

DATA GAPS WORK PLAN

HERS Industrial Park Site

Prepared for: Russell Road Industrial Park, LLC

Project No. 140252 • March 19, 2021 Draft



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Acronyms

Aspect	Aspect Consulting, LLC
Ecology	Washington State Department of Ecology
FFS	Focused Feasibility Study
NAVD88	North American Vertical Datum of 1988
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
PID	photoionization detector
RI/FS	Remedial Investigation/Feasibility Study
RRIP	Russell Road Industrial Park, LLC
SAP	Sampling and Analysis Plan
TPH	total petroleum hydrocarbons
VCP	Voluntary Cleanup Program
VOC	volatile organic compounds
Work Plan	Data Gaps Work Plan

1 Introduction

This Data Gaps Work Plan (Work Plan) has been prepared by Aspect Consulting, LLC (Aspect) on behalf of Russell Road Industrial Park, LLC (RRIP). RRIP is conducting a cleanup for the HERS Industrial Park Site (the Site), located in Mukilteo, Washington, under the Voluntary Cleanup Program (VCP) with the Washington State Department of Ecology (Ecology). A Remedial Investigation/Feasibility Study (RI/FS; Aspect, 2015) was submitted in November 2015, and a Focused Feasibility Study (FFS; Aspect, 2020) was submitted to Ecology on March 10, 2020. RRIP's goals are as follows:

- Define the Site such that any parcels that are not affected by Site releases are not part of the Site.
- Identify a preferred remedy for the Site for which Ecology can provide a 'No Further Action Likely' opinion letter.
- Implement the preferred remedy and ultimately receive a "No Further Action" letter from Ecology.

Based on Ecology's review of the FFS and subsequent discussions, Ecology has identified additional information needed before providing an opinion on the FFS and the selected remedy. To address these data needs, the following activities are planned:

- Installing a new monitoring well to define the northwestern extent of the chlorinated solvent plume on the 4440 Chenault Beach Road parcel.
- Additional groundwater sampling and surveying of well casings to the North American Vertical Datum of 1988 (NAVD88) using a licensed surveyor, to provide a current understanding of groundwater conditions.
- Collecting soil samples in the solvent source area to aid the conceptual design of potential remedies.
- Revising the FFS report with the new data and to update the alternatives analysis, including a new thermal treatment option and a graphical presentation of the disproportionate cost analysis.

This Work Plan is organized as follows:

- **Section 1** describes the purpose and organization of the Work Plan.
- **Section 2** identifies the Site data gaps and describes the data collection activities proposed to fill in these gaps.
- **Section 3** presents the schedule and reporting of data gaps activities.
- **Section 4** provides references used in the preparation of this report.

Proposed explorations are shown on Figure 1. A sampling and analysis plan (SAP) is provided in Appendix A. Figures from the RI/FS showing proposed soil borings relative to historical data are provided in Appendix B.

2 Data Gaps and Data Collection Activities

General data needs were summarized in Section 1. This section describes the specific data needed to revise the FFS and provides a plan for collecting that data.

2.1 Data Gaps

Additional groundwater data is needed to delineate the extent of the solvent plume and additional soil data is needed to delineate the extent of contamination in the source area that would be targeted for treatment.

Specific groundwater data to be collected include the following:

- Shallow groundwater data to bound the extent of the solvent plume to the northwest. This will be collected by installing and sampling a new well (MW-23) as shown on Figure 1.
- Groundwater at existing shallow wells that were not sampled in 2019 (prior used as injection points) will be sampled to further understand current groundwater conditions in the source area.
- Deep well MW-16D will be resampled to confirm vertical delineation in the source area.
- Shallow well MW-19 will be resampled to support western boundary delineation of the solvent plume.
- Groundwater elevations at all Site wells will be measured and a licensed surveyor will be used to survey well top-of-casing elevations into the NAVD88 datum, to verify groundwater flow direction.

All wells will be sampled for volatile organic compounds (VOCs), diesel- and oil-range total petroleum hydrocarbons (TPH), and arsenic (total and dissolved).

Specific soil data include the following:

- VOC concentrations in soil within the area of the groundwater plume, to more closely define the extent of soil that would be removed or treated under FFS alternatives. Proposed soil borings are shown on Figure 1.

The highest concentrations are likely within the perched-water zone above the lithological transition from weathered to non-weathered glacial till, 10 to 15 feet deep. Soil samples from above the water table and within the perched-water zone will be analyzed to determine the extent of ‘hot-spot’ soil contamination.

2.2 Data Collection Activities

Data will be collected in the following sequence:

1. Install and develop new monitoring well MW-23.

2. Advance six new soil borings in the source area to just below the glacial till contact, approximately 15 to 20 feet deep (or refusal, if shallower). Soil sampling will be conducted as follows:
 - a. Continuous soil samples will be collected using a direct-push drill rig, logged, and field screened for contamination with a photoionization detector (PID).
 - b. Up to 14 samples will be submitted for analysis for VOCs. Samples submitted for analysis will include the zones below and above the water table exhibiting the highest PID readings (if detected), and at the lithological contact if no PID readings are detected. Up to two samples at borings with observable contamination will be collected from the bottom of boring within the till unit below observable contamination to provide vertical delineation of contamination.
3. Survey new and existing well casing elevations to the nearest 0.01-foot NAVD88, using a Washington State licensed professional land surveyor.
4. Measure water levels at all Site wells at the same time. Well caps will be removed for a minimum of 15 minutes and water level will be confirmed to stabilize to ensure water elevations have equilibrated to atmospheric pressure.
5. Collect samples from 12 wells (MW-1, MW-7, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16D, MW-19, and MW-23). Sampling will be conducted a minimum of 1 week after development of new well MW-23. Samples will be submitted for analysis for:
 - a. VOCs, by USEPA Method 8260D.
 - b. Diesel- and oil-range TPH, by NWTPH-Dx.
 - c. Total and dissolved arsenic, by USEPA Method 6020B. Samples for dissolved arsenic will be field-filtered with a 0.45-micron filter.

Proposed exploration locations are shown on Figure 1. A detailed SAP, including sampling techniques and QA/QC procedures to be employed in the work, is provided in Appendix A. Proposed soil boring locations are shown relative to historical soil and groundwater data in the source area (as mapped in the RI/FS) in Appendix B.

3 Schedule and Reporting

Field activities will be coordinated with the property owner and tenants and implemented as soon as the Work Plan is approved. Drilling would likely be performed within 2 weeks of approval, barring any access issues.

Data collected during the data gaps investigation will be summarized on tables and figures within approximately 2 weeks of data receipt and shared with Ecology to determine if data gaps have been adequately filled. If additional data is required, an addendum to this Work Plan will be prepared. If the collected data are sufficient, the FFS will be revised and resubmitted to Ecology for opinion. The revised FFS will include the newly collected data, inclusion of a thermal remediation alternative for comparison, graphical depiction of the disproportionate cost analysis, and any adjustments to previously developed remedial alternatives that are warranted based on the newly collected data.

4 References

Aspect Consulting, LLC (Aspect), 2015, Remedial Investigation/Feasibility Study, HERS Industrial Park, Mukilteo, Washington. November 2015.

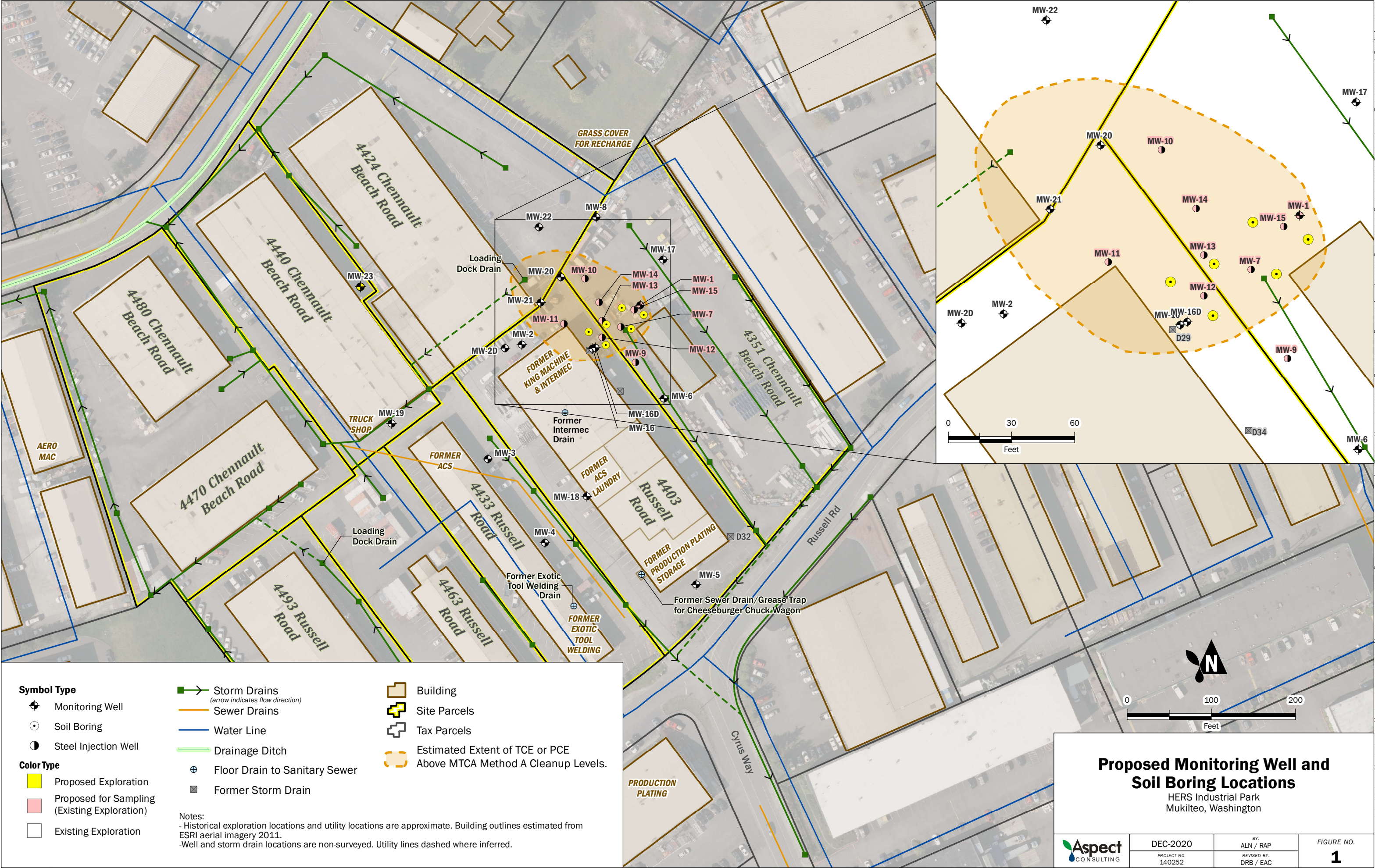
Aspect Consulting, LLC (Aspect), 2020, Focused Feasibility Study, HERS Industrial Park, Mukilteo, Washington. March 10, 2020.

5 Limitations

Work for this project was performed for Russell Road Industrial Park LLC (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

FIGURE



APPENDIX A

Sampling and Analysis Plan

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A1 Introduction

This Sampling and Analysis Plan (SAP) has been prepared by Aspect Consulting, LLC (Aspect) for the HERS Industrial Park Site (Site) located in Mukilteo, Washington. This SAP is Appendix A to the Data Gaps Work Plan (Work Plan).

The purpose of this SAP is to ensure that field sample collection, handling, and laboratory analysis conducted during the data gaps work will generate data to meet project-specific data quality objectives (DQOs) in accordance with the Model Toxics Control Act (MTCA) requirements (Washington Administrative Code [WAC] 173-340-350).

This SAP comprises two major components: a Field Sampling Plan (FSP) defining field protocols and a Quality Assurance Project Plan (QAPP) defining analytical protocols. It is the responsibility of Aspect personnel and subcontracted analytical laboratory personnel performing the data gaps sampling and analysis activities to adhere to the requirements of the FSP and QAPP.

The FSP and QAPP are presented below in Section A2 and Section A3, respectively.

A2 Field Sampling Plan

Field investigation and sampling procedures to be followed during the data gaps work are described in the following sections. Specific sample locations are shown on Figure 1 of the Work Plan. Explorations will be located in the field by measuring off of existing monitoring wells and site features. Exploration locations may be adjusted in the field based on the presence of utilities, structures, or other obstructions that may be encountered.

A2.1 Soil Borings and Soil Sampling

Soil sampling will be conducted to address existing data gaps related to the nature and extent of soil contamination at the Site. The rationale for soil sample locations, depths, and chemical analyses are provided in the Work Plan. The following subsections detail the procedures for soil sample collection, handling, identification, and sample quality assurance/quality control (QA/QC).

Aspect will subcontract with a Washington-licensed resource protection well driller to complete soil borings in accordance with requirements of Chapter 173-160 WAC. Soil borings will be advanced using direct push methods (e.g., Geoprobe).

Soil borings will be sampled on a continuous basis. Each boring will be advanced to collect samples as described below and in Table A-1, or as determined by field observations. The boring locations are shown on Figure 1 of the Work Plan, and the

borings will be advanced into the dense, unweathered glacial till unit approximately 15 feet deep. Borings will be labeled sequentially using the 'AB-' prefix, starting with AB-5.

The direct-push drilling method provides continuous cores of soil, depending on soil recovery, returned within disposable 1.5-inch-diameter plastic liners (4-foot or 5-foot lengths). The liners are sliced longitudinally and opened to access the soil core.

A2.1.1 Soil Sample Collection and Handling Procedures

An Aspect geologist will oversee the drilling activities and preparation of a geologic log for each of the completed explorations. The field representative will visually classify the soils in accordance with ASTM International (ASTM) Method D2488, *Field Screen for Volatile Contamination using a Photoionization Detector (PID)*, and record soil descriptions, field screening results, and other relevant details (e.g., staining, debris, odors, etc.) on the boring log form. If samples are collected for chemical analysis, the sample ID and depth will also be recorded on the log.

Soil samples will be collected directly from the sampler using U.S. Environmental Protection Agency (USEPA) Method 5035A techniques and will be placed into certified-clean jars supplied by the analytical laboratory.

Each soil boring will be decommissioned with hydrated granular bentonite in accordance with requirements of Chapter 173-160 WAC.

A2.1.2 Soil Sample Identification

Each soil sample collected for chemical analysis will be assigned a unique sample identification number including the boring number (without a hyphen) and the depth from which the sample was collected. For example, the soil sample collected from boring AB-5 at a depth of 7 feet bgs would be identified as AB5-7.

A2.2 Monitoring Well Installation and Development

A2.2.1 Monitoring Well Installation

Monitoring wells will be constructed by a Washington state-licensed, resource protection well driller, in accordance with Chapter 173-160 WAC. A qualified individual with field experience will oversee and document installation of each monitoring well. Documentation will completion of an As-Built Well Completion Diagram and construction details.

The new monitoring well will be constructed with 2-inch-diameter threaded Schedule 40 PVC slotted screen and blank casing. If field conditions prevent driving larger-diameter casing to install the 2-inch casing, 3/4-inch well screens may be used. Well screens will be 10-foot-long 0.010-inch (10 slot) slotted screen with an artificial filter pack consisting of 20/40 silica sand.

An annular seal consisting of bentonite chips will be placed above the filter pack. A concrete surface seal will be set at grade for each new monitoring well. The finished monitoring wells will be protected with steel flush-mount monument (truck rated), embedded in the concrete surface seal. The top of the monitoring well casing will be marked (through either a notch or other permanent mark) to indicate the location from

which depth-to-water measurements will be collected and for surveying top of casing elevation.

A2.2.2 Monitoring Well Development

Following installation, the new monitoring well will be developed to remove fine-grained material from inside the well casing and filter pack to the extent practical, and to improve hydraulic communication between the well screen and the surrounding water-bearing formation. Well development will be performed by means of a surge block and a 12-volt submersible pump. During development, the surge block will be gently surged through the entire length of the well screen. Each well will be developed until visual turbidity is reduced to minimal levels (below 10 nephelometric turbidity units [NTU] if practical) or until a maximum of 15 casing volumes of water has been removed.

A2.3 Groundwater Sampling

A2.3.1 Groundwater Level Monitoring and Well Inspection

Depth-to-groundwater measurements will be conducted in the wells using an electric well sounder, graduated to 0.01 foot. Water level measurements will be completed before water quality sampling. All water levels will be recorded in the field notes.

A2.3.2 Groundwater Sample Collection

Groundwater samples will be collected from monitoring wells MW-1, MW-7, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16D, MW-19, and MW-23. Groundwater samples will be collected using low-flow techniques with peristaltic pumps and polyethylene tubing. Sampling will be conducted at least one week after monitoring well development.

Prior to sample collection, the static water level in the well will be measured. The well will then be purged at flow rates less than 0.5 liter per minute. The following field parameters will be monitored using a YSI meter and flow-through cell:

- Temperature
- pH
- Electrical conductance
- Dissolved oxygen (DO)
- Oxidation-reduction potential (Eh)

These field parameters will be recorded on Groundwater Sampling Record form at 5-minute intervals throughout well purging until they stabilize. Stabilization is defined as three successive readings where the parameter values vary by less than 10 percent (or 0.5 mg/L dissolved oxygen if the readings are below 1 mg/L). However, no more than three well casing volumes will be purged prior to groundwater sample collection.

Once purging is complete, the groundwater samples will be collected using the same low flow rate. Samples will be collected by directly filling laboratory supplied pre-cleaned containers. Samples for dissolved metals analyses will be filtered in the field using a disposable in-line 0.45-micron filter (changed for each well).

A2.3.3 Groundwater Sample Identification

Each groundwater sample will be assigned a unique sample identification number that includes the well number (no hyphen) and the 8-digit date on which the sample was collected. For example, a groundwater sample collected from well MW-1 on April 1, 2021, would be identified as B-1-040121.

A2.4 Sample Custody and Field Documentation

A2.4.1 Sample Custody

Upon collection, samples will be placed upright in a cooler. Ice or blue ice will be placed in each cooler to meet sample preservation requirements. Inert cushioning material will be placed in the remaining space of the cooler as needed to limit movement of the sample containers. If the sample coolers are shipped (not hand carried) to the laboratory, the chain-of-custody (COC) form will be placed in a waterproof bag within the cooler for shipment.

After collection, samples will be maintained in Aspect's custody until formally transferred to the analytical laboratory courier or the shipper. For purposes of this work, custody of the samples is defined as follows:

- In plain view of the field representatives;
- Inside a cooler that is in plain view of the field representative; or
- Inside any locked space such as a cooler, locker, car, or truck to which the field representative has the only immediately available key(s).

A COC record provided by the laboratory will be initiated at the time of sampling for all samples collected. The record will be signed by the field representative and others who subsequently take custody of the sample. Couriers or other professional shipping representatives are not required to sign the COC form; however, shipping receipts will be collected and maintained in project files as a part of custody documentation. A copy of the COC form with appropriate signatures will be kept by Aspect's project manager.

Upon sample receipt, the laboratory will fill out a cooler receipt form to document sample delivery conditions. A designated sample custodian will accept custody of the shipped samples and will verify that the COC form matches the samples received. The laboratory will notify the Aspect project manager, as soon as possible, of any issues noted with the sample shipment or custody.

A2.4.2 Field Documentation

While conducting field work, the field representative will document pertinent observations and events, specific to each activity, on field forms (e.g., boring log form, as-built well completion form, well development form, groundwater sampling form, etc.) and/or in a field notebook, and, when warranted, provide photographic documentation of specific sampling efforts. Field notes will include a description of the field activity, sample descriptions, and associated details such as the date, time, and field conditions.

A2.5 Exploration Surveying

Horizontal coordinates for each sampling location will be recorded using a hand-held GPS instrument with real-time differential correction. Vertical elevations of well casings will be surveyed to an accuracy of 0.01-foot by a Professional Land Surveyor licensed in the State of Washington.

A2.6 Decontamination and Investigative-Derived Waste Management

All non-disposable sampling equipment will be decontaminated before collection of each sample. The decontamination sequence consists of a scrub with a non-phosphate (Alconox) solution, followed by a tap water (potable) rinse, and then a thorough spraying with deionized or distilled water.

Investigation-derived waste (IDW) water generated during equipment decontamination and monitoring well development and sampling will be placed in labeled Department of Transportation (DOT)-approved drums pending the analytical results to determine appropriate disposal. The drums will be temporarily consolidated on-site, profiled based on available analytical data, and disposed of appropriately at a permitted off-site disposal facility.

Soil cuttings from borings and disposable personal protective equipment (PPE) will be placed in labeled DOT-approved drums pending the analytical results to determine appropriate disposal. The drums will be temporarily consolidated on-site, profiled based on available analytical data, and disposed of appropriately at a permitted off-site disposal facility.

Documentation for off-site disposal of IDW will be maintained in the project file.

A3 Quality Assurance Project Plan

This QAPP identifies QC procedures and criteria required to ensure that data collected during the data gaps work are of known quality and acceptable to achieve project objectives. Specific protocols and criteria are also set forth in this QAPP for data quality evaluation, upon the completion of data collection, to determine the level of completeness and usability of the data. It is the responsibility of the project personnel performing or overseeing the sampling and analysis activities to adhere to the requirements of the FSP and this QAPP.

A3.1 Purpose of the QAPP

As stated in Ecology's *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies* (Ecology Publication No. 04-03-030, July 2004), specific goals of this QAPP are as follows:

- Focus project manager and project team to factors affecting data quality during the planning stage of the project.
- Facilitate communication among field, laboratory, and management staff as the project progresses.
- Document the planning, implementation, and assessment procedures for QA/QC activities for the investigation.
- Ensure that the DQOs are achieved.
- Provide a record of the project to facilitate final report preparation.

The DQOs for the project include both qualitative and quantitative objectives, which define the appropriate type of data and specify the tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the environmental assessment. To ensure that the DQOs are achieved, this QAPP details aspects of data collection including analytical methods, QA/QC procedures, and data quality reviews. This QAPP describes both quantitative and qualitative measures of data to ensure that the DQOs are achieved. DQOs dictate data collection rationale, sampling, and analysis designs that are presented in the main body of the Work Plan, along with the sample collection procedures presented in the FSP (Section A2) of this SAP.

A3.2 Project Organization and Responsibilities

The project consultant team involved with data generation includes representatives from Aspect and Friedman & Bruya (F&B). Key individuals and their roles on this project are as follows:

Project Manager – Jeremy Porter, PE, Aspect. The project manager is responsible for the successful completion of all aspects of this project, including day-to-day management, production of reports, acting as liaison with RRIP, and coordination with the project team members. The project manager is also responsible for resolution of non-conformance issues, is the lead author on project plans and reports, and provides regular, up-to-date progress reports and other requested project information to RRIP and Ecology.

Field Manager – Daniel Babcock, GIT, Aspect. The field manager is responsible for overseeing the field sampling program outlined in this plan, including collecting representative samples and ensuring that they are handled properly prior to transfer of custody to the project laboratory. The field manager will manage procurement of necessary field supplies, assure that monitoring equipment is operational and calibrated in accordance with the specifications provided herein, and act as the Site Health and Safety Officer.

Data Quality Manager – Lea Beard, Aspect. The data quality manager is responsible for developing data quality objectives, selecting analytical methods, coordinating with the analytical laboratory, overseeing laboratory performance, and approving QA/QC procedures. The data quality manager is also responsible for conducting QA validation of the analytical data reports received from the project laboratory.

Laboratory Project Manager – Mike Erdahl, F&B. The laboratory project manager is responsible for ensuring that all laboratory analytical work for soil and water media complies with project requirements. The laboratory project manager also, while acting as liaison with the project manager, field manager, and data quality manager, fulfills project needs on the analytical laboratory work. This responsibility applies to work the laboratory project manager subcontracts to another laboratory.

A3.3 Analytical Methods and Reporting Limits

Analytical methodologies applied to the analyses of samples collected during the data gaps work are in accordance with the following documents:

- USEPA SW Methods – USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, December 1996.
- USEPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and updates.
- Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 20th Edition, 1995.

Table A-2 lists the laboratory analytical methods for soil and groundwater analyses to be performed during the data gaps work, along with samples containers, preservation, and analytical holding times for each analysis.

A3.3.1 Method Detection Limit and Method Reporting Limit

The method detection limit (MDL) is the minimum concentration of a compound that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero. MDLs are established by the laboratory using prepared samples, not samples of environmental media.

The method reporting limit (MRL) is defined as the lowest concentration at which a chemical can be accurately and reproducibly quantified, within specified limits of precision and accuracy, for a given environmental sample. The MRL can vary from sample to sample depending on sample size, sample dilution, matrix interferences, moisture content, and other sample-specific conditions. As a minimum requirement for organic analyses, the MRL should be equivalent to or greater than the concentration of the lowest calibration standard in the initial calibration curve and equivalent to or, preferably less than, the project screening levels.

A3.4 Data Quality Objectives

DQOs, including the Measurement Quality Indicators (MQIs)—precision, accuracy, representativeness, comparability, completeness, and sensitivity (namely PARCCS parameters)—and sample-specific MRLs are dictated by the DQOs, project requirements, and intended uses of the data. For this project, the analytical data must be of sufficient technical quality to determine whether contaminants are present and, if present, whether their concentrations are greater than or less than applicable screening criteria based on protection of human health and the environment.

The quality of data generated through this data gaps work will be assessed against the MQIs set forth in this QAPP. Specific QC parameters associated with each of the MQIs are summarized in Table A-3. Definitions of these parameters and the applicable QC procedures are presented below.

A3.4.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared with their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples and laboratory control samples/laboratory control sample duplicate (LCS/LCSD) for organic analysis, and through laboratory duplicate samples for inorganic analyses.

Analytical precision is quantitatively expressed as the RPD between the LCS/LCSD, MS/MSD, or laboratory duplicate pairs and is calculated with the following formula:

$$RPD (\%) = 100 \times \frac{|S - D|}{(S + D)/2}$$

where:

S = analyte concentration in sample

D = analyte concentration in duplicate sample

Analytical precision measurements will be carried out at a minimum frequency of 1 per 20 samples for each matrix sampled, or 1 per laboratory analysis group. Laboratory precision will be evaluated against laboratory quantitative RPD performance criteria provided with the laboratory's analytical data report. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. The RPD will be evaluated during data review and validation. The data reviewer will note deviations from the specified limits and will comment on the effect of the deviations on reported data.

A3.4.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. The accuracy of chemical test results is assessed by "spiking" samples with known standards (surrogates, blank spikes, or matrix spikes) and establishing the average recovery. Accuracy is quantified as the %R. The closer the %R is to 100 percent, the more accurate the data.

Surrogate recovery will be calculated as follows:

$$\text{Recovery (\%)} = \frac{MC}{SC} \times 100$$

where:

SC = spiked concentration

MC = measured concentration

Matrix spike (MS) percent recovery will be calculated as follows:

$$\text{Recovery (\%)} = \frac{MC - USC}{SC} \times 100$$

where:

SC = spiked concentration

MC = measured concentration

USC = unspiked sample concentration

Accuracy measurements on MS samples will be carried out at a minimum frequency of 1 in 20 samples per matrix analyzed. Blank spikes will also be analyzed at a minimum frequency of 1 in 20 samples per matrix analyzed. Surrogate recoveries for organic compounds will be determined for each sample analyzed for respective compounds. Laboratory accuracy will be evaluated against the laboratory's quantitative MS and surrogate spike recovery performance criteria as provided with the laboratory's analytical data report. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. Percent recoveries will be evaluated during data review and validation, and the data reviewer will comment on the effect of the deviations on the reported data.

A3.4.3 Representativeness

Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. The FSP sampling techniques and sample handling protocols (e.g., homogenizing, storage, preservation, and use of duplicates and blanks) have been developed to ensure representative samples. Sampling locations for data gaps work activities are described in Section 2 of the Work Plan. The field sampling procedures are described in the FSP (Section A2) of this SAP.

A3.4.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal will be achieved through the use of standard techniques to collect samples, USEPA-approved standard methods to analyze samples, and consistent units to report analytical results. Data comparability also depends on data quality. Data of unknown quality cannot be compared.

A3.4.5 Completeness

Completeness is defined as the percentage of measurements made that are judged to be valid. Results will be considered valid if the precision, accuracy, and representativeness objectives are met and if MRLs are sufficient for the intended uses of the data. Completeness is calculated as follows:

$$\text{Completeness (\%)} = \frac{V}{P} \times 100$$

where:

V = number of valid measurements

P = number of measurements taken

Valid and invalid data (i.e., data qualified with the R flag [rejected]) will be identified during data validation. The target completeness goal for this project is 95 percent.

A3.5 Quality Control Procedures

Field and laboratory QC procedures are outlined below.

A3.5.1 Field Quality Control

Beyond the use of standard sampling and decontamination protocols defined in the FSP, field QC procedures include maintaining the field instruments used. Field instruments (e.g., YSI multiparameter instrument or equivalent meter for measuring field parameters during groundwater sampling) are maintained and calibrated regularly prior to use, in accordance with manufacturer recommendations.

A3.5.2 Laboratory Quality Control

The laboratories' analytical procedures must meet requirements specified in the respective analytical methods or approved laboratory standard operating procedures (SOPs; e.g., instrument performance check, initial calibration, calibration check, blanks, surrogate spikes, internal standards, and/or labeled compound spikes.) Specific laboratory QC analyses required for this project will, at a minimum, consist of the following:

- Instrument tuning, instrument initial calibration, and calibration verification analyses as required in the analytical methods and the laboratory SOPs.
- Laboratory and/or instrument method blank measurements at a minimum frequency of 5 percent (1 per 20 samples) or in accordance with method requirements, whichever is more frequent.
- Accuracy and precision measurements, at a minimum frequency of 5 percent (1 per 20 samples) or in accordance with method requirements, whichever is more frequent. In cases where a pair of MS/MSD or MS/laboratory duplicate analyses are not performed on a project sample, a set of LCS/LCSD analyses will be performed to provide sufficient measures for analytical precision and accuracy evaluation.

The laboratory's QA officers are responsible for ensuring that the laboratory implements the internal QC and QA procedures detailed in OnSite's Quality Assurance Manual.

A3.6 Corrective Actions

If routine QC audits by the laboratory result in detection of unacceptable conditions or data, actions specified in the laboratory SOPs will be taken. Specific corrective actions are outlined in each SOP used and can include the following:

- Identifying the source of the violation.
- Reanalyzing samples if holding time criteria permit.

- Resampling and analyzing.
- Evaluating and amending sampling and analytical procedures.
- Accepting but qualifying data to indicate the level of uncertainty.

If unacceptable conditions occur, the laboratory will contact Aspect's project manager to discuss the issues and determine the appropriate corrective action. Corrective actions taken by the laboratory during analysis of samples for this project will be documented by the laboratory in the case narrative associated with the affected samples.

In addition, the project data quality manager will review the laboratory data generated for this investigation to ensure that project DQOs are met. If the review indicates that non-conformances in the data have resulted from field sampling or documentation procedures or laboratory analytical or documentation procedures, the impact of those non-conformances on the overall project data usability will be assessed. Appropriate actions, including re-sampling and/or re-analysis of samples, may be recommended to the project manager to achieve project objectives.

A3.7 Data Reduction, Quality Review, and Reporting

All data will undergo a QA/QC evaluation at the laboratory, which will then be reviewed by the Aspect database manager and the project data quality manager. Initial data reduction, evaluation, and reporting at the laboratory will be carried out in full compliance with the method requirement and laboratory SOPs. The laboratory internal review will include verification (for correctness and completeness) of electronic data deliverable (EDD) accompanied with each laboratory report. The Aspect database manager will verify the completeness and correctness of all laboratory deliverables (i.e., laboratory report and EDDs) before data validation.

A3.7.1 Minimum Data Reporting Requirements

The following sections identify general and specific requirements for analytical data reporting to provide sufficient deliverables for project documentation and data quality assessment.

General Requirements

The following requirements apply to laboratory reports for all types of analyses:

- A cover page signed by the laboratory director, the laboratory QA officer, or his/her designee to certify the eligibility of the reported contents and the conformance with applicable analytical methodology.
- Definitions of abbreviations, data flags, and data qualifiers used in the report.
- Cross reference of field sample names and laboratory sample identity for all samples in the sample delivery group (SDG).
- Completed COC document signed and dated by parties who acquired and received the samples.
- Completed sample receipt document with record of cooler temperature and sample conditions upon receipt at the laboratory. Anomalies such as inadequate

sample preservation, inconsistent bottle counts, and sample container breakage, and communication record and corrective actions in response to the anomalies, will be documented and incorporated in the sample receipt document. The document will be initialed and dated by personnel that complete the document.

- Case narrative that addresses any anomalies or QC outliers in relation to sample receiving, sample preparation, and sample analysis on samples in the SDG. The narrative will be presented separately for each analytical method and each sample matrix.
- All pages in the report are to be paginated. Any insertion of pages after the laboratory report is issued will be paginated with starting page number suffixed with letters (e.g., pages inserted between pages 134 and 135 should be paginated as 134A, 134B, etc.)
- Any resubmitted or revised report pages will be submitted to Aspect with a cover page stating the reason(s) and scope of the resubmission or revision, and signed by the laboratory director, QA officer, or the designee.

Specific Requirements

The following presents specific requirements for laboratory reports:

- Sample results will be evaluated and reported down to the MRLs.
- All soil sample results will be reported on a dry-weight basis. The report pages for sample results (namely Form 1s) will, at a minimum, include sample results, MRLs, unit, proper data flags, dates of sample collection, preparation, and analysis, dilution factor, percent moisture (for solid samples), and sample volume (used for analysis).
- Method blank results.
- LCS and LCSD (if MSD analysis is not performed) results with laboratory acceptance criteria for %R and RPD.
- Surrogate spike results with laboratory acceptance criteria for %R.
- MS and MSD results with laboratory acceptance criteria for %R and RPD. In cases where MS/MSD analyses were not performed on a project sample, LCS/LCSD analyses should be performed and reported instead.
- Internal standard (as applicable) results: Internal standard response areas in field samples, QC analyses, and associated calibration verification analyses.

A3.8 Data Quality Verification and Validation

Reported analytical results will be qualified by the laboratory to identify QC concerns in accordance with the specifications of the analytical methods. Additional laboratory data qualifiers may be defined and reported by the laboratory to more completely explain QC concerns regarding a particular sample result. All data qualifiers will be defined in the laboratory's narrative reports associated with each case.

The project data quality manager, or other as directed by Aspect, will conduct an independent Level II (or Stage 2a as defined in USEPA [2009]) data verification and

validation for all chemical data submitted by the analytical laboratories during the independent environmental assessment, following the guidance below:

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, January 2010, USEPA 540/R-10/011.
- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-08-01.

The data validation will examine and verify the following parameters against the method requirements and laboratory control limits:

- Sample management and holding times
- Laboratory and field blank results
- Detection and reporting limits
- Laboratory replicate results
- MS/MSD results
- LCS and/or standard reference material results
- Field duplicate results
- Surrogate spike recovery (organic analyses only)

Data qualifiers will be assigned based on the outcome of the data validation. Data qualifiers are limited to and defined as follows:

- J - The associated numerical value is an estimate of the approximate concentration of the analyte in the sample.
- UJ - The analyte was not detected above the reported quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.
- DNR - Do not report from this analysis; the result for this analyte is to be reported from an alternative analysis.

In cases of multiple analyses (such as an undiluted and a diluted analysis) performed on one sample, the optimal result will be determined and only the determined result will be reported for the sample.

The scope and findings of the data validation will be documented and discussed in the Data Validation Report(s). The Data Validation Report(s) will be included in the Data Report.

A3.9 Preventative Maintenance Procedures and Schedules

Preventative maintenance in the laboratory will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. Details of the maintenance procedures are addressed in the respective laboratory SOPs.

Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the method-specific QC criteria.

Maintenance and calibration of instruments used in the field for sampling (e.g., YSI meter for measuring field parameters during groundwater sampling) will be conducted regularly in accordance with manufacturer recommendations prior to use.

A3.10 Performance and System Audits

The Aspect project manager has responsibility for reviewing the performance of the laboratory QA program; this review will be achieved through regular contact with the analytical laboratory's project manager. To ensure comparable data, all samples of a given matrix to be analyzed by each specified analytical method will be processed consistently by the same analytical laboratory.

A3.11 Data and Records Management

Records will be maintained documenting all activities and data related to field sampling and chemical analyses.

A3.11.1 Field Documentation

The Aspect project manager will ensure that the field team receives and understands the final approved version of this QAPP, the Site Health and Safety Plan, and the SAP prior to the initiation of field activities and that all approved plans are followed at all times. Field documents will be maintained in the project file.

A3.11.2 Analytical Data Management

Raw data received from the analytical laboratory will be reviewed, entered into a computerized database, and verified for consistency and correctness. The database will be updated based on data review and independent validation if necessary.

The following field data will be included in the database:

- Sample location coordinates

- Sample type (i.e., groundwater or soil)
- Soil or groundwater sampling depth interval

Information regarding whether concentrations represent total phase (unfiltered samples) or dissolved phase (filtered samples) will be compiled and stored in the database. Data will be submitted to Ecology's Environmental Information Management (EIM) database once data have been reviewed and validated.

A4 References

- U.S. Environmental Protection Agency (USEPA), 2008, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-08-01.
- U.S. Environmental Protection Agency (USEPA), 2009, Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, January 13 2009. EPA 540-R-08-005.
- U.S. Environmental Protection Agency (USEPA), 2010, Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, January 2010, USEPA 540/R-10/011.

Table A-1. Groundwater Sampling Plan

Project No. 140252 HERS Industrial Park, Mukilteo, Washington

DRAFT

		Groundwater Analytes			
Exploration Name	Sampling Method	Total Arsenic	Dissolved Arsenic	Diesel and Oil-Range TPH	VOCs
Monitoring Well					
MW-1	Peristaltic	X	X	X	X
MW-7	Peristaltic	X	X	X	X
MW-9	Peristaltic	X	X	X	X
MW-10	Peristaltic	X	X	X	X
MW-11	Peristaltic	X	X	X	X
MW-12	Peristaltic	X	X	X	X
MW-13	Peristaltic	X	X	X	X
MW-14	Peristaltic	X	X	X	X
MW-15	Peristaltic	X	X	X	X
MW-16D	Peristaltic	X	X	X	X
MW-19	Peristaltic	X	X	X	X
MW-23	Peristaltic	X	X	X	X

Table A-2. Analytical Methods, Sample Containers, Preservation, and Holding Times

DRAFT

Project No. 140252 HERS Industrial Park, Mukilteo, Washington

Sample Matrix	Analytical Parameter	Analytical Method	Sample Container	No. Containers	Field Filtered?	Preservation Requirements	Holding Time
Water	Total Arsenic	EPA 6020B	500-mL polyethylene bottle	1	N	4°C ±2°C	6 months
Water	Dissolved Arsenic	EPA 6020B	500-mL polyethylene bottle	1	Y	4°C ±2°C, HNO ₃ pH < 2	6 months
Water	Diesel- and Oil-Range TPH	NWTPH-Dx	500-mL glass amber	2	N	4°C ±2°C, HCl pH < 2	14 days
Water	VOCs	EPA 8260D	40 mL vials	3	N	4°C ±2°C, HCl pH < 2	14 days
Soil	VOCs	EPA 8260D	Method 5035, 3 40-mL vials	3	N	4°C ±2°C, NaHSO ₄	14 days

Table A-3. QC Parameters Associated with PARCCS

DRAFT

Project No. 140252 HERS Industrial Park, Mukilteo, Washington

Data Quality Indicators	QC Parameters
Precision	RPD values of:
	(1) LCS/LCS Duplicate
	(2) MS/MSD
	(3) Field Duplicates
Accuracy/Bias	Percent Recovery (%R):
	(1) LCS
	(2) MS
	(3) Surrogate Spikes
	Results of:
	(1) Method (Preparation) Blank
	(2) Equipment Rinse Blank (if appropriate)
Representativeness	Results of All Blanks
	Sample Integrity (Chain-of-Custody and Sample Receipt Forms)
	Holding Times
Comparability	Sample-specific Reporting Limits
	Sample Collection Methods
	Laboratory Analytical Methods
Completeness	Data Qualifiers
	Laboratory Deliverables
	Requested/Reported Valid Results
Sensitivity	MDLs and MRLs

Notes:

LCS – laboratory control sample

MDL – method detection limit

MRL – method reporting limit

MS/MSD – matrix spike/matrix spike duplicate

APPENDIX B

**Select Figures from RI/FS
(Aspect, 2015)**

