	
Date:	

Yes	NA	Information Reviewed
☐	☐	Emergency Response Procedures and Site Evacuation Routes
☐	☐	Route to Hospital
☐	☐	HASP Review and Location
☐	☐	Key Project Personnel
☐	☐	Emergency Phone Numbers
☐	☐	Stop Work Authority
☐	☐	General Site Description/History and Chemical Hazards
☐	☐	For Active Sites—Site Activities and Vehicular/Equipment Traffic
☐	☐	Site-Specific Physical Hazards
☐	☐	Required Personal Protective Equipment
☐	☐	Available Safety Equipment and Location
☐	☐	Daily Scope of Work (reference JHAs as applicable)
☐	☐	Decontamination Procedures
☐	☐	Identify Work Zones, Exclusion Zones, and Decontamination Zones
☐	☐	Hazardous Atmospheres
☐	☐	Air Monitoring Equipment and Procedures
☐	☐	Identify Potential Site-Specific Slip, Trip, and Fall Hazards
☐	☐	Dust and Vapor Control
☐	☐	Confined Space(s)
☐	☐	Open Pits and Excavation
☐	☐	Extreme Temperatures
☐	☐	Incident Reporting
☐	☐	Other: ____

Additional Health and Safety Practices and Considerations

Attendees

Name	Signature	Company
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		

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Appendix F

HASP Audit Checklist

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HASP Audit Checklist

Project Name: Tiki Car Wash	
Project No.: M0592.06.001	
Project Location: 11909 NE 8th Street, Bellevue, WA	
Audit Date / Time:	
Person / Persons Performing Audit:	
MFA Personnel Interviewed or Conducting Fieldwork:	

	Status			Comment	Recommendation	Assigned to:	Scheduled Completion Date:	Actions Completed:	Person Who Completed Actions:	Date Completed:	Current Status / Notes:
	Yes	No	N/A								
Audit Checklist Item											
1. Is there a written HASP for this project? If so, what is the revision date?											
2. Is the HASP available to project personnel?											
3. Does the HASP appear accurate and complete? For example, are the directions to the hospital and the emergency contact numbers accurate? Are the site contaminants listed?											
4. Do the JHAs appear accurate and complete? For example, do there appear to be risks addressed for all of the applicable activities?											
5. Do you observe violations of the HASP requirements?											
6. If applicable, are employees adhering to the respirator program (see SOP 03, Respiratory Protection)?											
Interview Questions											
7. Where do you keep the HASP for this project?											
8. Have you reviewed the HASP for this project? If so, what was your review process?											
9. Can you tell me how you conduct your site activities? Note to auditor—pick a JHA activity and identify major discrepancies between the answer and the JHA, if any.											
10. Do you have any health and safety questions or concerns? For example, have you observed things on this project that you thought were unsafe? Note to auditor—make sure we come up with a plan to promptly address any listed concerns.											

Signature of Person / Persons Conducting Audit

Name	Signature	Date

Signature of Project Manager and Principal in Charge Acknowledging Review of Completed HASP Audit Checklist

Name	Signature	Date

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Appendix C

Standard Operating Procedures

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Scope and Application

This standard operating procedure (SOP) describes the use of a push probe (i.e., Geoprobe™) to observe subsurface conditions and collect samples of various environmental media (e.g., soil, sediment, groundwater, soil vapor) for laboratory analysis. Push-probe drilling is generally not suitable for soils with gravel/rock clast larger than about 4 inches in diameter. If gravelly/rocky soils are expected at the project site, consider use of the sonic drilling method described in SOP 8.

Push-probe drilling can be used for a variety of purposes, including:

- Retrieving cores to document subsurface soil or sediment conditions and to obtain samples for physical and/or chemical evaluation
- Sampling soil vapors, using temporary well points
- Collecting reconnaissance groundwater samples from temporary well screens
- Installing permanent monitoring wells

Equipment and Materials Required

The following equipment and materials are necessary for this procedure:

- Push-probe drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the drilling work.
- Sampling equipment appropriate for the media to be sampled (e.g., water level meter, pumps, hand tools, and pump tubing).
- Laboratory-supplied sample containers.
- Traffic cones, measuring tape, buckets.
- Department of Transportation (DOT)-approved containers (e.g., 55-gallon drum) for storing excess soil and decontamination water; the drums are typically provided by the drilling subcontractor.
- Boring log form and notebook.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Personal protective equipment (as required by the project health and safety plan).

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for push-probe drilling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Utility Locate:

- Before beginning the fieldwork, assess the proposed drilling location(s) for the presence of overhead and underground utilities, and adjust the locations, as needed, to avoid identified utilities.
- See SOP 18 for the utility locating procedures.

Push-Probe Drilling Process:

- The push-probe drilling rig is equipped with a soil sampling device that retrieves a continuous soil core. A combination of static force and percussion is used to drive the soil sampler into unconsolidated geologic material. A plastic liner placed inside the sampler contains the soil core and permits its removal from the sampler for examination. The sampler is driven into the subsurface, typically in 4- or 5-foot intervals, depending on the length of the sampling device. When each interval depth is reached, the soil sampler is removed from the ground, and the liner is removed to facilitate soil observation and sampling.
- This process is repeated for each soil sample interval until the targeted boring depth is reached.
- Ensure that the drilling subcontractor decontaminates all subsurface equipment before and after each boring. Document the decontamination procedures in the field notebook. Store decontamination water in DOT-approved containers for later off-site disposal.

Logging and Soil Sampling Process:

- Remove the soil core from the sampler for field screening, description, and sampling.
- Describe the lithology in accordance with SOP 2.
- Confirm the required depth interval(s) for soil sample collection and field screening with the MFA project manager, or conduct the work in accordance with the SAP. The sample interval may require adjustment based on core recovery, soil stratigraphy and characteristics, and evidence of contamination. Confirm any adjustments to the sample intervals with the project manager.
- If the project requires field screening for organic vapor, conduct it in accordance with SOP 3.
- If the project requires laboratory analyses for gasoline-range petroleum hydrocarbons or volatile organic compounds, conduct the sampling in accordance with SOP 5.
- Contain all soil core remaining after sample collection in DOT-approved containers for later off-site disposal. See SOP 1 for drum storage, labeling, and documentation procedures.

Reconnaissance Groundwater Sampling Process:

- Typically, reconnaissance groundwater samples are collected at the first occurrence of groundwater in a boring. Confirm the required depth and procedures for groundwater sample collection with the MFA project manager, or conduct the work in accordance with the SAP. If the project requires use of the low-flow sampling method, refer to SOP 9 for the low-flow sampling procedures.
- Reconnaissance groundwater samples are collected using a decontaminated stainless steel or disposable, temporary polyvinyl chloride well screen placed in the boring. If the soils in the boring are fine-grained and may cause excessive turbidity in groundwater, consider using a filter pack

around the screen to reduce turbidity. Alternatively, purging the well screen of groundwater prior to sample collection may also reduce the turbidity. See SOP 9 for purging procedures.

- Purging and sampling will be conducted using a peristaltic pump unless otherwise specified in the SAP. New tubing will be used for each boring. Field parameters (e.g., temperature, conductivity, and pH) will be recorded in accordance with SOP 9 during purging and sampling.

Monitoring Well Installation:

- If the project requires installation of a monitoring well in the boring, refer to SOP 11 for the well installation procedures. Confirm the procedures with the MFA project manager.

Borehole Abandonment Process:

- Abandon each borehole in accordance with local and state regulations/procedures. The abandonment will be performed by the drilling subcontractor.
- The abandonment procedure typically consists of backfilling the boring with granular bentonite and hydrating the bentonite with potable water.
- If the boring was advanced through concrete or asphalt, backfill the boring to about 6 inches below grade to allow for placement of asphalt or concrete in the remaining 6 inches to match the surface conditions.

Standard Operating Procedure

Well Installation

SOP Number: 11
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of conventional machine slotted polyvinyl chloride (PVC) or prepacked well screens to install monitoring wells. The screen permits water to enter the well from the saturated aquifer, prevents soil from entering the well, and serves structurally to support the aquifer material. The slot size of the well screen is typically based on selection of the filter pack material. Monitoring wells must be designed and installed to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data that are representative of conditions in the aquifer can be obtained.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the well installations.
- Personal protective equipment (as specified in the health and safety plan).
- Water-level meter.
- Monitoring well construction log and notebook.

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well installation, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The drilling contractor will be responsible for conforming to all applicable local and state regulations for well construction.

The proposed well construction should be provided to the driller in advance so that (1) the driller can confirm that the proposed construction is consistent with state regulations, and (2) the driller comes to the project site with sufficient materials for the well construction.

General Procedure:

Drilling and Well Construction. This SOP assumes that a boring has already been drilled and is ready for well installation. See SOPs 7 and 8 for drilling procedures. If the boring was advanced to a depth below the targeted well screen interval, backfill the boring with cement-bentonite slurry or bentonite chips so that the boring bottom is at a depth about 2 feet below the lower screen interval depth. Well construction will include flush-threaded Schedule 40 PVC casing and conventional PVC well screen or stainless steel mesh prepacked well screen, placed at the bottom of the boring.

Filter Pack. Clean silica sand pack will be placed between the boring wall and the PVC screen/riser (i.e., the annulus) from the bottom of the well to approximately 1 to 2 feet above the screened interval. The filter pack should have greater hydraulic conductivity than the surrounding formation so that water can be drawn into the well. Before installation of the seal, the well may be surged using a surge block or similar technique to consolidate the filter pack and eliminate voids. Measure and document the depth to the sand filter pack before setting the seal.

Seal. A bentonite seal 1 to 2 feet thick will be placed above the sand. The bentonite will be hydrated and allowed to sit for a minimum of 30 minutes for proper hydration and sealing. Measure and document the depth to the top of the seal before placing grout.

Grout. Cement-bentonite slurry or bentonite chips (hydrated after installation) will be placed above the bentonite seal following proper hydration of the seal. The cement-bentonite slurry will be placed to within 1 foot of the ground surface.

Surface Seal and Monument. A concrete surface seal will secure a flush-mounted, traffic-rated monument, or a bollard-protected stickup monument. Flush-mounted surface monuments will be completed slightly above grade to prevent ponding of water on the monument lid. A locking cap and lock will secure the top of the well casing in a surface monument. Tamper-resistant bolts (e.g., pentagonal) may be used to secure the lid of a flush-mounted monument. The lid of a stickup monument should be secured with a lock.

The well constructor shall permanently affix a well identification label to the wellhead. In addition, the well number should be marked on the well (e.g., punched into monument ring, written on the well casing/cap with permanent marker). A v-notch is typically cut into the north side of the PVC riser for use as a survey point and for water level measurements.

Documentation. The field representative will produce the following documentation during the well installation:

- Length of well components, including blank casing, well screen, and sump (if included).
- Preinstallation boring depth below ground surface (bgs).
- Depth bgs to top and bottom of screen.
- Depth bgs to top of filter pack and seal.
- Types, brands, and amounts of materials (sand, bentonite, grout) used.
- Decontamination procedures followed, if needed (see SOP 1 for equipment decontamination procedures).
- If potable water was placed into the boring or well during installation, document the total volume of water placed; this information will be needed for well development (see SOP 12).
- Any deviation from standard procedures or any problems encountered during the installation activities.

Scope and Application

This standard operating procedure (SOP) describes the methods for developing new monitoring well installations. New wells should be developed no sooner than a period of 24 hours after the grout seal has been placed; longer periods of 48 to 72 hours may be necessary, depending on applicable local or state regulations. The objective of well development is to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data representative of conditions in the aquifer can be obtained from the well. This SOP is also applicable to the redevelopment of existing monitoring wells.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Well purge equipment (e.g., Waterra Pump, bailer, and peristaltic pump)
- Water-quality meter (e.g., Oakton and turbidity meter)
- Water-level meter
- Well construction logs for all wells to be developed
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- Five-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Well development log and notebook

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well development, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Owing to the potential for hazardous substances in groundwater, well development requires consideration of the work area and equipment setup, health and safety procedures, use of appropriate personal protective equipment, procedures for equipment decontamination, and disposal of expendable development supplies. Confirm all procedures in advance with the MFA project manager and the MFA health and safety professional.

1. Cut a segment of plastic sheeting to an approximate 10-foot-by-10-foot dimension. Cut a hole in the center of the sheeting and place the sheeting over the well so that the well monument can be accessed through the hole and the sheeting lies flat on the ground. The sheeting defines the

work area for well development. All equipment that may come in contact with groundwater should remain in this work area until it has been decontaminated or containerized for disposal.

2. Measure the depth to water and the total depth of the well before development. Confirm that the entire screen length is below the water level; if it is not, contact the MFA project manager to discuss potential modification of the well-development procedures.
3. Subtract the depth to water from the total well depth to determine the height of the column of groundwater present in the well casing. Multiply the height by the gallon-per-foot value in the table below, corresponding to the diameter of the well being developed, to calculate the volume of water in the well casing. Record the readings and casing volume on the well development log.

Casing Diameter (inches)	Volume (gallons per foot)
1	0.04
2	0.17
3	0.37
4	0.65
5	1.02
6	1.46

4. Surge groundwater through the entire well screen interval with a weighted bailer or Waterra pump with tubing equipped with surge block. Begin surging at the top of the well screen by vigorously moving the bailer or surge block in approximately 1-foot vertical increments. Gradually increase the surge depth until the entre screen interval has been surged. The surge time for each 1-foot increment will depend on type of drilling, lithology, and well completion details. Generally, there should be at least one minute of surging across each increment.
5. After surging the well screen, purge groundwater from the well into buckets at a higher purging rate than the expected purging rate of groundwater sampling. Ideally, purging will be completed using a method that does not continue to surge the well (i.e., peristaltic or submersible pump). If a Waterra pump is used, remove the surge block from the tubing and set the tubing intake above the well screen for purging. Measure the water level during the purging process and adjust the pumping rate to maintain a water level above the top of the screen interval if possible. Document the volume of water removed.
6. When the volume of water purged equals the casing volume, use the water-quality meter to measure the temperature, pH, conductivity, and turbidity of the purge water. Repeat the measurements for each casing volume removed. Note that a YSI water-quality meter or similar meters should not be used in highly turbid water, per the manufacturer's recommendation.
7. After the removal of five casing volumes, review the stability of the water quality meter readings. The well will be considered developed if the water quality readings have stabilized for three consecutive casing volumes for the following:

pH (± 0.1 unit),
Specific Conductance (3%),
Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),

8. If the water-quality readings stabilize before a total of ten casing volumes are removed, development is complete. If the water-quality readings do not stabilize, well development will be consider complete after ten casing volumes have been removed.
9. If the water level cannot be maintained above the well screen or the well pumps dry during purging, contact the MFA project manager for further instructions.
10. If potable water was placed into the boring during drilling or into the well during installation, remove that volume of water and then begin purging as described in step 5.