# SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

West Coast Door Site
Tacoma, Washington

September 17, 2025

Prepared for

3102 Tenants in Common
3102/3120 South Pine Street
Tacoma, Washington


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# West Coast Door Site
# Tacoma, Washington

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## APPENDICES

# LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AO | Agreed Order |
| bgs | below ground surface |
| CLP | Contract Laboratory Program |
| CSL | Contaminated Sites List |
| DI | deionized |
| DO | dissolved oxygen |
| DQI | data quality indicators |
| DQO | data quality objective |
| Draft RI | Public Review Draft Remedial Investigation Report |
| Ecology | Washington State Department of Ecology |
| EDD | electronic data deliverables |
| EIM | Environmental Information Management |
| EPA | US Environmental Protection Agency |
| ft | feet/foot |
| GC/MS | gas chromatography/mass spectrometry |
| ID | identification |
| IDW | investigation-derived waste |
| IW | injection well |
| Landau | Landau Associates, Inc. |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| MQO | measurement quality objective |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| MW | monitoring well |
| NFG | National Functional Guidelines |
| ORP | oxidation reduction potential |
| PAH | polycyclic aromatic hydrocarbon |
| PID | photoionization detector |
| PM | project manager |
| ppm | parts per million |
| Work Plan | Pilot Study Work Plan |
| Property | 3133 South Cedar Street, Tacoma, Washington |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RL | reporting limit |

# LIST OF ABBREVIATIONS AND ACRONYMS (continued)

| | |
|---|---|
| RPD | relative percent difference |
| SAP | Sampling and Analysis Plan |
| Site | West Coast Door Site |
| TIC | 3102 Tenants in Common |
| VOA | volatile organic analysis |
| VOC | volatile organic compound |

# 1.0 INTRODUCTION AND BACKGROUND

On behalf of 3102 Tenants in Common (TIC), Landau Associates, Inc. (Landau) prepared this combined Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) to guide proposed soil and groundwater sampling and analysis as part of a pilot study at the West Coast Door Site (Site), located at 3133 South Cedar Street in Tacoma, Washington (Property). Pilot-study testing was completed in accordance with an Agreed Order (AO; No. DE 14016, April 11, 2017) with the Washington State Department of Ecology (Ecology) that requires 3102 TIC to address contamination resulting from historical creosote-treated wood pipe manufacturing operations on the Property. The Site is included on Ecology's Contaminated Sites List (CSL) under Facility Site ID 6308485 and Cleanup Site ID 2599. Pilot testing was also completed in general accordance with the Pilot Study Work Plan (Work Plan; Landau 2025a), which was reviewed and approved by Ecology (Penner-Ash 2025). Additionally, prior to ground-disturbing activities and consistent with WAC 173-340-815(3)(a), Landau initiated a cultural resource review by Ecology. An Inadvertent Discovery Plan was prepared to avoid, minimize, or mitigate the effects of the pilot study field activities on archaeological and cultural resources (Landau 2025b) and approved on March 4, 2025 (Ecology 2025). The purpose of the pilot study is to (1) apply technological treatment to reduce contaminant mass, contain contaminant source material, and lower contaminant flux in the creosote source area, (2) evaluate the results of the application, (3) provide a recommendation for potential expanded use of the technology in the source area, and (4) provide information to complete an appropriate feasibility study (FS) for the Site.

The following sections present planned project organization and responsibilities, data quality objectives, sampling and analysis procedures (including soil sampling, sample transport and chain-of-custody procedures, and chemical and physical analysis), data validation, and reporting. This SAP/QAPP has been prepared in accordance with Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2016) and the US Environmental Protection Agency's (EPA's) *Uniform Federal Policy for Quality Assurance Projects Plans: Evaluation, Assessing, and Documenting Environmental Data Collection and Use Programs* (EPA 2005). Updates to this SAP/QAPP will be prepared as addendums if appropriate.

# 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The specific roles, activities, and responsibilities of project participants are described in this section. The client has the primary responsibility for managing the work completed at the Property. Landau is the primary consultant for the management and execution of the project.

**Table 1. Project Team Roles and Responsibilities**

| Title/Role | Name | Organization | Responsibilities |
|---|---|---|---|
| **Client Project Manager/Agreed Order PM** | c/o Donna Chamberlin via Steve Locke | 3102 TIC | Project Manager of record for Agreed Order No. DE 14016 on behalf of 3102 TIC. |
| **Ecology Project Manager** | Cam Penner-Ash | Ecology | Oversees the project on behalf of the Washington State Department of Ecology. |
| **Consultant Project Manager** | Steve Locke | Landau | Supervises and coordinates all work for the project. These responsibilities include conducting: project planning and execution, scheduling, staffing, data evaluation, sample archive management, oversight of data submittal to Ecology's Environmental Information Management (EIM) database, report preparation, subcontracts, and deliverables management. |
| **QA Manager** | Danille Jorgensen | Landau | Oversees and directs quality assurance reviews for the project, including laboratory procedures and actions. Coordinates and reviews data validation. Has oversight responsibility for management and integrity of the data. |
| **Data Validator** | Kristi Schultz | Landau | Reviews laboratory analytical data and provides data validation. |
| **Data Manager** | Morgan DeMell | Landau | Manages project database, provides support for reporting activities, uploads data to EIM per Consultant Project Manager direction. |
| **Field Lead** | Jesikah Cavanaugh | Landau | Leads and coordinates field activities, including documentation, sampling, and sample handling. Reports directly to the Consultant Project Manager. |
| **Health and Safety Manager** | Christine Kimmel | Landau | Responsible for review and implementation of the project health and safety plan. |
| **Field Equipment Manager** | Ken Reid | Landau | Ensures equipment is properly maintained and in good condition for project use. |
| **Environmental Laboratory Project Manager(s)** | Philip Nerenberg | Apex | Manages laboratory analysis and reporting, including supervising in-house chain-of-custody and scheduling sample analyses within required holding times; oversees data review and preparation of laboratory reports and electronic data deliverables (EDDs). |

# 3.0 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) reflect the overall degree of data quality or uncertainty that the decision-maker is willing to accept during decision-making. DQOs are used to specify the quality of the data, usually in terms of the following data quality indicators: precision, bias, representativeness, comparability, and completeness. DQOs apply to the entire measurement system (e.g., sampling locations, methods of collection and handling, field analysis, laboratory analysis). DQOs are used to ensure that environmental data are scientifically valid, defensible, and of an appropriate level of quality given the intended use for the data (EPA 2000). A summary of DQOs for this project is summarized in Table 2 below.

**Table 2. Data Quality Objectives – West Coast Door**

| Process | Response |
|---|---|
| Step 1:<br>State the problem | The Property was used for log storage and treatment and included a creosoting plant with two pressurized retort vessels and drying kilns used to impregnate wood pipe with creosote. Soil and groundwater contamination was identified, and previous investigations are summarized in the Public Review Draft Remedial Investigation Report (Draft RI; Landau 2024). The Draft RI recommended a pilot study to evaluate cleanup action technologies and alternatives for implementation at the Site.<br><br>The primary objective of the pilot test is to evaluate the feasibility and effectiveness of *In Situ* Geochemical Stabilization (ISGS), the technology chosen as part of the Work Plan (Landau 2025a), to reduce contaminant mass, contain contaminant source material, and lower contaminant flux in the creosote source area. As part of the pilot study, seven injection wells and five new performance monitoring wells were installed. During installation, soil was sampled for laboratory analysis. Prior to the treatment media injection, all performance monitoring wells were monitored as part of a baseline sampling event. Following the injection, a targeted monitoring well list will be sampled quarterly for 1 year to evaluate the effectiveness of the injection. |
| Step 2:<br>Identify the decision | Confirm through soil field-screening and sample analysis (for naphthalene, polycyclic aromatic hydrocarbons (PAHs), and/or select volatile organic compounds (VOCs [BTEX, 1,2,4-trimethylbenzene, and 1,3-5-trimethylbenzene]) that the injection wells are installed within the creosote source area. Compare sample results to historical high concentrations and the applicable Ecology screening levels.<br><br>Evaluate observations and results for effectiveness of injection, including evaluating evidence of stable or declining concentrations of naphthalene, PAHs, and select VOCs (BTEX, 1,2,4-trimethylbenzene, and 1,3-5-trimethylbenzene) in the groundwater target treatment zone. |
| Step 3:<br>Identify the inputs to the decision | Soil and groundwater samples will be analyzed for naphthalene, PAHs, and/or select VOCs (BTEX, 1,2,4-trimethylbenzene, and 1,3-5-trimethylbenzene). |

| Process | Response |
| --- | --- |
| Step 4:<br>Define the study boundaries | Geographic: Soil samples will be collected from seven injection wells and five performance monitoring wells using a hollow-stem auger drill rig.<br>Time frame: Spring 2025.<br>Sample type: Discrete soil samples.<br>Geographic: Groundwater samples will be collected from injection and groundwater monitoring wells using low flow sampling techniques.<br>Time frame: Spring 2025 through summer 2026; quarterly monitoring.<br>Sample type: Groundwater. |
| Step 5:<br>Develop a decision rule | If Landau and the Agreed Order PM determine that the soil field-screening and concentrations of chemicals of concern indicate that the injection wells are within the creosote source area, then minimal changes will be recommended to the injection plan as described in the Work Plan.<br>If the soil field-screening or concentrations of chemicals of concern indicate that the injection wells do not appear to be within the source area, then Landau and the Agreed Order PM will review and make recommendations for the next steps for the pilot study.<br>Groundwater concentrations of chemicals of concern collected from the Site will be evaluated compared to baseline concentrations and applicable screening levels within the year of monitoring. Landau and the Agreed Order PM will review the results and determine appropriate remediation responses for inclusion in the FS for the Site. |
| Step 6:<br>Specify performance or acceptance criteria | Regulatory limits to be used as proposed cleanup levels are presented in Table 3.<br>Chemical analysis shall be performed by an accredited laboratory.<br>Performance and acceptance criteria are presented in Tables 4 and 5, including the following quality control considerations:<br>• Data quality indicators for laboratory analyses (precision, accuracy, representativeness, completeness, and comparability)<br>• Laboratory quality control<br>• Field quality control samples. |
| Step 7:<br>Develop the detailed plan for obtaining data | The sample design is presented in Section 5.0 of this SAP/QAPP. |

# 4.0 MEASUREMENT PERFORMANCE CRITERIA

Data quality indicators (DQIs) are used to establish data quality objectives and are discussed in detail below. A summary of DQIs and their associated measurement quality objectives (MQOs) is presented in Table 4.

## Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves (EPA 2005). Precision is best expressed in terms of the standard deviation or relative percent difference (RPD). Quality control (QC) sample types that can be used to evaluate precision include field and laboratory duplicates, matrix spike duplicates (MSDs), and laboratory control sample duplicates (LCSDs). The precision of duplicate measurements will be expressed as an RPD, which is calculated by dividing the absolute value of the difference of the two measurements by the average of the two measurements, and expressing it as a percentage. The formula for RPD calculation is shown below:

$$\mathrm{RPD} = \left[\frac{|\mathrm{D1} - \mathrm{D2}|}{[(\mathrm{D1} + \mathrm{D2}) \div 2]}\right] \times 100\%$$

Where:

D1 = first measurement value

D2 = second measurement value (duplicate).

## Accuracy/Bias

Accuracy is a combination of precision (random error) and bias (systemic error) and represents the degree to which a measured value agrees with the known value. Bias describes the systemic or persistent distortion associated with a measurement process (EPA 2005). Accuracy is expressed as the percent recovery of spiked samples (matrix spike [MS], laboratory control sample [LCS], and surrogate spike). The general formula used to calculate percent recovery is shown below (for MS/MSD percent recovery the result from the unspiked sample is taken into account in the formula):

$$\%\mathrm{R} = \left[\frac{\mathrm{SSR}}{\mathrm{C_S}}\right] \times 100\%$$

Where:

%R = percent recovery

SSR = spiked sample result

$C_S$ = concentration of the spike added.

## Representativeness

Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at sampling point, a process condition, or an environmental condition (EPA 2005). Representativeness qualitatively describes how well the analytical data characterize an area of concern. Representativeness is largely determined by the sampling design, analytical parameters for use in its evaluation include method-specified holding times and preservation requirements, and matrix heterogeneity. The sampling design for this project is presented in Section 5.0 of this SAP/QAPP.

### Comparability

Comparability describes the degree to which different data sets agree, can be represented as similar, and can contribute to a common analysis and interpolation (EPA 2005). QC procedures and MQOs, as stated in this SAP/QAPP, will provide measurements that are consistent and representative of the media and conditions measured.

### Completeness

Completeness is a measure of "amount of valid data obtained from a measurement system compared to the amount that could be expected to be obtained under normal conditions" (EPA 2005). Field completeness is calculated as the number of actual samples collected divided by the number of planned samples. Analytical completeness is calculated as the number of valid data points divided by the total number of data points requested. Data points are considered invalid if they are rejected during data validation. The data validation approach for this project is provided in Section 12.0 and completeness objectives are provided in Table 4.

### Sensitivity

Sensitivity is the capability of a method or an instrument to discern the difference between very small amounts of a substance (EPA 2005). For the purposes of this project, sensitivity is the lowest concentration that can be accurately detected by the analytical method. Target reporting limits (RLs) and screening levels are provided in Table 3.

# 5.0 FIELD INVESTIGATION

This section describes procedures for soil logging and field-screening during well installation, the methodology for collecting soil samples and for groundwater samples collected from permanent monitoring or injection wells, and the associated laboratory analyses. All field forms referenced below are included in Appendix A.

## 5.1 Well Installation

Landau will subcontract a state-licensed well driller to install seven injection wells and five monitoring wells. Figure 3 of the Work Plan shows the approximate locations of the wells, which may be moved based on the presence of utilities or due to warehouse operational needs. The driller will install the wells, as described in the Work Plan, with a hollow-stem auger drill rig in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). Based on observations made during drilling of soil borings and monitoring wells in the former creosote retort area, and the distribution of naphthalene and PAHs in soil and groundwater, the injection wells will be installed with screens between approximately 25 feet (ft) and 35 ft below ground surface (bgs), which is the warehouse floor, up to 3 ft above the surrounding grade.

Five performance monitoring wells will be installed around the target treatment zone. All monitoring wells will be screened between approximately 25 and 35 ft bgs (relative to the warehouse floor). Two wells will be installed on the north side of the target treatment zone, two wells will be installed on the south side of the target treatment zone, and one well will be installed on the east side of the target treatment zone, with all wells located approximately 10 to 15 ft outside the target treatment zone. Because existing monitoring wells MW-05 (screened 25 to 35 ft bgs) and MW-09 (screened 60 to 70 ft bgs) are located to the west of the former creosote retort area, no additional performance monitoring wells will be installed on the west side of the target treatment zone.

The wells will be constructed of Schedule 40 polyvinyl chloride (PVC) well materials, with silica sand backfill, a bentonite annular seal, and a flush-mount surface monument set in concrete. Landau's authorized state-licensed drilling subcontractor will develop each monitoring well using surging, bailing, and pumping techniques to clean out silty water introduced during the well installation process, establish a hydraulic connection between the aquifer and the well filter pack, and reduce the groundwater turbidity in the well.

A state-licensed surveyor will determine the horizontal and vertical coordinates of the wells. The elevations of the wells will be relative to NAVD88,[1] and the horizontal locations of the wells will be relative to NAD83/91,[2] Washington State Plane Coordinate System North Zone.

[1] North American Vertical Datum of 1988.
[2] North American Datum of 1983/1991.

### 5.1.1 Soil Logging and Field Screening

Continuous soil samples will be collected during subsurface exploration using a hollow-stem auger to classify soil lithology in accordance with the Unified Soil Classification System. Lithology will be recorded on a Log of Exploration form, along with evidence of contamination based on field-screening and other pertinent information.

Soil will be field-screened for evidence of creosote or volatile organic impacts. Field-screening techniques may include inspecting the soil for staining, sheen, discoloration, odor, and other evidence of impacts; field meters may be used to identify known or suspected contaminants. If initial screening indicates potential VOC or creosote impacts, soil-screening for VOC contamination will be conducted using headspace analysis and will be performed by first measuring VOC levels along the length of freshly exposed soil in recovered soil cores using a photoionization detector (PID). If VOC readings above background levels (i.e., PID readings taken from ambient air in the project area) are observed, a small amount of soil from that portion of the soil core yielding the VOCs will be placed in a zip-top bag (e.g., Ziploc). The bag will then be sealed, the contents broken up, and the bag allowed to equilibrate for 2 to 5 minutes. Tubing will be attached to the PID and inserted into the zip-top bag. The bag will be resealed around the tube and the highest reading measured by the PID within the first 90 seconds will be recorded and entered in the comments section of the soil boring logs. Additionally, any PID readings of more than 5 parts per million (ppm) will be noted on the chain-of-custody form to communicate the potential need for dilution to the laboratory; 5 ppm is the threshold, because readings below 5 ppm are commonly caused by interference. If evidence of creosote contamination is identified during field-screening, Landau will proceed with well installation as described in the Work Plan.

### 5.1.2 Soil Sampling Collection and Analysis

Soil samples will be collected above, within, and below locations where field-screening indicates the greatest evidence of creosote contamination. If field-screening indicates no obvious impacts to soil, soil sampling intervals from 15 to 35 ft will be selected based on field observations. For example, soil samples may be collected from distinct layers of fill, fill contacts, or from above geologic units that are noticeably finer grained than the surrounding units (the semi-confining silt to clay layer observed during previous investigations). Borings will not be advanced below the semi-confining unit. Soil samples will be collected from the identified soil sampling intervals from well installation borings using the following methods:

- For soil borings, lightly scrape the outside of the soil core to expose a fresh sampling surface.
- Soil samples for volatile constituents will be collected using EPA Method 5035A procedures. The procedures involve using a small coring device or open-ended syringe to collect an undisturbed soil sample of a specified weight, which is then placed in a pre-preserved volatile organic analysis (VOA) vial. This method minimizes loss of VOCs to volatilization during the sampling process. The contracted analytical laboratory will provide specific sampling equipment and instructions on how to collect the samples (e.g., sample quantity for each VOA vial).
- Soil samples for PAHs will be collected using a clean, decontaminated, stainless-steel spoon: Collect soil from the desired interval and place in a clean, decontaminated stainless-steel bowl.

- Homogenize the soil from the given interval in a decontaminated stainless-steel bowl using the stainless-steel spoon used to collect the sample.
- Transfer the homogenized soil into the appropriate laboratory-supplied sample containers.
- Seal sample containers into low-density polyethylene zip-top bags (e.g., Ziploc) and immediately place all sample containers into a pre-chilled cooler.

### 5.1.3 Soil Laboratory Analysis

Soil samples collected for laboratory analysis will be submitted on ice and under standard chain-of-custody procedures to the laboratory to be analyzed for chemicals of concern. Sample chain-of-custody procedures are discussed in Section 8.0. Soil analytical methods, sample containers, preservation requirements, and holding times are presented in Table 5.

## 5.2 Baseline and Performance Monitoring

Baseline monitoring will occur prior to the injection at all performance monitoring wells and injection wells as indicated in the Work Plan. Performance monitoring will occur quarterly at the five new and two existing performance monitoring wells (MW-05 and MW-09). All baseline monitoring locations (apart from the injection wells) will be sampled one year following the injection, to evaluate the effectiveness of the injection.

### 5.2.1 Water Levels

Before baseline monitoring begins, synoptic water levels will be collected from all performance monitoring and injection wells as described in the Work Plan. Before performance monitoring begins, synoptic water levels will be collected from the performance monitoring wells as described in the Work Plan. The static water level of each well will be measured with a water-level indicator. The probe and attached tape will be thoroughly rinsed with deionized (DI) water and wiped with a clean towel before use in each well. The water-level indicator will be constructed of chemically inert materials to prevent damage of the equipment and cross-contamination between wells.

After the well cap is removed, the depth to water will be measured by slowly inserting the water-level indicator probe into the well casing. As the probe enters the water, a buzzer and indicator light will be activated. The probe will be gently inserted into and retracted from the water surface so that the water surface can be determined accurately. The depth at which the water level buzzer and light activate represents the groundwater surface. The graduation mark on the water level tape adjacent to the reference mark on the rim of the PVC well casing represents the depth to water. After initially determining the depth to water, the probe will be re-inserted to recheck the measurement. This measurement will be recorded on the groundwater sampling form to a precision of 0.01 ft.

### 5.2.2 Low Flow Sample Collection

Groundwater samples will be collected following low flow procedures and in accordance with the Work Plan. All field observations will be logged on a groundwater sample collection form. Low flow sampling minimizes disturbance to the aquifer during groundwater sample collection. The low pumping rate induces laminar flow in the immediate vicinity of the sampling pump intake, drawing groundwater horizontally from the aquifer and into the sampling device.

Purging and sampling will be performed using a peristaltic pump with dedicated polyethylene tubing. Conventional wells will have dedicated tubing that is stored in the well. The end of the sample tubing will be positioned at 2 to 3 ft above the bottom of the well within the well screen. Care will be taken to gently insert the tubing to minimize disturbance of any sediment that may have accumulated in the well. Purging will proceed as follows:

- The well will be purged at a rate of less than 0.5 liters per minute and with drawdown of less than 4 inches (0.3 ft) during purging. The flow rate will be measured by filling a 1-liter container and measuring the rate of filling using a stopwatch. Some wells may need to be pumped at slower rates to avoid drawdown of the water column within the well. Purging will continue until temperature, conductivity, pH, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity have stabilized, as described below.
- Field parameters (pH, temperature, conductivity, DO, ORP, and turbidity) will be continuously monitored during purging using a flow cell. Purging of the well will be considered complete when all field parameters become stable for three successive readings. The three successive readings should be within +/- 3 percent for temperature, +/- 3 percent for conductivity, +/- 10 percent for DO, +/- 10 millivolts for ORP, and +/- 10 percent for turbidity.

If one or more of the readings have not stabilized within 30 minutes, samples will be collected, and the unstable readings will be noted on the sampling form.

- Purge water will be contained in 55-gallon drums or other transportable liquid containers. The drums will be labeled and stored onsite in a specified containment area. The water will be stored until laboratory analysis of groundwater samples is complete and IDW disposal options are evaluated. Disposal will be in accordance with appropriate regulations.

### 5.2.3 Groundwater Laboratory Analysis

All samples will be stored in coolers with ice and transported using proper chain-of-custody procedures to the laboratory, to be analyzed for chemicals of concern. Sample chain-of-custody procedures are discussed in Section 8.0. Groundwater analytical methods, sample containers, preservation requirements, and holding times are presented in Table 5.

## 5.3 Field Quality Control Samples

Field QC samples will be collected to identify possible issues resulting from sample collection or sample processing in the field. The collection of field QC samples includes field duplicates and MSs/MSDs, as described below. Equipment blanks may be collected, as appropriate for the media and sample collection process. Field QC samples will be documented in the field logbook and verified by the quality assurance (QA) manager or designee. Field QC sample frequency is specified in Table 4.

## 5.4 Sample Containers, Preservation, and Holding Times

The analytical laboratory will provide certified, pre-cleaned, EPA-approved containers for all samples (see Table 5), with appropriate preservation in accordance with guidance provided in the EPA's SW-846 Compendium (EPA; accessed August 2025).

## 5.5 Sample Identification and Labels

The nomenclature to label and identify soil samples collected during well installations will be as follows:

- Code for injection well (IW) or monitoring well (MW)
- Well number (a two-digit, consecutive number)
- Soil interval depths
- Date of sample collection by month, day, and year (mmddyy).

For example, a soil sample collected from injection well IW-01, spanning a depth from 12 to 13 ft bgs and collected on July 10, 2025 would be: IW01(12-13)-071025.

The nomenclature to label and identify groundwater samples collected during baseline and quarterly groundwater monitoring will be as follows:

- Code for injection or monitoring well (IW or MW, respectively)
- Well number (a two-digit, consecutive number)
- Date of sample collection by month, day, and year (mmddyy)

For example, a groundwater sample collected from monitoring well MW-05 and collected on July 10, 2025 would be: MW-05-071025.

# 6.0 EQUIPMENT DECONTAMINATION

The decontamination procedures described below are to be used by field personnel to clean drilling, sampling, and related field equipment. Deviation from these procedures will be documented in field records. Decontamination fluids will be managed per the procedures described in Section 7.0.

## 6.1 Water Level Indicator

The tape and probe head of the water level probe, if used, will be wiped with a clean paper towel wetted with Alconox soap and laboratory-provided DI water and rinsed with DI water between each measurement.

## 6.2 Sampling Equipment

Dedicated sampling equipment (e.g., tubing) will be used where practicable. All non-dedicated sampling equipment (e.g., stainless-steel bowls, stainless-steel spoons, water level indicator) will be decontaminated between sample locations. Sampling equipment includes all devices used to collect or contain a sample prior to placement in a laboratory-provided sample container or used downhole in a well or boring (e.g., water level indicator and depth sounding tape). Before initial use, sampling equipment that may contribute to the contamination of a sample must be thoroughly decontaminated, unless specific documentation exists to show that the sampling equipment has already been decontaminated. Pre-cleaned equipment and sample jars in factory-sealed containers do not require decontamination.

Decontamination will be performed according to the following procedure:

- Scrub equipment thoroughly using an Alconox and water solution, using a brush to remove any particulate matter or surface film.
- Rinse with potable water.
- Conduct a final rinse with DI water.
- Keep decontaminated equipment in a clean location to prevent recontamination.

## 6.3 Heavy Equipment

Heavy drilling equipment (i.e., drilling equipment that is used downhole, or that contacts material and equipment going downhole) will be cleaned by a high-pressure, hot water wash before each use and at completion of the project.

# 7.0 WASTE MANAGEMENT

Investigation-derived waste (IDW) from the investigation (e.g., soil cuttings, purge water, decontamination water) will be stored in Washington State Department of Transportation-approved 55-gallon drums. Procedures for IDW storage are as follows:

- Segregate soils into separate drums exploration locations so the source of materials in each drum can be easily identified.
- Leave about 3 to 4 inches of headspace in each drum.
- When full or when not in active use, confirm the lid and ring are securely closed and attached to each drum and cover the drums with plastic sheeting that extends to the ground.
- Drums will be stored on a hard, flat surface, at a pre-approved temporary storage location at the site.

Upon initial placement of IDW into a drum, each drum will be labeled with "Investigation-Derived Waste–Pending Analysis" and the following information:

- A description of the media (i.e., soil or water)
- Origin of the medium (i.e., boring or well number; including depth interval for soil from borings if divided between multiple drums)
- Accumulation start date (i.e., date the medium was first placed in the drum)
- Site identification
- Generator name
- Contact person
- Drum ID number corresponding to Landau drum inventory form
- Other pertinent information.

Once characterization has been completed, drums will then be labeled with Hazardous/Dangerous Waste or Non-Hazardous/Non-Dangerous Waste labels, as appropriate. Placement of these labels will occur no later than 30 days after receipt of the final analytical results used for waste characterization and classification.

After analytical results are received, Landau will arrange for the appropriate offsite disposal of the drums and their contents at an appropriately licensed and permitted disposal facility. Advanced Chemical Transport, Inc. of Tacoma, Washington will transport the waste, appropriately-manifested drums to the appropriate disposal facility. Non dangerous and non-hazardous waste will be disposed of at a regional Subtitle D landfill once a waste profile and waste manifest are generated. Hazardous waste will be disposed of at a regional Subtitle C landfill.

# 8.0 SAMPLE TRANSPORT AND CHAIN-OF-CUSTODY PROCEDURES

This section addresses the sampling program requirements for maintaining custody of the samples throughout the sample collection and delivery process.

## 8.1 Sample Custody Procedures

Samples are considered to be in one's custody if they are in the custodian's possession or view, in a secured location (under lock) with restricted access, or in a container that is secured with an official seal, such that the sample cannot be accessed without breaking the seal.

Chain-of-custody procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the chain-of-custody form. Each sample will be represented on a chain-of-custody form the day it is collected. All data entries will be made using an indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines or spaces on the chain-of-custody form will be lined-out and dated and initialed by the individual maintaining custody.

A chain-of-custody form will accompany each cooler of samples to the analytical laboratory. Each person who has custody of the samples will sign the chain-of-custody form and ensure that the samples are not left unattended unless properly secured. Copies of all chain-of-custody forms will be retained in the project files.

## 8.2 Sample Delivery and Receipt Requirements

Samples submitted to the laboratory will be collected in the appropriate sample containers and preserved as specified in Table 5. The storage temperatures and method-specified holding times for chemical analyses are also provided in Table 5. The persons transferring custody of the sample container will sign the chain-of-custody form upon transfer of sample possession to the laboratory, unless the samples are shipped via commercial carriers, in which case the custody signature will be that of the individual taking possession of the samples from the carrier at its final destination. If soil samples are to be shipped, samples will be packed in coolers with new, wet ice, sample containers will be placed in laboratory-provided zip top plastic bags, and custody seals will be affixed to the outside of the cooler prior to taping. Samples will be shipped on a daily or every-other-day basis as conditions allow.

When the samples are delivered to the laboratory, the receiver will record the condition of the samples on a sample receipt form. Chain-of-custody forms will be used internally in the laboratory to track sample handling and final disposition. If containers arrive with broken custody seals, the laboratory will note this on the chain-of-custody record and will immediately notify the Landau PM or Field Lead, as appropriate. Once the laboratory work has been completed and the data report submitted by the laboratory, samples and extracts will be transferred from cold storage to a sample archiving area (as appropriate for the type of media to be handled), where they will be stored for 30 days, unless the

Landau PM provides other written instructions. Custody will be maintained in the long-term storage area and upon ultimate disposition, samples will be logged out and the disposition recorded. Disposal will be in accordance with local, state, and federal landfill and wastewater regulations.

# 9.0 CHEMICAL ANALYTICAL TESTING

This section includes information on target analytes, appropriate analytical testing methods, and laboratory-testing information, as the information relates to the media being evaluated.

## 9.1 Sample Analysis

Soil and groundwater samples will be submitted to Apex Laboratories, LLC for the analysis of carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Target analyte lists, analytical methods, reporting limits, method detection limits, and screening levels are presented in Table 3. Where achievable, target RLs for each analyte will be less than the screening levels.

## 9.2 Laboratory Quality Control

Analytical procedures will be documented in writing as laboratory standard operating procedures (SOPs), with each SOP including a QA section that addresses the minimum QC requirements for the procedure. Certain QC requirements are matrix- or method-specific, but in general, the QA program must include the following:

- Instrument calibration
- Preparation and analysis of reagent/preparation blanks
- Analysis of instrument and/or method blanks
- Preparation and analysis of MSs and MSDs
- Preparation and analysis of surrogate spikes
- Analysis of laboratory duplicates for inorganics
- Preparation and analysis of LCSs and standards
- Identification of internal standard areas and control limits
- System performance checks for both organic analyses.

An analytical batch is defined as 20 samples or less of the same type of matrix, prepared and analyzed as a group. The following analytical QC samples will be associated with each batch if the control procedure is applicable to the analysis. Laboratory QC frequency is presented in Table 4.

### Method Blank

A reagent or media blank will be analyzed as a check on laboratory contamination (glassware, reagents, analytical hardware) that might affect analytical results. A sample consisting of laboratory reagent-grade water (distilled and deionized water) or a solid matrix will be analyzed to monitor the analytical instrument for contamination. The method blank will be processed through the entire analytical procedure, including sample preparation. The results will be used in conjunction with other control data to validate overall system performance and identify bias that may impact data quality. Method blanks must be analyzed per Method SW-846 for applicable analyses, at least once with each analytical batch, with a 1 in 20 sample minimum.

### Laboratory Control Samples

Independently prepared control samples will be processed through the entire analytical procedure. The purpose of these samples is to monitor and assure the accuracy of the procedure in the absence of matrix interference. Results of the LCSs will be charted and must meet acceptance criteria. LCSs must be analyzed per Method SW-846 for applicable analyses, at least once with each analytical batch, with a 1 in 20 sample minimum.

### Laboratory Control Sample Duplicates

Independently prepared control sample duplicates will be processed through the entire analytical procedure. The purpose of the LCSD is to assure the precision of the procedure in the absence of matrix interference. Precision results in RPD will be tabulated and charted. LCSDs must be analyzed per Method SW-846 for applicable analyses, at least once with each analytical batch, with a 1 in 20 sample minimum.

### Surrogates

Sample aliquots and laboratory QC samples scheduled for organic analysis will be spiked with surrogates. The surrogates to be added will be in compliance with the SW-846 analytical method referenced and will be detailed in the laboratory method SOP. The purpose of the surrogates is to monitor and assure the accuracy of the analytical performance on individual samples and to indicate the presence of system bias, extraction inefficiencies, and/or matrix interferences. The recoveries of the surrogates will be charted and must meet acceptance criteria.

### Internal Standards

Sample aliquots and laboratory QC samples scheduled for gas chromatography/mass spectrometry (GC/MS) analysis will be spiked with interval standards prior to extraction or analysis, as applicable. The internal standards to be added will be in compliance with the SW-846 analytical method referenced and will be detailed in the laboratory method SOP. The purpose of the internal standards is to ensure GC/MS instrument sensitivity and stability, and to provide for accurate target analyte quantitation. The internal standard area counts and retention times will be charted and must meet acceptance criteria.

### Matrix Spike

An aliquot of a sample will be spiked with a known amount of the selected analyte(s). Percent recoveries of the selected spiked analytes will be tabulated by subtracting the non-spiked concentration from the spiked sample results. Results are used to assess accuracy in specific matrices. Matrix spikes must be analyzed per Method SW-846 for applicable analyses, at least once with each matrix-specific analytical batch, with a 1 in 20 sample minimum. Project-specific MSs are not required.

### Duplicate Samples or Matrix Spike Duplicates

MSDs will be analyzed to monitor the method precision. Results in RPD will be tabulated and charted. For analytical methods in which spiking is not applicable, sample duplicates will be used to assess precision. Duplicates or MSDs must be analyzed per Method SW-846 for applicable analyses, at least once with each matrix-specific analytical batch, and with a 1 in 20 sample minimum.

## 9.3 Laboratory Requirements

Environmental analytical laboratories performing work under this SAP/QAPP shall maintain current accreditation through the National Environmental Laboratories Accreditation Program and Ecology (WAC 173-340-830). Testing will be in accordance with the methodologies established in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (SW-846; EPA; accessed July 31, 2025). All laboratory methodologies will also be approved through Ecology.

The laboratory's QA program will be reviewed by the Quality Assurance Officer with specific emphasis on the acceptance criteria for QC samples, and on related corrective action should the QC criteria not be met. Acceptance criteria and corrective actions consistent with Method SW-846 Update III method criteria will be deemed acceptable.

Data obtained will be properly recorded. The required QC summary package and the EDD format is detailed in Section 10.0. The laboratory will reanalyze samples not handled or analyzed in conformance with the QC criteria, if sufficient sample volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

Completed data reports from the laboratory will include a narrative outlining any problems, corrections, anomalies, and conclusions, as well as chain-of-custody documentation and results for all analyses and laboratory QC.

# 10.0 DATA MANAGEMENT

## 10.1 Data Recording and Reporting

Field data and observations will be recorded on waterproof paper kept in field notebooks. Qualified staff will transfer information contained in field notebooks to Excel spreadsheets (or alternate software) after they return from the field. Data entries will be independently verified for accuracy by another member of the project team. Relevant field and laboratory data for the project will be uploaded to Ecology's EIM System.

Laboratory results, including QC data, will be submitted electronically. The electronic formats will include a PDF file of the laboratory report and an EDD in EQuIS EFWEDD format with Landau-specified valid values. The laboratory PM shall ensure that the EDD matches the laboratory hard copy data report. This data review must be completed before deliverables are reported by the laboratory. Raw and final data will be stored electronically, with regularly scheduled backups performed and maintained at the laboratory. The laboratories will prepare a detailed laboratory data package documenting all activities associated with the sample analyses.

## 10.2 Laboratory Data Package Requirements

Laboratory data will be provided in a Stage 3 data report, modified to exclude raw data, with Contract Laboratory Program (CLP)-equivalent forms. Required Stage 3 data report elements include the following, as applicable:

- Case narrative
- Chain-of-custody documentation, sample receipt, and condition documentation
- Sample summary or equivalent, method summary or equivalent
- Sample results (with date, units, method reporting, and detection limits)
- Laboratory data qualifier definitions
- Method/laboratory blank results
- Sample surrogate results
- Field QC results
- Laboratory control sample results, matrix spike results, duplicate and/or matrix spike duplicate results, post-digestion spike sample results
- Tuning results summary
- Initial calibration results, continuing calibration results
- Internal standard results
- QC surrogate results
- Secondary column results
- Instrument blanks

- Analytical sequences
- Initial and continuing calibration verification results
- Calibration blank results
- Instrument detection limits
- Inductively coupled plasma (ICP) interference check sample results
- ICP/mass spectrometry internal standard areas
- ICP interelement correction factors, ICP linear ranges, ICP serial dilution results
- Analysis run logs, extraction logs, preparation logs.

## 10.3 Data Reduction

This section summarizes the procedures for ensuring the accuracy of the data reduction process. Both field and laboratory data reduction procedures are summarized. Responsibilities for the data reduction process are delegated as follows:

- Technical personnel will document and review their own work and are responsible for the accuracy of the work.
- Calculations will receive a method and calculation check by a secondary reviewer prior to reporting (peer review).
- The laboratory PM will be responsible for ensuring that data reduction is conducted according to protocols discussed within this SAP/QAPP.

The laboratories will follow the data reduction and calculation procedures set forth in EPA-approved methods. Data reports and EDDs generated by the laboratory will undergo internal data approval in accordance with the laboratory's Quality Services Manual before being reported.

Automated data calculation and reduction, using instrument data system software or electronic spreadsheet software, will be used by the laboratory to the greatest extent practicable. Analyses will be programmed to allow for raw data entry and editing at the keyboard, with integrated software performing calculations and permanent database generation. Data-entry errors will be checked by comparing the raw data printouts to the chemist's original work, minimizing the common sources of error in data reduction.

The laboratory PM must ensure that the EDD matches the laboratory hard copy data report. This data review must be completed before deliverables are submitted by the laboratory. Raw and final data will be stored electronically, with regularly scheduled backups performed and maintained at the laboratory.

Logbooks will be maintained for each instrument. Computer record file identification will readily allow retrieval by the client name. Worksheets and spreadsheets will be prepared using an electronic spreadsheet or related software package.

Raw data from the chemists' notebooks or bench sheets will include all analytical variables compiled for samples, replicates, blanks, standards, and matrix spikes. The laboratory PM will approve submittal of the final data report and EDD after internal review.

For the purposes of toxicity equivalence or summed calculations, one-half the reporting limit will be used. If results are reported down to the method detection limit, the laboratory and Landau PMs may elect to use one-half the method detection limit for non-detect values.

## 10.4 Documents and Records

This section describes the management requirements for production, distribution, and storage of documents and records associated with planned activities at the Property.

### 10.4.1 Document Distribution

Prior to beginning field activities, field staff will receive and have an opportunity to review plan-related documents pertinent to the field activities as appropriate to support the planned activities. The Project Plans will be finalized prior to commencement of field activities, and only the finalized versions will be distributed to field staff. Changes to procedures and plans after finalization will be documented as addenda and distributed along with the original finalized versions.

### 10.4.2 Field Documentation

Field equipment will have reference and related manuals stored with the equipment. In addition, equipment that requires calibration will be accompanied by a calibration logbook. Field staff will record the calibration process in the logbook every time a calibration is conducted.

A complete record of field activities will be maintained for the duration of the field phase of the work. Documentation will include the following:

- Daily recordkeeping by field personnel of field activities
- Recordkeeping of samples collected for analysis (field sample collection forms)
- Use of sample labels and tracking forms for samples collected for analysis.

The field logs will provide a description of sampling activities completed, sampling personnel, daily weather conditions, and a record of modifications to the procedures and plans identified in the Work Plan or related documentation. The field logs are intended to provide sufficient data and observations to enable project staff to reconstruct events that occurred during the sampling period.

Field logs will be supplemented by sample collection forms, boring logs, and test pit logs completed by field staff, as applicable.

Sample possession and handling will also be documented with chain-of-custody forms so that the sample is traceable from the time of sample processing in the field, to delivery to the laboratory, and to the ultimate data analysis. All personnel shall have their initials logged to correspond with their name and appropriately denoted with data entries.

### 10.4.3 Analytical Data Records

Laboratory analytical data reports will be provided in electronic format by the laboratory. These reports will be included as appendices in documents where data are reported, and they will be kept with all other documents in the project files.

### 10.4.4 Storage

Documents and records associated with the project (i.e., final documents, billing and invoice records) will be stored in electronic form in files on Landau's servers for the duration of the project.

# 11.0 AUDITS AND CORRECTIVE ACTIONS

Field and/or laboratory audits are not planned for this project.

Corrective action will be required if there are deviations from the methods or QA requirements established in this QAPP or if there are equipment or analytical malfunctions. Corrective action procedures will be implemented based on the type of unacceptable data and will be developed on a case-by-case basis. The following corrective actions may be included:

- Altering procedures in the field
- Using a different batch of sample containers
- Performing an audit of field or laboratory procedures
- Reanalyzing samples (if holding times allow)
- Resampling
- Evaluating sampling and analytical procedures to determine possible causes of discrepancies
- Accepting the data with no action, acknowledging the level of uncertainty
- Qualification of the data
- Rejecting the data as unusable.

During field operations and sampling procedures, the field personnel will be responsible for conducting and reporting required corrective actions. A description of any corrective action taken will be entered in the daily field notebook. If field conditions do not allow for conformance with this QAPP, the Landau PM will be consulted immediately. For any corrective action or field condition resulting in a revision of this QAPP, the Landau PM will authorize changes or exceptions to this QAPP, as necessary and appropriate.

Incidents of QA failure and associated corrective action will be documented and reports will be placed in the appropriate project file. Also, corrective action will be taken promptly for deficiencies noted during spot-checks of raw data. As soon as sufficient time has elapsed for corrective action to be implemented, evidence of correction of deficiencies will be presented.

Corrective action in the analytical laboratory may be required due to equipment malfunction, failure of internal QA/QC checks, method blank contamination, non-compliance with QA requirements, or failure of performance or system audits. When measurement equipment or analytical methods fail QA/QC checks, the problem will be immediately brought to the attention of the appropriate persons in the laboratory, in accordance with the laboratory's SOPs. If failure is due to equipment malfunction, the equipment will be repaired, precision and accuracy will be reassessed, and the analysis will be rerun. Attempts will be made to reanalyze all affected parts of the analysis so that, in the end, results are not affected by failure to achieve QA requirements.

During laboratory analysis, the laboratory PM will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet the data quality goals outlined in this SAP/QAPP, corrective action generally will follow the guidelines in the EPA analytical methods noted in this QAPP, and the EPA guidelines for data validation (EPA 2020). If analytical conditions are such that non-conformance with this SAP/QAPP is indicated, the Landau PM will be notified as soon as possible so that any additional corrective actions can be taken.

The Landau PM is ultimately responsible for implementation of appropriate corrective actions and maintenance of a complete record of QC issues and corrective actions.

# 12.0 DATA VALIDATION AND VERIFICATION

The processes that will be used to verify and validate data are described in the subsections below.

## 12.1 Verification

Sample collection forms and field notes will be reviewed by the Landau PM or designee and placed in the electronic project files. Relevant field data will be entered into an Excel spreadsheet (or alternate software) and verified to determine that entered data are correct and without omissions and errors.

Laboratory data, which will be electronically provided and loaded into the database, will undergo a 100 percent check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables will be exported from an EQuIS database to Microsoft Excel tables based on the requirements for reporting and data management and use.

## 12.2 Validation

Data validation will be conducted by a Landau data validator with guidance from applicable portions of the EPA National Functional Guidelines (NFG; EPA 2020), and Guidance for Externally Labeled Data (EPA 2009).

Environmental analytical data associated with well installation will undergo a Stage 2A data verification and validation to verify that the results are acceptable for the intended use. Environmental analytical data associated with baseline and performance monitoring will undergo a Stage 2B data verification and validation to verify that the results are acceptable for the intended use. Validation review elements are listed below; raw data is not reviewed as part of Stage 2A or 2B.

- Verification that the laboratory data package contains all necessary documentation (Stages 2A and 2B)
- Verification that all requested analyses, special cleanups, and special handling methods were conducted (Stages 2A and 2B)
- Verification that QC samples were analyzed as specified (Stages 2A and 2B)
- Evaluation of sample holding times (Stages 2A and 2B)
- Evaluation of QC data compared to acceptance criteria, including method blanks, surrogate recoveries, laboratory duplicate and/or replicate results, and LCS results (Stages 2A and 2B)
- Evaluation of RLs compared to target RLs specified in this SAP/QAPP (Stages 2A and 2B)
- Verification and validation checks for the compliance of instrument-related QC (Stage 2B).

Analytical data may be qualified based on the data validation review. Qualifiers will be consistent with the applicable NFG and will be used to provide data users with an estimate of the level of uncertainty associated with the qualified result. Data validation results will be evaluated with respect to assigned qualifiers to determine any data usability issues.

The following qualifiers may be assigned during the data validation process:

- J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- J+ The result is an estimated quantity, but the result may be biased high.
- J– The result is an estimated quantity, but the result may be biased low.
- NJ The analyte has been "tentatively identified" or "presumptively identified" as present and the associated numerical value is the estimated concentration in the sample.
- R The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
- U The analyte was analyzed for but was not detected above the reported sample quantitation limit.
- UJ The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

The objectives, evaluations, and actions employed during the data validation process will be guided by NFG. Laboratories will be permitted to provide CLP-like forms in lieu of true CLP forms. The data validation criteria will not strictly adhere to the NFG but will also take into consideration method criteria for preservation and holding times; laboratory-specified criteria for surrogate, laboratory control samples, laboratory duplicates, and matrix spikes; and the data validator's professional judgment. Data qualification arising from data validation activities will be documented in validation worksheets and as qualifiers in the EIM database.

The results of the data quality review, including text assigning qualifiers in accordance with the EPA National Functional Guidelines and a tabular summary of qualifiers will be overseen by the QA Manager, who will conduct final review and confirmation of the validity of the data. A copy of the validation report will be submitted by the QA Manager and will be presented as an appendix to the appropriate report.

# 13.0 DATA EVALUATION AND REPORTING

Following receipt of the analytical report from the laboratory, analytical data for each of the samples will be evaluated and tabulated. Analytical data will be compared to applicable screening levels.

Once data verification and validation have been completed for the project, and data have been evaluated against the MQOs and qualified accordingly, the project percent completeness will be calculated (Section 4.0). Data are considered valid and usable as long as they were not rejected during validation. The Landau PM or designee will review the data along with field documentation to ensure project DQOs were met. The Landau PM is responsible for analyzing the data and determining whether the data are of sufficient quantity and quality to meet the project objectives.

After receipt of final laboratory analytical reports, Landau will draft a Pilot Study Report on behalf of TIC within 90 days. Following the completion of the Pilot Study Report, Landau will draft an FS on behalf of TIC within 60 days.

# 14.0 REFERENCES

Ecology. 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Publication No. 04-03-030, Revision of Publication No. 01-03-003. July 2004. Revised December 2016.

Ecology. 2025b. Memorandum: West Coast Door Final Determination Memo, Washington State Governor's Executive Order 21-02, DAHP Project 2025-01-00557. From Carolyn Subramaniam, Department of Ecology, Toxics Cleanup Program, Public Involvement Coordinator, to Cam Penner-Ash, Cleanup Project Manager, Department of Ecology, Toxics Cleanup Program, Southwest Region. March 4.

EPA. 2000. Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, QA00 Update. US Environmental Protection Agency. July.

EPA. 2005. Uniform Federal Policy for Quality Assurance Projects Plans: Evaluation, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version 1. US Environmental Protection Agency. March.

EPA. 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. US Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540-R-08-005. January.

EPA. 2020. National Functional Guidelines for Organic Superfund Methods Data Review. US Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. OLEM 9240.1-65, EPA 542-R-20-007. November.

EPA. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. Third Edition Final Updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), and V (2015). SW-846. US Environmental Protection Agency. https://www.epa.gov/hw-sw846. Accessed July 31, 2025.

Landau. 2024. Public Review Draft Remedial Investigation Report: West Coast Door Site, Tacoma, Washington. Landau Associates, Inc. July 3.

Landau. 2025a. Pilot Study Work Plan: West Coast Door Site, Tacoma, Washington. Landau Associates, Inc. January 13.

Landau. 2025b. Inadvertent Discovery Plan for Pilot Study Work Plan Agreed Order No. DE 14016, West Coast Door Remediation Project. Landau Associates, Inc. March 12.

Penner-Ash, C. 2025. Email: RE: West Coast Door Pilot Study Work Plan. From Cam Penner-Ash, Washington State Department of Ecology, to Steve Locke, Landau Associates, Inc. January 15.

# Table 3
## Analyte List, Analytical Methods, and Reporting Limits
## West Coast Door Site SAP/QAPP
## Tacoma, Washington

| Analyte | Soil | | Groundwater | |
|---|---|---|---|---|
| | Reporting Limit (mg/kg) | Proposed CUL[a] (mg/kg) | Reporting Limit (µg/L) | Proposed CUL[a] (µg/L) |
| **cPAHs by EPA 8270E** | | | | |
| Acenaphthene | 0.00267 | -- | 0.0395 | |
| Acenaphthylene | 0.00267 | -- | 0.0395 | |
| Anthracene | 0.00267 | -- | 0.0395 | |
| Benzo(a)anthracene | 0.00267 | -- | 0.0197 | |
| Benzo(a)pyrene | 0.004 | -- | 0.0197 | |
| Benzo(b)fluoranthene | 0.004 | -- | 0.0197 | |
| Benzo(k)fluoranthene | 0.004 | -- | 0.0197 | |
| Benzo(g,h,i)perylene | 0.00267 | -- | 0.0395 | |
| Chrysene | 0.00267 | -- | 0.0197 | |
| Dibenzo(a,h)anthracene | 0.00267 | -- | 0.0197 | |
| Fluoranthene | 0.00267 | -- | 0.0395 | |
| Fluorene | 0.00267 | -- | 0.0395 | |
| Indeno(1,2,3-c,d)pyrene | 0.00267 | -- | 0.0197 | |
| 1-Methylnaphthalene | 0.00533 | -- | 0.0789 | |
| 2-Methylnaphthalene | 0.00533 | -- | 0.0789 | |
| Naphthalene | 0.00533 | 5.0 (b) | 0.0789 | 160 (b) |
| Phenanthrene | 0.00267 | -- | 0.0789 | |
| Pyrene | 0.00267 | -- | 0.0395 | |
| Dibenzofuran | 0.00267 | -- | 0.0395 | |
| cPAH TEQ | (c) | 0.10 | (c) | 0.1 |
| **VOCs by EPA 8260D** | | | | |
| Benzene | 0.01 | 0.030 | 0.200 | 5.0 |
| Toluene | 0.025 | -- | 1.00 | -- |
| Ethylbenzene | 0.05 | 6.0 | 0.500 | 700 |
| Xylenes, total | 0.075 | 9.0 | 1.50 | 1,000 |
| Naphthalene | 0.005 | 5.0 | 5.00 | -- |
| 1,2,4-Trimethylbenzene | 0.001 | 1.3 | 1.00 | 80 |
| 1,3,5-Trimethylbenzene | 0.001 | 1.3 | 1.00 | 80 |

**Notes:**

a) Proposed cleanup levels from the Draft RI.

b) CUL is for total napthalenes.

c) cPAH TEQs will be calculated in accordance with Ecology Implementation Memo 10.

-- = not applicable

**Abbreviations and Acronyms:**

µg/L = micrograms per liter
cPAH = carcinogenic polycyclic aromatic hydrocarbon
CUL = cleanup level
EPA = US Environmental Protection Agency
mg/kg = milligrams per kilogram
RI = remedial investigation
TEQ = toxicity equivalency quotient
VOC = volatile organic compound

# Table 4
## Measurement Quality Objectives
## West Coast Door Site SAP-QAPP
## Tacoma, Washington

| Method | Preservative | Field Duplicates | Blanks [a] | Surrogates | LCS, MS | LR, LCSD, MSD | Calibrations | Completeness |
|---|---|---|---|---|---|---|---|---|
| **Soil** | | | | | | | | |
| VOCs by EPA 8260D | See Table 5 | 20% RPD, 1 per 10 samples | Method: No target analytes>1/2 RL, 1/batch<br>Trip: No target analytes>1/2 RL, 1/cooler with VOCs | Lab limits [b], Every sample | Lab limits [b], method-specified freq. | Lab limits [b], method-specified freq. | ICAL: Before analysis and when CC does not meet method requirements<br>CC: Method-specific | 95% |
| PAHs by EPA 8270E | See Table 5 | 20% RPD, 1 per 10 samples | Method: No target analytes>1/2 RL, 1/batch | Lab limits [b], Every sample | Lab limits [b], method-specified freq. | Lab limits [b], method-specified freq. | ICAL: Before analysis and when CC does not meet method requirements<br>CC: Method-specific | 95% |
| **Groundwater** | | | | | | | | |
| VOCs by EPA 8260D | See Table 5 | 20% RPD, 1 per 10 samples | Method: No target analytes>1/2 RL, 1/batch<br>Trip: No target analytes>1/2 RL, 1/cooler with VOCs | Lab limits [b], Every sample | Lab limits [b], method-specified freq. | Lab limits [b], method-specified freq. | ICAL: Before analysis and when CC does not meet method requirements<br>CC: Method-specific | 95% |
| PAHs by EPA 8270E | See Table 5 | 20% RPD, 1 per 10 samples | Method: No target analytes>1/2 RL, 1/batch | Lab limits [b], Every sample | Lab limits [b], method-specified freq. | Lab limits [b], method-specified freq. | ICAL: Before analysis and when CC does not meet method requirements<br>CC: Method-specific | 95% |

# Table 4
## Measurement Quality Objectives
## West Coast Door Site SAP-QAPP
## Tacoma, Washington

**Notes:**

[a] Trip blanks will submitted with samples scheduled for analysis of VOCs.

[b] Laboratories limits are updated annually and subject to change.

-- = not applicable

**Abbreviations and Acronyms:**

% = percent
CC = continuing calibration
EPA = US Environmental Protection Agency
ICAL = initial calibration
LCS = laboratory control spike
LCSD = laboratory control spike duplicate
LR = laboratory replicate
MS = matrix spike
MSD = matrix spike duplicate
RL = reporting limit
RPD = relative percent difference
PAH = polycyclic aromatic hydrocarbon
VOC = volatile organic compound

# Table 5
## Sample Containers, Preservatives, and Holding Times
## West Coast Door Site
## Tacoma, Washington

| Parameter Group [a] | Analytical Method | Bottle [b] | Preservative | Hold Time [b] | Laboratory |
|---|---|---|---|---|---|
| **Soil** | | | | | |
| Volatile Organic Compounds | EPA 8260D | 3 x 40 mL VOA | Methanol, Cool to ≤6 °C | 14 days | Apex |
| Polycyclic Aromatic Hydrocarbons | EPA 8270E | 8 oz Glass Jar | Cool to ≤6 °C | 14 days/ 40 days | Apex |
| **Groundwater** | | | | | |
| Volatile Organic Compounds | EPA 8260D | 3 x 40 mL VOA | Hydrochloric Acid to pH<2, No Headspace, Cool to ≤6 °C | 14 days | Apex |
| Polycyclic Aromatic Hydrocarbons | EPA 8270E | 1 L Amber Glass | Cool to ≤6 °C | 7 days/ 40 days | Apex |

**Notes:**

a) Target analyte lists for each parameter group, by matrix, are provided in Table 3.
b) Extraction/Analysis

**Abbreviations and Acronyms:**

°C = degrees Celsius
Apex = Apex Laboratories, LLC
EPA = US Environmental Protection Agency
mL = milliliter
oz = ounce
VOA = Volatile Organics Analysis

APPENDIX A

# Field Forms

LANDAU ASSOCIATES

Exploration No. ____________________
Date__________Hour _____________

# Log of Exploration

Project Name________________________Project No. ____________________

Client/owner________________________Exploration Operator ________________

Exploration Method ______________________________________________

Logged by________________________Exploration Completed _______________

Ground Surface Conditions ________________________________________

Weather Conditions ______________________________________________

Location Sketch (show dimensions to mapped features)

North Arrow

(East) (North)

Coordinates: "x"__________"y"__________Method__________

Elevations______________________Datum _

Sampler and Hammer Information

a = 3.25-in. O.D. – D&M
b = 2.0-in. O.D. – SPT
c = Shelby Tube
d = Grab Sample
g = 2.5-in. O.D.– WSDOT
h = 3.0-in. O.D. – M.Calif.
i = ______________

1 = 300-lb./30-in. Drop
2 = 140-lb./30-in. Drop
3 = Pushed
4 = Vibrocore
5 = ______________

Water Level Information

| | | |
|---|---|---|
| Date | | |
| Time | | |
| Depth to Water | | |
| Hole Depth | | |
| Casing Depth | | |

| Sample Depth (top) (ft.) | Sample Length (ft.) | Recovery Length (ft.) | Retained Depth (top) (ft.) | Retained Length (ft.) | Sample Number | Sampler/Hammer Codes | Blow Counts | Other Test Data) ____ | USCS Symbol / Unit Contact | Depth Scale (ft) | Sample Description<br>Color, secondary soil type, PRIMARY SOIL TYPE with modifiers and minor components (density/consistency, moisture)(geologic unit) | Comments on Heave, Water Conditions, & Drilling Action |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 0 | | |
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| | | | | | | | | | | 8 | | |
| | | | | | | | | | | 9 | | |
| | | | | | | | | | | 0 | | |

Total Depth____________Finish Date________________Hour_____________Continued

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# Drum/Tank Inventory

Project Name ______________________________ Project Number ______________________________

Location ______________________________ Date ______________________________

Client ______________________________ Landau Representative ______________________________

| Drum/Tank Number | Date Generated | Contents | Estimated Quantity | Suspected Contaminants | Generation Source | Disposal Method / Date Disposed | Sketch of Site and Drum/Tank Location |
|---|---|---|---|---|---|---|---|
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# Field Report

Project No.: ______ Report No.: ______

Client: ______ Date: ______

Project Name: ______ DPD Permit No.: ______

Location: ______

Weather Conditions: ______

Prepared By: ______

Visitors: ______

Unsatisfactory Conditions & Recommended Correction: ______

Attachments: None______

Signed:______

| Location | Sample ID | Sample Depth (ft) | Date | Time | Analysis | Sample Description |
|---|---|---|---|---|---|---|
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Example sample ID:
Analysis:
PN: 2238001.010.013.031 (Injection Well Install)
2238001.010.014.041 (Performance Monitoring Well Install)

Signature

Date

# Utility Locate Checklist

Project Name ______________________________ Project No. ______________________________

Location ______________________________ Date ______________________________

Client ______________________________ Landau Rep. ______________________________

| Exploration Number (White) | TV & Telep. (Orange) | Lighting & Elect. (Red) | Fuel & Gas (Yellow) | Water (Blue) | Drains & Sewer (Green) | Access / Restriction | O.K. To Drill/Exc. | Remarks |
|---|---|---|---|---|---|---|---|---|
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# // GROUNDWATER LOW-FLOW SAMPLE COLLECTION FORM

Project Name: West Coast Door
Project Number: 2238001.010
Event: Baseline Sampling
Well ID: MW-12
Weather:
Sample ID: MW-12-
Landau Rep.:
Date:
Time:

## WELL INFORMATION

Screened Interval: Top (ft): 35.00 Bottom (ft): 45.00
Well Secure? ☐ No ☑ Yes
Damaged? ☑ No ☐ Yes
DTW After Cap Opened (ft): Time:
Describe:
Static DTW (ft): Time:
Flow-Thru Cell Vol.: 230 mL
WQM No.:
Begin Purge (Date/Time):
End Purge (Date/Time):
Gallons Purged: <1
Water Disposal: ☑ 55-gal drum ☐ Storage tank ☐ Ground ☐ Other:

## PURGE DATA

**Cell shading indicating purge stabilization is for informational purposes only.**

| Time | Temp (°C) | DO (mg/L) | Cond (µS/cm) | pH (S.U) | ORP (mV) | Turbidity (NTU) | DTW (ft) | Purge Vol ≥1 flow-thru cell vol. | Comments/ Observations |
|---|---|---|---|---|---|---|---|---|---|
| Stabilization → | ± 3% | ± 10% | ± 3% | ± 0.1 units | ± 10 mV | ± 10% | ± 0.00 ft | (Yes/No) | |
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Sample Description (turbidity, color, odor, sheen):
$Fe^{2+}$ (mg/L):

## PUMP AND MATERIAL INFORMATION

Collection Method: ☐ Bailer ☑ Pump Type: peri
Material: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ☑ Dedicated
Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☑ Dedicated
☐ Other (describe sequence):

## CONFIRMATION PARAMETERS (if applicable per Landau Field Manual)

☐ Applicable

| Time | Temp (°C) | DO (mg/L) | Cond (µS/cm) | pH (S.U) | ORP (mV) | Turbidity (NTU) | DTW (ft) | Comments/Observations |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| Scheduled Analysis (Circle/Bold Applicable) | | | | | | | Bottle Information Number | Type |
|---|---|---|---|---|---|---|---|---|
| *Volatiles:* | **8260** | 8260 SIM | 8021 | 524 | 624 | | 3 | 40 mL VOA (HCl) |
| *Semivolatiles:* | 8270 | **8270 SIM** | 8011 | 625 | | | 2 | 125 mL Amber (unpres.) |
| *Petroleum Hydrocarbons:* | NWTPH-HCID | NWTPH-Gx | NWTPH-Dx | NWTPH-Dx SGC | | | | |
| *Total/Dissolved Metals:* | 6010 | 6020 | 200.7 | 200.8 | 7471 | ☐ Field Filtered | | |
| *PCBs & Nitroaromatics:* | 8082 | 1668 | 608 | 8330 | | | | |
| *Dioxin-Furans:* | 1613 | 8290 | | | | | | |
| *PFAS:* | 1633 | 537.1 | 533 | SOP | | | | |
| *Conventionals:* | 300.0 | SM2450C | SM2450D | SM5310C | RSK175 | | | |
| *Other:* | | | | | | | | |

Duplicate or Parent Sample ID: FieldDup2
☐ MS/MSD
Comments:
Signature:
Date:

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# As-Built Well Completion Form

Exploration No.: ____________

Well No. (If different than Expl. No.): ________

Elevation of Well Cover ____________

Elevation Top of Well Pipe ____________

Client/Owner: ____________ Project No.: ____________

Project Name: ____________

Drilling Co.: ____________

LAI Rep(s): ____________

Installation Start Date: ____________ Hour: ________

Installation Finish Date: ____________ Hour: ________

Install Type(s): ☐ MW/PW ☐ Seismic/Inclino. ☐ VWP ☐ Extract/Recovery

**BORING AND WELL DIMENSIONS AND INSTALLATION DETAILS**

DOE Unique Well No.: ____________

Number of Instillations in Boring: ____________

Boring Diameter at Top of Hole: ____________

Does Diameter of Hole Change? ____________

Boring Diameter/Depth at First Step Down: ____________

Boring Diameter/Depth at Second Step Down: ____________

Depth to Water: ________ Date: ________ Time: ________

**Vibrating Wire Piezometer Installation Details**

Serial Number: ____________ PSI Rating: ____________

Transducer Depth: ____________

Unsat. Digits (surface): ____________

Unsat. Temp. (surface): ____________

Sat. Digits (surface): ____________

Sat. Temp. (surface): ____________

Downhole Digits: ____________

Downhole Temp. ____________

Remarks: ____________

____________

**MATERIALS USED**

________ Sacks of ____________ Sand

________ Sacks of ____________ Concrete/Cement

________ Sacks of ____________ Grout Mix Used

________ Sacks of Bentonite Chips

________ Feet of ________-inch PVC Blank Casing

________ Feet of ________-inch PVC Slotted Screen

________ Threaded End Cap

________ Waterproof Well Seal/Slip Cap

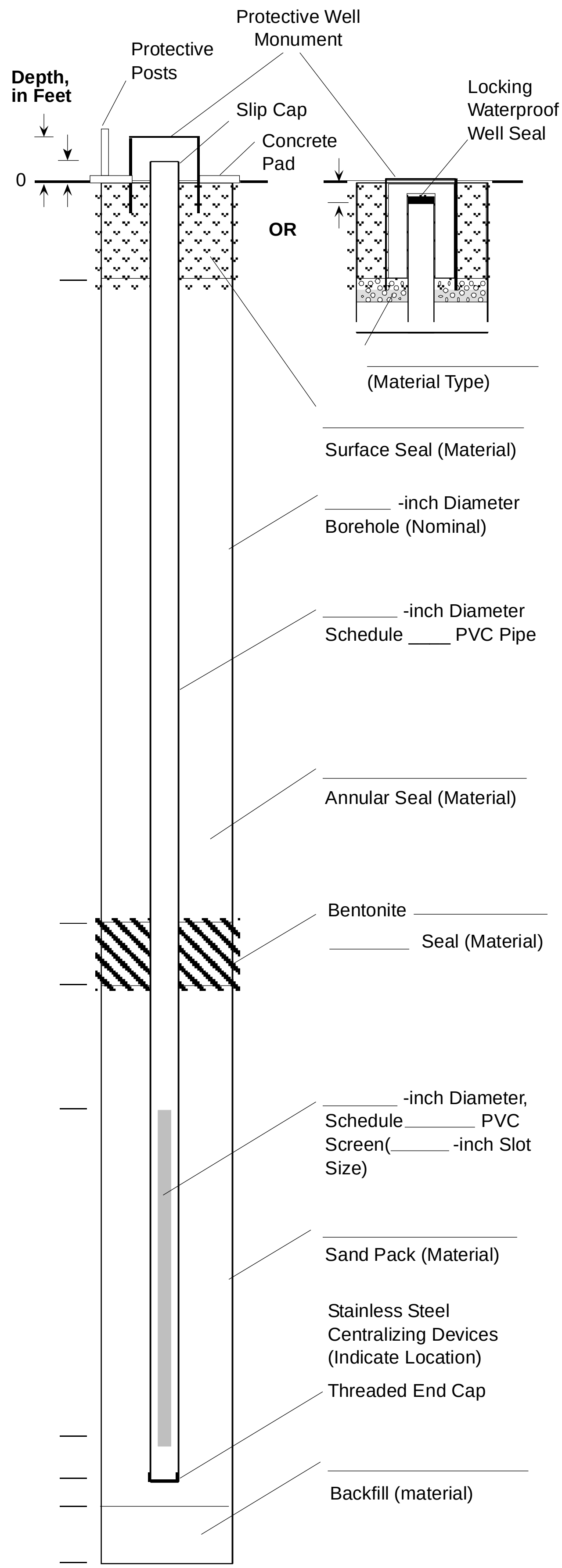
________ Flush Mount/Aboveground Protective Monument

________ Protective Posts

____________

____________

____________



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# Well Development Record

Project Name: ______________________ Project No. ______________________
Location: ______________________ Date: ______________________
Client: ______________________ Landau Representative: ______________________

Well Number: ______________________ Time: ______________________

Depth to Water: ______________________
Well Depth: ______________________
Casing Diameter: ______________________
Casing Volume: ______________________

**Volume of Schedule 40 PVC Pipe**

| Diameter (inch) | O.D. (inch) | I.D. (inch) | Volume (gal/ln ft) | Wt. Water (lbs/ln ft) |
|---|---|---|---|---|
| 1.25 | 1.660 | 1.380 | 0.08 | 0.64 |
| 2 | 2.375 | 2.067 | 0.17 | 1.45 |
| 4 | 4.500 | 4.026 | 0.66 | 5.51 |
| 6 | | | 1.47 | 12.24 |

Est. Purge Volume: ______________________

Method of Development: ______________________ Surge Block: Yes ______ No ______

Begin Development: Time: Final Volume Purged: ______________________
Finish Development: Time: Water Disposal: ☐ 55-gal drum ☐ Storage Tank ☐ Ground ☐ Other __________

Initial Water Quality: (Turbidity, Color, Odor, Other) ______________________ Initial Yield: _______
pH: ________ Temp: ________ Conductivity: ________ Turbidity: ___
Notes: ______________________

**Water Quality Notes:** ______________________

| Gallons | pH | Temperature | Conductivity | Turbidity | Comments |
|---|---|---|---|---|---|
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Final Water Quality: (Turbidity, Color, Odor, Other) ______________________
Final Yield: ______________________
pH: ________ Temperature: ________ Conductivity: ________ Turbidity: ________

Depth to Water After Development: ______________________ Well Depth After Development: ______________