# Compliance Monitoring Plan
# Coleman Oil Yakima Bulk Fuel

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|---|---|
| Site Name: | Coleman Oil Yakima Bulk Fuel |
| Site Address: | 1 East I Street, Yakima 98901 |
| Agreed Order: | DE 23182 |
| Ecology Site Cleanup ID: | 13200 |
| Facility/Site ID: | 4233 |

Prepared for:

Washington State Department of Ecology
Under Agreed Order DE 1563923182
Washington State Department of Ecology Toxics Cleanup Program
Central Region Office
Union Gap, Washington

June 5, 2025
PBS Project 41392.000

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PBS has prepared this report for use by Coleman Oil. The site is managed under a State Agreed Order, and it is understood that this report may become available to the public.

Findings and recommendations contained in this report represent PBS' professional opinions based on the currently available information and are arrived at in accordance with currently accepted professional standards. This Compliance Monitoring Plan will be used in conjunction with the Engineering Design Report for the Cleanup Action Plan for compliance with MTCA regulations (WAC 173-340).

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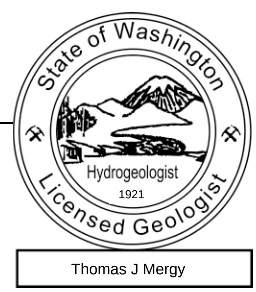

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Bgs | below ground surface |
| BTEX | Benzene, Toluene, Ethylbenzene, Xylenes |
| CAP | Cleanup Action Plan |
| COC | Contaminant/Chemical of Concern |
| CMP | Compliance Monitoring Plan |
| CPOC | Conditional Points of Compliance |
| CSID | Cleanup Site Identification number |
| CSM | Conceptual Site Model |
| CUL | Cleanup Levels |
| DCAP | draft Cleanup Action Plan |
| Ecology | Washington State Department of Ecology |
| EDR | Engineering Design Report |
| EIM | Ecology's Electronic Information Management system |
| FS | Feasibility Study |
| FSID | Facility Site identification number |
| MPE | Multiphase Extraction |
| MTCA | Model Toxics Control Act |
| NAPL | Non-aqueous phase liquid |
| Order | Agreed Order: DE 23182 |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| PCS | Petroleum contaminated soil |
| PLP | Potential Liable Parties |
| POC | Point of Compliance |
| RI | Remedial Investigation |
| RCW | Revised Code of Washington |
| SEB | Surfactant Enhanced Bioremediation |
| TPH | Total Petroleum Hydrocarbons |
| UST | Underground Storage Tank |
| VCP | Voluntary Cleanup Program |
| VOCs | Volatile Organic Compounds |
| WAC | Washington State Administrative Code |

# 1 INTRODUCTION

This compliance monitoring plan (CMP) has been prepared pursuant to the requirements of Agreed Order (No. DE 23182) to implement the cleanup action with other potentially liable parties (PLPs) and Washington State Department of Ecology (Ecology). The effective date of the Agreed Order is August 19, 2024 (Ecology, 2024). It is an attachment to the Engineering Design Report (EDR) and describes the monitoring to be performed as part of the cleanup action.

## 1.1 Monitoring Plan Purpose

The CMP for this cleanup action outlines the monitoring activities needed to ensure that cleanup actions are effective and that cleanup standards are met. This plan describes the compliance monitoring to be performed during construction and during operations and maintenance to meet the requirements of Washington Administrative Code (WAC) 173-340-410. A Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) meeting the requirements of WAC 173-340-820 is included. This plan also contains data analysis and evaluation procedures (including statistical methods) that will be used to demonstrate and confirm compliance, and justification for these procedures (WAC 173-340- 410(3)(b)).

## 1.2 Monitoring Plan Organization

The remainder of this monitoring plan is organized into the following sections:

- **Section 2—Background**. Section 2 provides a description of the site, summarizes the contaminants of concern and the monitoring network currently in place, and provides a summary of the site conditions.
- **Section 3—Compliance Monitoring.** Section 3 summarizes the rationale, monitoring locations, and schedule associated with compliance monitoring.
- **Section 4—Sampling and Analysis Plan**. Section 4 describes the methods and procedures to be followed during groundwater and air monitoring.
- **Section 5—Quality Assurance Project Plan**. Section 5 identifies QAPP procedures for groundwater monitoring and laboratory analysis.
- **Section 6—Reporting.** Section 6 provides the schedule for reporting of the groundwater monitoring.
- **Section 7—References.** Section 7 provides the references cited in the CMP.

# 2 BACKGROUND

## 2.1 Site Information

The Coleman Oil Company owns and operates the Yakima Bulk Fuel Plant (Site) located at 1 East I Street in Yakima, Washington. The approximate 1.0-acre property comprises one parcel (181313-14070) in Yakima, Washington, at the northeastern corner of the intersection of East I Street and the BNSF Railroad (see Site Vicinity Map, Figure 1). The property has operated as a bulk petroleum storage and distribution facility for over 60 years.

## 2.2 Summary of Site Investigations

Site characterization and interim action activities were completed at the Site from 2016 to 2023 as detailed in the *"Remedial Investigation and Interim Action Report, Coleman Oil Yakima Bulk Fuel" PBS, dated October 11, 2023,* and included the following:

- Advancement of 26 soil borings with soil samples analyzed at various depths
- Installation of 16 groundwater monitoring wells to permit groundwater sample and analysis

- Installation of one recovery well (RW-1)
- Shallow soil sampling to identify sources of contamination
- One heating oil underground storage tank (UST) decommissioning by removal and associated UST site assessment
- Excavation and off-site disposal of petroleum-contaminated soil
- Ongoing multiphase extraction (MPE) of non-aqueous phase liquid (NAPL) and contaminated water from recovery well RW-1
- Quarterly groundwater monitoring
- Vapor intrusion evaluation of adjacent structures

Groundwater flow is consistently to the southeast with an average gradient of approximately 0.015 feet per foot. The extent of groundwater contamination has been defined in the upgradient, downgradient, and lateral (east-west) directions by the monitoring well network at the Site, including the off-site BNSF monitoring wells BNSF MW1 and BNSF MW6, as shown on Figure 2. The contamination identified on the Coleman Oil Company property has migrated in the groundwater media south toward I Street and beyond the property boundary, and to the west toward the BNSF railway corridor. There are also three distinct areas of NAPL consisting of gasoline and/or diesel fuel present on the subject property and extending south toward the I-Street corridor.

### 2.3 Contaminants of Concern and Source Areas

The Remedial Investigation (RI) report concluded that the Site is impacted by two discrete and apparent releases of diesel and gasoline fuels to the subsurface that were identified in March and December 2016, respectively. There is also evidence of weathered petroleum in both the gasoline and diesel ranges that indicate prior undefined releases at the Site. The locations of both 2016 releases are depicted in Figure 2. The exact volumes of the respective releases are unknown.

The nature and extent of contamination in soil are well-characterized. Initial analysis of soil and groundwater included Total Petroleum Hydrocarbons (TPH) using Northwest Methods gasoline extended (Gx) and diesel extended (Dx), the full suite of volatile organic compounds (VOCs) using Environmental Protection Agency (EPA) Method 8260, Polycyclic Aromatic Hydrocarbons (PAHs) using EPA Method 8270C, and Resource Conservation and Recovery Act (RCRA) 8 metals using EPA Method 6010. Petroleum-contaminated soils remain at the Site in defined areas. The potential for petroleum vapor intrusion was evaluated and found to not be present in the existing on-site structures.

NAPL is present at several locations on the Site, including wells RW-1, MW-3, MW-4, MW-5, MW-8, MW-11, and MW-12. The locations of the product plumes are shown in Figure 2. The western extent of the petroleum in groundwater at the Site extends toward the BNSF railway line located approximately 20 feet west of the Coleman Oil Company property line and to the south toward MW-12. Analysis and visual assessment of NAPL samples by the laboratory indicate that the NAPL plume contains three distinguishable compositions.

- A mixture of fresh and weathered gasoline and diesel fuels
- A mixture of fresh and weathered diesel fuel only
- Weathered diesel fuel only

The RI (PBS, 2023) concluded that the following eight contaminants of concern (COCs) are present at the Site within the source areas.

| Soil COCs | Groundwater COCs |
|---|---|
| TPH as gasoline-range organics | TPH as gasoline-range organics |
| TPH as diesel-range organics | TPH as diesel-range organics |
| TPH as heavy oil-range organics | Benzene |
| Naphthalene | Toluene |
| Cadmium | Ethylbenzene |
| Lead | Xylenes |
| | Naphthalene |

### 2.4 Points of Compliance and Monitoring Well Network

Groundwater standard points of compliance are for protection of drinking water and would extend vertically from the uppermost level of the saturated zone to the lowest depth potentially impacted by the releases. Standard points of compliance for groundwater are established under this CAP. The groundwater points of compliance include all monitoring well locations at the Site.

There are 16 monitoring wells and one existing recovery well (RW-1) located at the project Site (see Figure 2). For reference, the boundaries of groundwater contamination, as defined where groundwater concentrations are compliant with cleanup levels (CULs), include the following sentinel monitoring wells:

| Direction | Soil Boring/Monitoring Well | Reference/Consultant |
|---|---|---|
| North | MW7, MW9 | Remedial Investigation |
| South | MW14, MW16 | Remedial Investigation |
| East | MW9, MW10, MW16 | Remedial Investigation |
| West | MW7, BNSF-MW1, BNSF-MW6 | Remedial Investigation |

### 2.5 Summary of Cleanup Action

Ecology selected Alternative 2 Surfactant Enhanced Bioremediation (SEB) in the Cleanup Action Plan (CAP) in July 2024 (CAP, 2024). The selected cleanup action complies with Model Toxics Control Act (MTCA) requirements, addresses concerns of Coleman Oil Company and the public, and maximizes the benefit/cost ratio.

The selected cleanup action will employ SEB using a designed injection/recovery treatment system. Surfactant technology has the unique ability to selectively desorb contaminants and make NAPL miscible in the aqueous phase for enhanced mass removal. The surfactants will also desorb contamination from the soil surfaces or from NAPL layers, making them more available for in situ or ex situ remediation. The liberated contaminated water is then more biologically available for microbial (bacteria) and associated enzymatic degradation. The NAPL and contaminated water is collected through recovery wells, pumped into a treatment system, and then reinjected into the impacted areas to create a recirculation treatment zone.

It is expected that the Alternative 2 SEB recirculating system, NAPL recovery, and supplemental biological treatment may take five years of operation to reach the CULs. Achievement of CULs would be evaluated and confirmed by groundwater monitoring performed throughout and following remediation. Compliance groundwater monitoring will be required during and following completion of the cleanup action.

### 2.6 Institutional/Engineering Controls

The cleanup action includes engineering and institutional controls to protect human health and the environment from residual contamination in soil and groundwater in accordance with WAC 173-340- 440.

Institutional controls at the Site include perimeter fencing and gates restricting access to the project facility and informational signage posted around the Site. The gates are locked every day after operation hours by the facility staff.

During implementation of the cleanup action, interim engineering controls including construction fencing/securing the work area would be used to minimize exposure to contaminated soil. Following construction, engineering controls will include replacement of asphalt pavement over excavation or trench areas, removal of the treatment system components, and the decommissioning of monitoring or recovery wells in accordance with WAC 173-160-460.

Based on remedy performance criteria review as described in the EDR, institutional controls may be considered in the form of a restrictive environmental covenant on the property to protect human health and the environment from exposure to soil remaining on site exceeding MTCA Method A CULs. The restrictive covenant would, at a minimum, require notifications for conducting intrusive activities at the Site within the zone of residual soil contamination. The use of Site groundwater as a drinking water source would also be prohibited.

The restrictive covenant would be recorded prior to completion of the cleanup actions, if required. An Institutional Controls (IC) Plan would be developed prior to completion of the cleanup action. The IC Plan would prescribe periodic inspections of the Site, including the integrity of asphalt pavement. The IC Plan would be reviewed and updated every five years as part of the periodic review process. Appendix C to the Cleanup Action Plan Agreed Order includes a template for an environmental covenant.

# 3 COMPLIANCE MONITORING

Compliance monitoring consists of protection monitoring, performance monitoring, and confirmational monitoring. Protection monitoring confirms that human health and the environment are adequately protected during construction and operation of the cleanup action. Performance monitoring confirms that the cleanup action has reached cleanup and/or performance standards, including the Site CULs listed in Section 2.3. Confirmational monitoring confirms the long-term effectiveness of the cleanup action once cleanup standards are attained.

Health and safety hazards associated with this cleanup include exposure to site contaminants during deployment of the in-situ bioremediation system and groundwater sampling activities. Monitoring for protection of human health and the environment will be addressed in a project-specific Health and Safety Plan (HASP). The HASP supports protection monitoring by specifying emergency procedures, site hazards, protective clothing, equipment, and monitoring required for the protection of human health and the environment during field activities.

## 3.1 Protection Monitoring

Protection monitoring is short-term monitoring conducted to “confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action as described in the safety and health plan” (WAC 173-340-420(a)).

As discussed in Section 3.4, health and safety hazards associated with this cleanup action include exposure to site contaminants during in-situ treatment deployment and groundwater sampling activities. Monitoring for protection of human health and the environment will be addressed in a project-specific HASP. The HASP supports protection monitoring by specifying emergency procedures, site hazards, protective clothing, equipment, and monitoring required for the protection of human health and the environment during field activities.

## 3.2 Performance Monitoring

Performance monitoring is short-term monitoring that confirms that the cleanup action has attained cleanup standards (WAC 173-340-410(1)(b)).

Performance monitoring will begin with semiannual events during the quarter prior to the start of the in-situ bioremediation system.

Performance monitoring during the SEB system starting in 2026 will continue with semiannual events during the spring and fall until the COC concentrations are below the CULs for two sequential events.

### *3.2.1 Bioremediation Injection Monitoring*

Reagent distribution and initial treatment performance will be monitored during injections using field monitoring. Injection pressures and water levels will be monitored during injections to evaluate reagent distribution. Changes in water levels are indicative of reagent distribution. Groundwater quality parameters (pH, dissolved oxygen [DO], temperature, and oxygen-reduction potential [ORP]) will be monitored before and after the injections to confirm biologic, nutrient, and surfactant distribution.

Water levels and groundwater quality parameters will be monitored in the on-property wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-8, MW-9, and MW-10). See Table 2 for designated monitoring locations and Table 3 for designated water quality analysis parameters.

### *3.2.2 NAPL Monitoring*

Performance monitoring for NAPL in groundwater includes a proposed remediation level for NAPL thickness of 0.05 feet (or 0.6 inches), indicating recovery of NAPL to a maximum extent practicable that is not consistently recoverable, and the remaining NAPL impacts are immobile. The NAPL remediation level must be met for four-quarterly periods to meet the criteria. The NAPL thickness will be measured on a quarter-annual basis in monitoring wells and extraction wells using an oil/water interface probe to record to the nearest 0.01 feet.

Per WAC 173-340-355, a remediation level defines the concentration of a hazardous substance in an environmental medium at which a particular cleanup action component will be used. If the proposed cleanup action does not result in a reduction of NAPL thickness to below the remediation level within the restoration timeframe of 5 years, additional cleanup actions may be performed to further reduce NAPL thickness.

**NAPL Transmissivity to Track NAPL Recovery Progress**

NAPL transmissivity describes the capacity of aquifer materials to transmit NAPL. NAPL transmissivity is a function of the NAPL saturation and relative permeability of porous media to NAPL flow. It is possible to estimate NAPL transmissivity values from recovery data for groups of wells or trenches, or entire hydraulic recovery systems. As NAPL is recovered from the subsurface, the NAPL saturation decreases, and it is expected that the NAPL transmissivity will decrease as a result. An analysis of NAPL transmissivity over time can provide a gauge of the progress towards completion of hydraulic recovery. The benefit of using NAPL transmissivity as compared to tracking NAPL recovery volumes is that NAPL transmissivity can normalize changes in system operation that may result in increased NAPL production.

The transmissivity evaluation for an NAPL recovery system showing progress over time is based on collecting data of the NAPL recovery (gallons) and the gallons of water pumped or recovered over time. This data is then graphed and the NAPL transmissivity value is calculated. The resulting NAPL transmissivity curve will show when the NAPL transmissivity peaks and when it shows decreasing return throughout operation of the remediation system.

The data collection and data analysis procedures for this LNAPL transmissivity measurement methods are discussed in detail by ASTM E2856-13: ASTM Standard Guide for Estimation of LNAPL Transmissivity (ASTM 2013).

### *3.2.3 Groundwater Monitoring*

Groundwater monitoring wells across the Site are used to monitor the effectiveness of remedial measures and track changes in contaminant concentrations and distribution over time.

Given the availability of historical data, the overall declining trend in COC concentrations, and due to the low hydraulic gradients measured at the Site not being conducive to rapid transport of COCs in groundwater, performance monitoring will initially be conducted at the Site semiannually before and during the in-situ bioremediation system operation.

- Performance monitoring will begin with semiannual events during the fall of 2025 before in situ bioremediation deployment.
- Performance monitoring during in situ bioremediation deployment starting in Q4 2025 will continue with semiannual events during the spring and fall until the COCs concentrations are below the CULs for two sequential events.
- Performance monitoring will then continue without in-situ bioremediation deployment for one additional year before transitioning to confirmation monitoring.

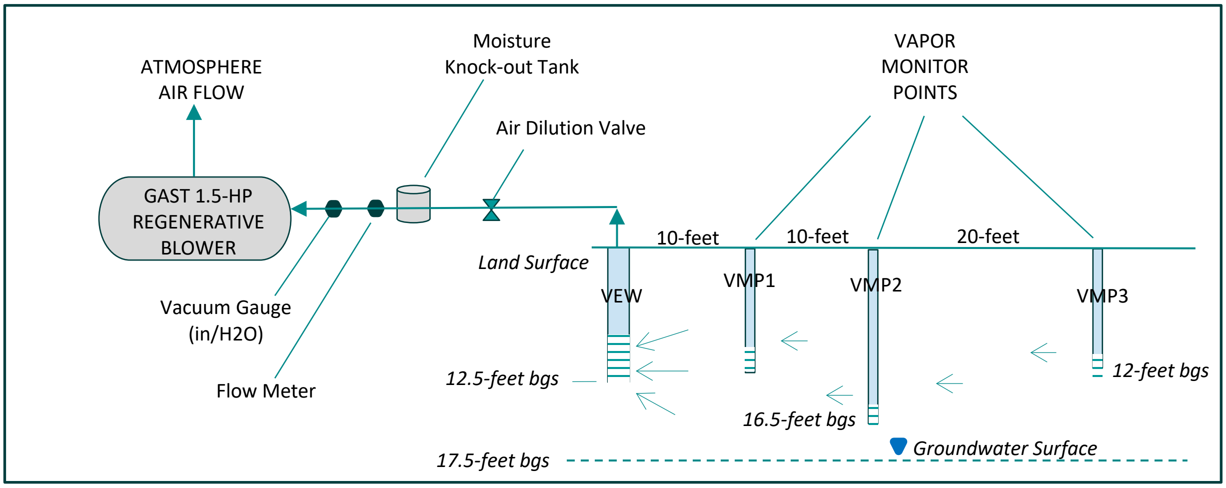
### *3.2.4 Air/Vapor Monitoring (Contingent)*

The soil vapor extraction (SVE) pilot test in 2024 demonstrated the effectiveness of the system in creating a substantial radius of influence for vacuum propagation and hydrocarbon removal. If remedy performance criteria review considers SVE, an SVE system would draw vapors from one vapor extraction well (VEW-1) and the four extraction wells (EW) by a regenerative blower system. The SVE system's performance would be measured using the following criteria:

Vacuum measurements in three vapor monitoring points (VMP1, VMP2, and VMP3) would be conducted on a monthly schedule to confirm radius of influence. The primary vapor monitor points would include:

- VMP1: 10 feet from VEW1
- VMP2: 20 feet from VEW1
- VMP3: 40 feet from VEW1

Influent and effluent air photoionization detector (PID) readings would be collected at the SVE blower piping to record the total VOCs in influent and effluent soil vapors. One vapor sample would be collected on a quarterly schedule from the SVE effluent, post carbon filter, and analyzed using EPA Method TO-15 for VOCs.




**SVE Contingent Schematic**

### 3.3 Confirmational Monitoring

Confirmational monitoring is long-term monitoring performed following the completion of the cleanup action to verify its long-term effectiveness (WAC 173-340-410(c)) (i.e., the site remedy is performing as expected over time).

After compliance with CULs has been demonstrated through performance monitoring, confirmation monitoring will then verify over two additional sequential semiannual events without in situ bioremediation deployed that the COCs remain below the CULs within the compliance monitoring well network. Confirmational monitoring needs to be conducted to ensure that contaminant levels do not rebound and exceed the CULs under high- and low-level groundwater conditions.

Groundwater compliance monitoring will include groundwater sampling and analysis of TPH as diesel and gasoline, naphthalene, and benzene, toluene, ethylbenzene, and total xylenes (BTEX). The details of the compliance monitoring program are presented in Table 2: Summary of Compliance Groundwater Monitoring Frequency and Table 3: Analytical Methods and Sample Handling Details.

When groundwater monitoring results indicate that cleanup objectives have been met, a Groundwater Completion Report will be prepared and submitted to Ecology for review and approval. After the cleanup standards have been met, the monitoring wells will be removed and closed in accordance with the Minimum Standards for Construction and Maintenance of Wells, WAC 173-160-381 and Water Well Construction, Chapter 18.104 of the Revised Code of Washington.

Ecology will perform periodic reviews in accordance with WAC 173-340-420 to evaluate the effectiveness of the cleanup action and assess contaminant trends in groundwater. The first periodic review will take place no more than five years after the cleanup action has commenced, which is considered to occur for five years after the in-situ bioremediation is initially deployed. After groundwater CULs have been achieved, periodic reviews will still be required because ICs are a part of the remedy.

### 3.4 Health and Safety

PBS will be responsible for the health and safety of its employees and subcontractors (if any) performing the work described in the report. A HASP will be developed to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the Site. A copy of the HASP will be provided to Ecology as consistent with WAC 173-340-815 prior to the start of construction and system implementation.

Before the start of work, PBS and subcontractors will review the project-specific HASP and perform a hazard assessment to ensure that all appropriate front-end safety planning is in place. Upon arrival for a sampling event, the PBS field team will participate in a safety kickoff meeting with Coleman Oil Company representatives to review site-specific safety concerns and requirements. Morning tailgate safety meetings will also be held daily and documented in the daily field report.

HASPs are considered “living” documents in that they are constantly being updated as site conditions dictate. Updates to the HASP will be performed as needed.

# 4 SAMPLING AND ANALYSIS PROCEDURES

## 4.1 Sampling Methods

### *4.1.1 Purging, Stabilization, and Sampling: Monitoring Wells*

Field personnel collecting groundwater samples will follow PBS’ Standard Operating Procedure (SOP) for Low-Flow Groundwater Monitoring, a copy of which is provided in Appendix A. Field conditions may warrant changes to the SOP to ensure achievement of the DQOs. One-time deviations from the SOP will be discussed in the quarterly groundwater monitoring reports. Permanent changes to the SOP will be communicated to Coleman Oil Company and Ecology for concurrence and should be included as future amendments to this plan.

### *4.1.2 NAPL Monitoring Measurements*

Water levels in wells subject to NAPL monitoring will be measured using an electronic interface meter. The depth to the NAPL layer and depth-to-water surface will be recorded. The thickness of NAPL will be calculated as depth to NAPL minus depth to water. Wells will be measured in increasing order of analytical concentrations, and the probe will be decontaminated between wells.

If an NAPL layer is measured, no groundwater sampling from beneath the NAPL layer will be performed due to cross-contamination risk.

### *4.1.3 Sample Labeling*

Each sample will be assigned a unique alphanumeric sample identification code. The code will contain sufficient information to identify the overall Site location and sample medium. The code will consist of three alphanumeric strings separated by hyphens (Site ID – Well ID – MonthYear). The first string will consist of the three letters “COY” to designate the overall Site as Coleman Oil Yakima. The second string will consist of the sampling point identification code (e.g., MW3, EW1, RW1, etc.). For groundwater samples, which are collected as part of an ongoing monitoring program, the final string will indicate the month and year of sample collection; thus, the sample identification code COY-MW3-0925 represents a sample collected from sampling point MW-3 during September 2025 as part of the routine groundwater monitoring program.

In the case of a nonroutine sample, or when a second sample is collected during the same month, the sample name will contain the month, day, and year (e.g., COY-MW3-091525).

Duplicate samples will be labeled as blind samples, using DUP1, DUP2, DUP3, etc. in place of the well ID, and will have a sample time different than the parent sample (typically 12:00); therefore, a field duplicate collected at well MW-3 during January 2026 will have a sample name of COY-DUP1-0126. The analytical laboratory will not be informed of where the duplicate samples were collected and cannot surmise the location based on the time of collection. For samples with short hold times, the sample time for the duplicate will be later than the parent sample to ensure extraction occurs within the hold time.

A label will be affixed to all sample containers to prevent misidentification of samples. At a minimum, the label should include the following:

- Location, client, or project number (i.e., Coleman-Yakima, PBS);
- Sample identification code;
- Date and time of collection;
- Analysis; and
- Preservative.

Blind duplicate, matrix spike (MS), and matrix spike duplicate (MSD) sample names and actual sample locations will be recorded in the field notebook. Each sample will be checked and recorded on the chain-of-custody (COC) forms prior to being released to the laboratory.

#### *4.1.4 Field Documentation—Groundwater Monitoring*

Information pertinent to work performed at the Site will be recorded on field forms or in logbooks during performance of that activity. Appendix B contains sample field forms, which may be used for water level measurement collection and groundwater monitoring (purge and sampling) activities. Documentation by PBS will be electronically stored on the PBS server.

#### *4.1.5 Chain-of-Custody Procedures*

The COC procedures will document sample transfer, possession, and integrity from collection through analysis. A COC form will be filled out at the time of sampling. The COC form shall contain the sample number, date, and time of sampling (a blind sample time, typically 12:00, may be used for field duplicate samples), and the laboratory analysis requested for each sample. Each party handling the sample bottles will sign the COC form. If samples are shipped, the COC form will indicate the shipper, date, and approximate time the samples were shipped along with the tracking number if available.

Custody seals shall be used to seal each cooler prior to transport by courier or other shipping agent. A signed and dated custody seal will be affixed across the opening of each cooler. Each cooler shall be sealed prior to transfer to the sample transportation agent.

#### *4.1.6 Sample Preservation and Handling*

Sample bottles, preservatives, and holding times for constituents to be tested are listed in Table 3. All sample bottles should be pre-cleaned and certified, supplied by the analytical laboratories for each sampling event, and include the appropriate preservatives. During the field day, sample bottles will be placed in insulated coolers packed with ice to cool them to approximately 4°C (40°F). Samples will be transferred to a refrigerator in the work trailer during the day as needed to maintain contents at or below 4°C (40°F).

#### *4.1.7 Field Instrument Calibration*

Calibration of the water quality meter (YSI Professional Plus or similar) and turbidity meter (LaMotte 2020 or similar) will follow manufacturer recommendations. Calibration will be performed at the start of each day using the auto-calibration mode and required standard solution(s). Calibration of the turbidity meter will also occur at the start of each day using standards for 0.0, 1.0, and 10 nephelometric turbidity units (NTUs).

## 4.2 Decontamination Procedures

Equipment and material contacting potentially contaminated material or the sample medium will be discarded after use and replaced or decontaminated in accordance with the procedures listed below. Materials to be discarded, including decontamination solutions, will be handled according to the Handling of Investigative-Derived Waste in Section 4.3.

The following decontamination procedures take into account that no running water is available on site; therefore, bottled water will be used for decontamination.

The probe and tape of the electronic water level indicator and interface meter, water-quality field parameter sensors, and flow cell will be decontaminated by washing with phosphate-free detergent (Alconox or similar) and rinsing with bottled water. No other decontamination procedures are recommended for the water level or interface probes. After the sampling event, the flow cell and multimeter sensors will be cleaned and maintained in accordance with the equipment manual.

Non-dedicated submersible pumps and other reusable equipment will be decontaminated by the following procedures:

- Wash the outside of the pump, tubing, and electrical cable with phosphate-free detergent (Alconox or similar), and double rinse with bottled water. Use a brush to remove visible dirt or contaminants.
- Place the pump in a bucket so that it is completely submerged. Add a small amount of detergent to the water.
- Place the discharge tubing back in the bucket, start the pump, and recirculate the soapy water for two minutes.
- Redirect the tubing into a bucket for storage and disposal. Pump the soapy water out of the bucket and add clean water. Continue to pump until soapy water is no longer visible.
- Put the pump into a second bucket of water and rinse.

For drill rigs, augers, split spoons, drill bits, etc. used during installation of new wells, decontamination will be performed with a steam cleaner between zones and between borehole locations.

The procedures for the decontamination of personnel are presented in the HASP for the site.

## 4.3 Handling of Investigation-Derived Waste

Investigation-derived waste (IDW) will consist of decontamination water, monitoring well purge water, sampling materials (e.g. sample tubing), and personal protective equipment (PPE). Waste generated during the bioremediation injection will be removed by the drilling subcontractor.

IDW will be placed in properly labeled drums and stored at a pre-approved location on the Site, pending receipt of chemical data to be used for profiling the waste for disposal. Based on the results, IDW will be transported to a Subtitle C (hazardous waste) or Subtitle D (non-hazardous waste) landfill according to WAC 173-303, Dangerous Waste regulation. for disposal or treatment. IDW consisting of sampling materials and PPE will be bagged and disposed of as solid waste under the state Solid Waste regulations.

# 5 QUALITY ASSURANCE PROJECT PLAN

Quality assurance and quality control (QA/QC) procedures include field, laboratory, and data validation procedures.

## 5.1 Field QA/QC

### *5.1.1 Field QA/QC Samples*

Field QA/QC samples include field duplicates, MS/MSD, and trip blanks. Field duplicates and MS/MSD samples will be collected at a minimum of 5% frequency (i.e., 1 per 20 field samples). Field duplicates will be collected to check reproducibility of field and laboratory procedures and indicate homogeneity. In order to keep the location of the field duplicate samples unknown to the laboratory, field duplicates will be labeled with a "DUP" sample ID and time, as indicated in the Sample Labeling section (Section 4.1.3) above.

MS/MSD samples will be collected to check accuracy and precision of analyses for the sample matrix. Two additional volumes of sample will be collected along with the parent sample for laboratory MS and MSD analyses. The MS and MSD samples will be labeled the same as the parent sample.

Trip blanks will be used to check contamination of VOC samples during handling, storage, and shipment from the field to the laboratory. A set of trip blank vials will be carried along with empty vials during field activities in order to subject them to the same sampling and handling protocols. Each cooler containing VOC samples will include one set of trip blank vials. To ensure sufficient volume for VOC analysis, each trip blank will consist of two 40 milliliter (mL) volatile organic analysis (VOA) vials filled with analyte-free water. Trip blanks will be provided by the laboratory and labeled in the field. As specified for the field samples, each trip blank will be submitted for laboratory analysis by both EPA method 8260.

QA/QC samples are collected and analyzed to assess the quality of the sampling and analysis by both the field personnel and the laboratory. For samples sent to the laboratory, field QA samples will be collected as provided below.

**Summary of Field QA/QC Samples:**

| Laboratory | QA/QC Sample | Purpose | Frequency | Number of Samples per Quarterly Event |
|---|---|---|---|---|
| Analysis by Laboratory | Field Duplicate | Precision | 10% | Three |
| Analysis by Laboratory | MS/MSD | Accuracy | 5% | Two |
| Analysis by Laboratory | Trip Blank | Cross-Contamination Check | One per cooler containing 40 mL VOAs | Varies |

### *5.1.2 Sample Custody*

Samples will be shipped overnight, transported on the same-day by a courier service, or hand-delivered to the laboratory for chemical analysis. Samples will be delivered to laboratory sample receiving staff (sample custodian).

Custody seals will be used to maintain sample integrity and indicate potential sample tampering or contamination if broken. A custody seal will be placed on each cooler after packing and prior to transfer to a courier or transportation company. The custody seal will be signed and dated and taped across the opening of each cooler.

COC records will be used to document the exchange and transport of samples from the field to the laboratory. A COC record will be prepared for each batch of samples submitted to the laboratory. The COC lists every sample, duplicate, MS/MSD, trip blank, and the laboratory analyses requested for each sample. A copy of the COC will be signed and dated by the sampler. If a courier is used to transport the samples to the laboratory, the courier will sign that (s)he has received the samples and will sign the COC again when handing them over to the laboratory. The COC record will accompany the courier and the cooler(s), which will be custody-sealed and taped closed.

## 5.2 Laboratory QA/QC Program

### *5.2.1 Sample Receiving*

Upon receipt of the shipping container, the laboratory will accept official custody of the samples by signing the COC. The laboratory will inspect the custody seal for integrity. All bottles in the cooler will be checked against the COC. The samples submitted will also be checked against analytical requirements in Table 3. Any inconsistencies or problems with a sample shipment (such as extra or missing bottles and breakage) will be reported to the samplers, project manager, or laboratory QA/QC Coordinator for immediate resolution. Any required changes to the COC will be initialed and dated by the laboratory and the revised COC will be included with the laboratory report. When any/all problems are resolved, the corrective action will be documented and included in the laboratory report. The samples will be handled in accordance with internal laboratory custody procedures and tracked accordingly.

### *5.2.2 Method Detection Limits and Reporting Limits*

The tabulated laboratory-specific method detection limits and requested reporting limits for all compounds to be analyzed in the groundwater program are presented in Table 3.

### *5.2.3 Analytical Turnaround Time*

The analytical turnaround time (TAT) is defined as the date of sample receipt at the laboratory to the date the final laboratory report is submitted by the laboratory. The TAT for a full data validation package is expected to be no more than four weeks unless expedited turnaround is specifically requested.

### *5.2.4 Laboratory Calibration Procedures and Frequency*

Initial calibration, continuing calibration verification, and any performance check of laboratory analytical systems should be carried out prior to any sample analysis in accordance with method requirements and laboratory SOPs.

### *5.2.5 Laboratory Data Reduction, Validation, and Reporting*

#### *5.2.5.1 Laboratory Data Reduction*

All data reductions performed in the laboratory should be carried out in accordance with the laboratory SOPs and in compliance with the laboratory quality assurance manual.

#### *5.2.5.2 Laboratory Data Validation*

The principal criteria that will be used by the laboratory to validate the data integrity prior to data reporting are:

- Verification by the laboratory QC officer that all raw data generated have been properly stored and documented in electronic or hard copy and that storage locations in the laboratory are coincident with COC records;
- Examination of the raw data by the laboratory's analysis coordinator to verify adequacy of documentation and check the accuracy of calculations;
- Confirmation that calibration standards are within the expected values;
- Reporting of all associated blank, duplicate, spike, standard, and QC data compared with results for analyses of each batch of samples; and
- Reporting of all analytical data for samples with no values rejected as outliers because of the completeness goal of 95% for the analytical support of this project.

*5.2.5.3 Laboratory Reporting*

All laboratory analytical results will be delivered as an electronic data deliverable as well as in electronic or hard copy report format. Data deliverables will include a report in an Adobe PDF file, a Microsoft Excel file in Washington State EIM format, and a domain data management service (DDMS) database data upload package or other data package requested.

### *5.2.6 Internal QC Checks*

Internal QC checks will be performed in accordance with the analytical methods and laboratory SOPs, whichever is more stringent for each method. The routine internal QC program will include daily calibration and calibration verification of instruments using certified standards as required. Glassware will be checked for cleanliness and for detergent removal prior to each analysis run. Nanograde quality solvents will be used for trace organic applications. Each lot of solvent will be checked to demonstrate its suitability for the intended analysis.

The following laboratory QC samples will be run at a minimum frequency of 1 for every 20 samples (or preparation batch):

- Method blanks will be used to demonstrate that all analytical materials (i.e., reagents, glassware, and solvents) are free of interferences.
- Field samples will be spiked to assess accuracy.
- Duplicates of field samples will be randomly selected and analyzed to document the precision of the analysis.
- A laboratory QC check sample will be analyzed with each analysis batch.

### *5.2.7 Specific Procedures for Routine Assessment of Data Precision, Accuracy, and Completeness*

The procedures in this section will be used to assess QC data. Field or laboratory duplicate samples and laboratory replicate analyses will be used to assess precision. Field or laboratory spike samples will be used to measure accuracy. Check samples will be used to evaluate comparability of the analytical results. These techniques are described in the following EPA documents:

- *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*, SW-846, Third Edition through Final Update V or subsequent revision. https://www.epa.gov/hw-sw846.
- *National Functional Guidelines for Superfund Organic Methods Data Review*, Office of Superfund Remediation and Technology Innovation (OSRTI), EPA, January 2017, OLEM 9355.0-136, EPA-540-R-2017-002.

- *National Functional Guidelines for Inorganic Superfund Data Review*, OSRTI, EPA, January 2017, OLEM 9355.0.135, EPA-540-R-2017-001.

*5.2.7.1 Assessment of Precision (Split, Duplicate, or Replicate Measurements)*

Replicate analysis of the same sample and analysis of duplicate or split samples will be evaluated by calculating the relative percent difference (RPD):

$$RPD = \frac{X1 - X2}{mean} \times 100$$

$$Mean = \frac{X1 + X2}{2}$$

*X*1 = the first result in the set
*X*2 = the second result in the set

*5.2.7.2 Assessment of Accuracy (Surrogate Spike Recovery)*

Surrogate spike recovery will be evaluated by calculating the ratio of concentration of the surrogate concentration measured in the sample relative to the actual amount of spike in the sample.

Surrogate recovery is calculated for liquid samples as:

$$\%\ Recovery = \frac{CsVs}{Qs} \times 100$$

*Cs* = measured concentration of surrogate compound in sample in
$\mu$g/L *Vs* = total volume of sample to which the surrogate was added in
liters *Qs* = quantity of surrogate compound added to the sample in $\mu$g

*5.2.7.3 Assessment of Accuracy (Blank Spike and Matrix Spike Recovery)*

The percent recovery for spike samples will be calculated by the ratio of the concentration measured in the spiked sample (or blank) relative to the known quantity of spiking solution added to a sample matrix.

Blank spike or matrix spike recovery is calculated as:

$$\%\ Recovery = \frac{Ct - Cb}{Cs} \times 100$$

*Ct* = total concentration measured in spiked sample (or spiked blank);
*Cb* = concentration measured in an aliquot of the sample (or blank) prior to spiking; and
*Cs* = resulting concentration of the addition of a known quantity of the spiking compound to a known quantity of the sample matrix.

All measurements and results used to calculate a given percent recovery will be in the same units of concentration.

#### *5.2.7.4 Completeness*

The completeness of the field sampling effort is defined as the percentage ratio of the number of samples received at the laboratory in a condition suitable for analysis divided by the number of samples to be collected as defined in the project specifications.

The completeness of the analytical effort is expressed as the percentage ratio of analytical results that meet the project QA requirements divided by the number of samples received at the laboratory in a condition suitable for analysis.

### 5.3 Data Validation Program

Data quality review and validation will be performed by personnel with experience and training in analytical chemistry, laboratory analytical QA/QC procedures, and EPA guidelines governing laboratory analytical data review. This includes verification and validation based on completeness and compliance checks of sample receipt conditions and both sample-related and instrument-related QC results. Stage 2b data validation (as defined in EPA 2009) will be performed on all data collected during routine quarterly/semiannual groundwater monitoring.

The validation procedures followed the requirements specified in the following documents (referenced above), as applicable:

- *National Functional Guidelines for Superfund Organic Methods Data Review*.
- *National Functional Guidelines for Inorganic Superfund Data Review*.

### 5.4 Analytical Laboratories:

Analytical testing methods, sample container requirements and storage conditions are provided in Table 3. Sampling containers will be fully filled to minimize head space and will be appropriately labeled and stored prior to shipment or delivery to the laboratory.

Sample container type, preservation, or quantity may be adjusted to meet laboratory analytical requirements or updates in EPA analytical methods. Additional container volume required for QA purposes will be as required by the laboratory.

## 6 REPORTING

### 6.1 Progress Reports

In accordance with the Agreed Order, Coleman Oil Company (lead entity for PLPs) is required to provide monthly progress reports for the Site during active design and remedial construction and semiannual progress reports upon completion of all remedial construction operations and commencement of routine operations and maintenance activities.

The monthly progress reports shall contain the following project-related information:

- A list of on-site activities that have taken place during the reporting period.
- A detailed description of any deviations from the required tasks not otherwise documented in project plans or amendment requests.
- Descriptions of all deviations from the scope of work (SOW) and schedule or from the applicable Operations and Maintenance (O&M) Plans for the current reporting period.
- Planned deviations in the upcoming reporting period.

- For any deviations in schedule, a plan for maintaining compliance with the schedule.
- All raw data (including laboratory analysis) received during the reporting period.
- The sample data will be uploaded to Ecology's Electronic Information Management (EIM) system, following data validation and prior to submittal of hard copy reports.
- A list of deliverables for the upcoming reporting period if different from the schedule.

### 6.2 Semiannual Groundwater Monitoring Reports

Semiannual groundwater monitoring reports will contain the following:

- The groundwater monitoring portion of the semiannual progress report will be developed in accordance with WAC 173-340-720(9).
- A brief summary identifying the report, its basis, and any unusual or exceptional conditions encountered during the semiannual groundwater monitoring event. Such conditions may include wellhead damage, pump failure, or other items that were observed during monitoring. A summary of IDW treatment or disposal will also be included in semiannual reports.
- Tabulated summaries of laboratory and field data from semiannual sampling. Laboratory analytical data will be presented for detected compounds only. Field data will include final well stabilization parameter measurements and groundwater elevation data.
- Graphical depictions of water table elevations.
- Graphical depictions of the spatial distribution of analyte concentrations exceeding CULs during the semiannual monitoring event will be presented as an isoconcentration contours map.

The second semiannual report will also serve as the annual report, which will contain discussion and interpretation of the groundwater data collected during that calendar year. Based on review of the past year of data, recommendations for revisions to the field sampling program may be presented.

In addition, the raw data (water level elevations and laboratory analytical results) will be submitted online in a format compatible with Ecology's Environmental Information Management (EIM) System, per Ecology Policy 840.

### 6.3 Schedule for Reporting

The schedule for the Semiannual Progress Reports is provided below.

| Task | Due Date |
|---|---|
| Monthly Progress Report | Monthly, delivery by the 10th of each month |
| Semiannual Report to Ecology and EIM update completed | Within 60 days of the last day of the previous 6-month period, with targeted February and July report delivery |

# 7 REFERENCES

PBS Engineering and Environmental, LLC [PBS] (2023a). *Remedial Investigation and Interim Action Report, Coleman Oil Yakima Bulk Fuel,* October 11, 2023,

PBS Engineering and Environmental, LLC [PBS] (2023b). *Feasibility Study – Coleman Oil Yakima Bulk Fuel.* October 6, 2023.

PBS Engineering and Environmental, LLC [PBS] (2024). *Cleanup Action Plan – Coleman Oil Yakima Bulk Fuel Study – Coleman Oil Yakima Bulk Fuel.* March 25, 2024.

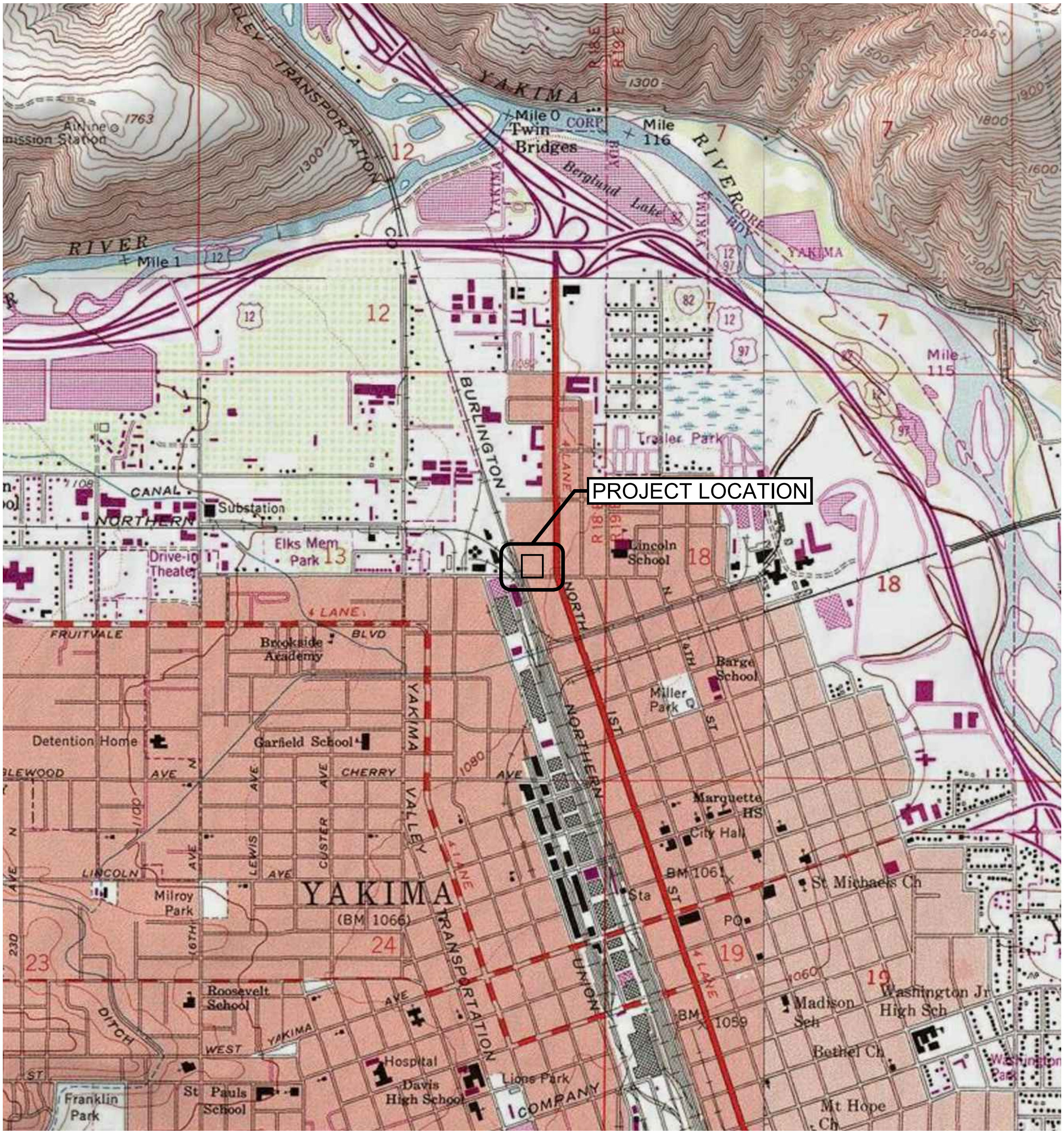
PBS Engineering and Environmental, LLC [PBS] (2025). *Engineering Design Report – Coleman Oil Yakima Bulk Fuel Study – Coleman Oil Yakima Bulk Fuel.* June 5, 2025.

Washington Department of Ecology, (Ecology 2024). *Coleman Oil Bulk Plant Cleanup Action Plan Agreed Order DE 23182*, August 19, 2024.

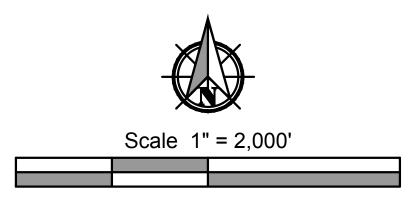
ASTM E2856-13: ASTM Standard Guide for Estimation of LNAPL Transmissivity (ASTM 2013).

# FIGURES

Figure 1. Site Vicinity Map
Figure 2. Project Monitoring Wells




SOURCE: USGS YAKIMA WEST, WA QUADRANGLE 1985


PREPARED FOR: COLEMAN OIL

PBS

# VICINITY MAP

1 EAST I STREET

YAKIMA, WASHINGTON

MAR 2025

41392.000

FIGURE

1


PREPARED FOR: COLEMAN OIL

Full Size Sheet Format Is 11x17; If Printed Size Is Not 11x17, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

Filename: L:\Projects\41000\41392 Coleman Oil\CAD\May 2024 Figure\41392.000_Fig_2.dwg Layout Tab: SITE PLAN User: Doroteo Chavez Castillo CAD Plot Date/Time: 6/4/2025 12:52:53 PM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PBS

SITE PLAN

# COLEMAN OIL

1 EAST I STREET, YAKIMA, WASHINGTON

| | |
|---|---|
| PROJECT | 41392.000 |
| DATE | JUNE 2025 |
| SHEET ID | 2 |

# TABLES

Table 1. Contaminants of Concern and Cleanup Levels
Table 2. Compliance Groundwater Monitoring Frequency
Table 3. Analytical Methods and Sample Handling Details
Table 4. NAPL Transmissivity Monitoring

# TABLE 1
## Contaminant of Concern and Cleanup Levels
## Compliance Monitoring Plan
Coleman Oil Company: 1 East I St., Yakima, Washington

| Contaminant of Concern | Soil Cleanup Level MTCA Method A* (mg/Kg) | Groundwater Cleanup Level MTCA Method A** (ug/L) | Remediation Levels |
|---|---|---|---|
| TPH - Gasoline Range | 30 | 800 | n/a |
| TPH - Diesel Range | 2,000 | 500 | |
| Benzene | 0.03 | 5 | |
| Toulene | 7 | 1,000 | |
| Ethylbenzene | 6 | 700 | |
| Total Xylenes | 9 | 1,000 | |
| Napthalene | 5 | 160 | |
| Cadmium | 2 | 5 | |
| Lead | 250 | 15 | |
| NAPL | n/a | n/a | 0.05 (feet) |

**Notes**:
* Soil cleanup levels based on MTCA Method A Soil cleanup levels for unrestricted land use
** Groundwater cleanup levels based on MTCA Method A Groundwater cleanup levels
MTCA – Model Toxics Control Act
mg/kg – milligrams per kilogram
N/A – not applicable. The DCAP does not establish remediation levels for COCs or cleanup standards for NAPL.
NAPL – nonaqueous phase liquid
TPH – Total Petroleum Hydrocarbons

**TABLE 2**

**Groundwater Monitoring Frequency**

**Compliance Monitoring Plan**

Coleman Oil Company: 1 East I St., Yakima, Washington

| Monitoring Well | Location Description | Monitor Purpose | Water Level/NAPL Measurement Frequency | Groundwater Sampling Frequency | | | NAPL |
|---|---|---|---|---|---|---|---|
| | | | | Field Parameters | TPH/pVOCs Analysis | Biological Analysis | Recorded Prior in Well (Yes or No) |
| MW-1 | On Property - source zone | GWM | Q | SA | SA/CQ | SA | Y |
| MW-2 | On Property - source zone | GWM | Q | SA | SA/CQ | SA | N |
| MW-3 | On Property - source zone | GWM | Q | Q/SA | SA/CQ | Q/SA | Y |
| MW-4 | On Property - source zone | GWM | Q | Q/SA | SA/CQ | Q/SA | Y |
| MW-5 | On Property - source zone | GWM | Q | Q/SA | SA/CQ | Q/SA | Y |
| MW-6 | On Property - source zone | GWM | Q | Q/SA | SA/CQ | Q/SA | N |
| RW-1 | On Property - source zone | GWM | Q | -- | -- | -- | Y |
| MW-7 | On Property - NW upgradient | POC | Q | SA | CQ | -- | N |
| MW-8 | On Property - source zone | GWM | Q | Q/SA | SA/CQ | Q/SA | Y |
| MW-9 | On Property - NE upgradient | POC | Q | SA | CQ | -- | N |
| MW-10 | On Property - E downgradient | POC | Q | Q/SA | SA/Q | Q/SA | N |
| MW-11 | Off Property - SW downgradient | GWM | Q | SA | SA/Q | -- | Y |
| MW-12 | Off Property - SW downgradient | GWM | Q | SA | SA/Q | -- | Y |
| MW-13 | Off Property - S downgradient | GWM | Q | SA | SA/Q | -- | N |
| MW-14 | Off Property - S downgradient | POC | Q | SA | CQ | -- | N |
| MW-15 | Off Property - SE downgradient | GWM | Q | SA | SA/Q | -- | N |
| MW-16 | Off Property - SE downgradient | POC | Q | SA | CQ | -- | N |
| BNSF-MW1 | Off Property - SW downgradient | POC | Q | -- | -- | -- | N |
| BNSF-MW6 | Off Property - W downgradient | POC | Q | -- | -- | -- | N |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RW-2 | On Property - source zone | Recv-GWM | M | Q | -- | SA | n/a |
| RW-3 | On Property - source zone | Recv-GWM | M | Q | -- | SA | n/a |
| RW-4 | On Property - source zone | Recv-GWM | M | Q | -- | SA | n/a |
| RW-5 | On Property - source zone | Recv-GWM | M | Q | -- | SA | n/a |

## TABLE 3
## Analytical Methods and Sample Handling Details
## Compliance Monitoring Plan

Coleman Oil Company: 1 East I St., Yakima, Washington

| Analyses | Analytical Method | Sample Container (groundwater) | Preservation | Max Holding Time | Practical Quantitation Limit (PQL) |
|---|---|---|---|---|---|
| Contaminant of Concern | | | | | |
| TPH - Gasoline Range | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 100 ug/L |
| TPH - Diesel Range | NWTPH-Dx /AK102-3 | 500 mL Amber Glass | Cool, 4° C / HCL | 14 days | 50 ug/L (DRO)/200 ug/L (RRO) |
| Benzene | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 0.35 ug/L |
| Toulene | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 1 ug/L |
| Ethylbenzene | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 1 ug/L |
| Total Xylenes | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 3 ug/L |
| Napthalene | EPA 8260/NWTPH-Gx | (3) x 40 mL Glass VOA Vial / HCl | Cool, 4° C | 14 days | 1 ug/L |
| Cadmium | EPA 6020/200.8 | 250 mL HDPE | Cool, 4° C, lab filtration | 28 days | 1 ug/L |
| Lead | EPA 6020/200.8 | 250 mL HDPE | Cool, 4° C, lab filtration | 28 days | 1 ug/L |

| | | | | | |
|---|---|---|---|---|---|
| Inorganic Nutrient Analysis | | | | | |
| Ammonia | SM 4500 NH3 D | 250 mL Polyethylene | Cool, 4° C, $H_2SO_4$ | 28 days | 0.15 mg/L |
| nitrate/nitrite | EPA 300.0/9056 | 250 mL HDPE | Cool, 4° C | 48 hours | 0.2 mg/L each or 0.4 mg/L added together |
| sulfate | EPA 300.0/9056 | 250 mL HDPE | Cool, 4° C | 28 days | 1.0 mg/L |
| phosphate | EPA 300.0 | 250 mL HDPE | Cool, 4° C | 48 hours | (as total Phosphorus) 0.25 mg/L |
| orhtophosphate | | 250 mL HDPE | Cool, 4° C | 48 hours | 0.4 mg/L |
| dissolved iron and manganese | EPA 6020/200.8 | 250 mL HDPE | Cool, 4° C, lab filtration | 28 days | 50 ug/L (Fe) and 1 ug/L (Mn) |

**NOTES:**

| | |
|---|---|
| HDPE | high density polyethylene |
| VOA Vial | 40 mL glass volatile organic analysis |
| TPH | Total Petroleum Hydrocarbons |
| C | degrees Celcius |
| mL | milli-Liters |

Gasoline analyzed by Northwest Total Petroleum Hydrocarbon Method - Volatile Petroleum Products (Extended) (NWTPH-Gx)
Diesel and heavy oil analyzed by Northwest Total Petroleum Hydrocarbon Method - Semi-volatile Petroleum Products (Extended) (NWTPH-Dx)

# TABLE 4
## NAPL Transmissivity Performance Monitoring
## Compliance Monitoring Plan
Coleman Oil Company: 1 East I St., Yakima, Washington

| Monitoring / Extraction Well | Location Description | Monitor Purpose | Measurement Frequency | Interface Probe Measurement (0.01 feet) |
|---|---|---|---|---|
| MW1 | On Property - source zone | NAPL Thickness | Q | |
| MW2 | On Property - source zone | NAPL Thickness | Q | |
| MW3 | On Property - source zone | NAPL Thickness | Q | |
| MW4 | On Property - source zone | NAPL Thickness | Q | |
| MW5 | On Property - source zone | NAPL Thickness | Q | |
| MW6 | On Property - source zone | NAPL Thickness | Q | |
| MW8 | On Property - source zone | NAPL Thickness | Q | |
| MW11 | Off-Property | NAPL Thickness | Q | |
| MW12 | Off-Property | NAPL Thickness | Q | |
| RW-1 | On Property - source zone | NAPL Thickness | Q | |
| RW-2 | On Property - source zone | NAPL Thickness | Q | |
| RW-3 | On Property - source zone | NAPL Thickness | Q | |
| RW-4 | On Property - source zone | NAPL Thickness | Q | |
| RW-5 | Off-Property | NAPL Thickness | Q | |
| RW-6 | Off-Property | NAPL Thickness | Q | |
| Total Fluids | System Flow Meter | Total Gallons Recovered | M | Gallons |
| Total NAPL | System - Seperator Tank | Total Gallons Recovered | M | Gallons |
| | | | | |

**NOTES:**

| | |
|---|---|
| Q | Quarter-Annually during active Pumping system operation (First event prior to system startup) |
| M | Monthly |
| MW | Monitoring Well |
| RW | Recovery/Extraction Well |

# Appendix A
## Standard Operating Procedure—Low Flow Groundwater Sampling

PBS

# STANDARD OPERATING PROCEDURE
## Sampling Groundwater Monitoring Wells

## 1 BACKGROUND AND PURPOSE

Groundwater samples are collected from monitoring wells for analysis of physical and chemical parameters, either by using field observations and portable equipment and/or using established laboratory analytical methods. The goal of this process is to obtain groundwater samples that are representative of the aquifer (i.e., avoiding a sample that has been impacted by surface or atmospheric conditions).

Low-flow or zero volume purging and sampling methods were developed to produce samples with the least amount of interference resulting from the collection method. Low-flow purging techniques became the industry standard for collecting a groundwater sample because the methods slow groundwater velocity to the well, minimize turbidity and agitation in the water column, and reduce the volume of purged groundwater requiring disposal. These techniques include the use of pumps dedicated to specific wells or the use of a portable pump system. A zero volume/no purging method requires installation of a collection vessel within the well prior to the sample collection event, allowing the water column within the well to equilibrate with the aquifer prior to retrieving the sample. The appropriate technique is dependent on project-specific goals and data quality requirements. Sampling methodology should be confirmed with the PBS project manager (PM) prior to preparing for groundwater monitoring.

The procedures in this Standard Operating Procedure (SOP) are specific to standard monitoring wells with a single-slotted interval. It is assumed that low-flow purging and sampling protocols are used, although these protocols can be easily adjusted for other sampling methods. Temporary borings advanced for a single field event may be sampled using the techniques presented in this SOP.

## 2 EQUIPMENT AND SUPPLY LIST

- Well lock keys
- Groundwater Sampling Field Form and Depth to Groundwater Field Form
- Copies of field forms and data tables from previous groundwater monitoring event
- Electronic water level probe or interface probe (if dense or light non-aqueous phase liquids [DNAPL or LNAPL] are potentially present)
- Tubing cutters, knife or scissors (note: some sites do not allow the use of a knife on-site)
- Decontamination equipment
- Measuring cup
- Safety cones
- Bolt cutters
- Replacement well caps, bolts, and padlocks
- Small cup, turkey baster, or large sponge to purge standing water inside well monument
- Fish hooks, stainless steel weight, and fishing line to retrieve objects in the well
- Site map and health and safety plan

- Personal protection equipment (PPE) required for the site, including nitrile gloves (confirm with site-specific health and safety plan)
- Submersible pump or peristaltic pump and associated equipment
- Compressed gas source (nitrogen or air compressor), battery source, or generator and fuel
- Control box
- Disposable tubing, if necessary
- Flow-through cell and water quality parameter meter (e.g. YSI model)
- Buckets or containers for purge water and drum labels
- Sample containers, labels, packaging material
- Coolers and ice for samples

## 3 PROCEDURE

This section outlines standard procedures used for collecting groundwater samples from a monitoring well. Project Managers may modify or remove tasks as dictated by project needs; for example, turbidity or depth-to-bottom measurements may not be warranted at a site with sufficiently developed wells.

Preparation for a monitoring event begins in the office. The first step is to read the scope of work (e.g., proposal, sampling and analysis plan (SAP), work plan) to determine the number and location of monitoring wells to be sampled, health and safety considerations, quality control (QC) samples needed, sample containers required, and equipment needed for the site (peristaltic pump, bladder pump, both, etc.). Recommended preplanning procedures are as follows:

- Prepare, review, or update Health and Safety Plan (HASP) for the site.
- Obtain appropriate PPE for the site (e.g., hard hat, safety vest, gloves, safety glasses, life vest, flame retardant [FR] shirt or other client-required PPE).
- Determine number and type of samples to be collected.
- Determine which laboratory can meet analytical requirements (required analysis, screening levels).
- Order sample containers from laboratory, making sure to order QC sample containers and at least one extra set of containers. Ensure that a Safety Data Sheet (SDS) is provided for any sample preservative supplied by the laboratory.
- Print all forms needed for sampling event (work plan, HASP, depth to water forms, groundwater sampling forms, labels, chain of custody, etc.).
- Schedule PBS vehicle and equipment use on PBS calendars, as warranted.
- Order rental equipment for sampling event, if not available internally.

After arriving at the site, the following procedures should be followed:

- Don appropriate PPE and place safety cones around the work zone, if required by the HASP or deemed necessary by site conditions.
- Open all of the monitoring wells on-site and wait a minimum of 15 minutes for water levels to approach an equilibrium state with atmospheric pressure before taking any measurements.

- Note the general condition of the well on the depth to groundwater field form. Check well for damage or evidence of tampering, and record pertinent observations. Note any maintenance tasks that should be completed, such as well cap or padlock replacement.
- Collect depth to water measurements from each monitoring well, decontaminating the probe between locations. If possible, gauging should be conducted in order from the least to the most contaminated well. The measurements should be collected from all wells prior to beginning sample collection, unless project scope or site conditions indicate otherwise.
- Measure the depth to water relative to the marking on the well casings. If there is no mark, use the north side of the casing. Record the water level on the depth to groundwater field form. Note if DNAPL or LNAPL is present (this typically requires a meter capable of detecting NAPL-water interfaces). If NAPL is present, additional decontamination procedures will be warranted.
- Measure depth to bottom of well to record if sedimentation in the well has occurred.
- Make sure all information is completed on the depth to groundwater field form and sign and date it.

Sampling a groundwater monitoring well utilizing low-flow techniques relies on stabilization of field water quality parameters to determine when groundwater is representative of aquifer conditions. Measurement of groundwater quality parameters with a water quality parameter meter occurs in a closed system in which groundwater does not come in contact with open air; this is important for valid measurements because dissolved oxygen (DO), oxidation-reduction potential (ORP), and pH measurements can be sensitive to reactions with the atmosphere. A flow-through cell (flow cell) connected to the water quality parameter meter provides this closed system and is used to measure field parameters prior to collecting groundwater samples. Stabilization of selected parameters indicates that collected groundwater is representative of the aquifer and conditions are suitable for sampling to begin. See protocol below for stabilization parameters.

Low-flow purge and sample methods require care when placing a portable pump and/or tubing in the well to minimize disturbance to the water column. Pumping rates must be maintained at 0.1 to 0.5 liter per minute to reduce drawdown; the pump should never be run higher than 0.5 liters per minute prior to sampling.

For monitoring wells, sampling should proceed as follows:

- If using a portable pump setup, slowly lower the pump or tubing to the midpoint of the screen or sample interval. Secure the pump or tubing at the surface to prevent it from moving (not applicable if using dedicated pumps).
- Connect the bladder pump (attaching control box, compressor or nitrogen tank with regulator) or peristaltic pump to flow cell containing water quality parameter probes. Place the water level probe in the well so water levels can be measured as you are pumping. Start the pump and adjust the pumping rate to between 0.1 and 0.5 liters per minute (using a measuring cup to calculate the flow rate). Begin recording readings on the groundwater sampling field form. Be sure to purge the initial volume of water in the tubing before taking a reading.
- During purging, record readings of groundwater parameters (listed below) and water level every 3 to 5 minutes on the groundwater sampling field form. A drawdown of less than 0.3 feet in the water column, once the pumping rate has stabilized, is desirable; however, less permeable aquifer material or a clogged well filter pack may result in a deeper drawdown. At a minimum, the depth-to-water should be stabilized for three consecutive readings taken between 3 to 5 minutes apart (in conjunction with the stabilization of the other parameters). Visually describe and record turbidity. Purging is considered complete when the groundwater parameters have stabilized for three consecutive readings.

| Field Parameter | Stabilization Goal |
|---|---|
| Temperature | +/-3% |
| Specific Conductance | +/- 3% mS/cm |
| pH | +/- 0.1 pH units |
| DO | +/- 10% or +/- 0.3 mg/L |
| ORP | +/- 10 millivolts |
| Depth to Water | +/- 0.3 feet |

Please note that multi-parameter meters may have a resolution greater than the stabilization goal. Note the meter capabilities. If the field parameters do not stabilize within the stabilization goal, but are within the resolution of the meter, it may be acceptable to collect a sample in this scenario. This MUST be noted on the field form.

- Measure turbidity of the sample water using field instruments prior to sample collection and upon any obvious visual changes in turbidity during sample collection.
- Prior to collecting the water sample, the tubing originating in the well must be disconnected from the influent (inflow) side of the flow cell.
- Directly fill the sample containers from the tubing originating in the well. If you are collecting samples for volatile organic compound (VOC) analysis, you may need to decrease the pump rate to minimize volatilization of compounds from the sample; if this is the case, other samples should be collected first. You may restore the flow rate upon completion of filling sample containers for VOC analysis. Fill unpreserved bottles first. Filtered samples should be collected after all other samples have been collected.
- Groundwater samples collected for VOC analysis must be collected with zero headspace in the sample vial. This can be confirmed by gently tapping the sealed vial against a gloved hand to ensure that air bubbles are not present.
- If a duplicate sample is required for the well, it should be filled concurrently with the regular sample. This is accomplished by alternating bottles of the same type during sample collection (e.g., filling one bottle from each sample, then the second bottle from each sample.)
- Groundwater samples for dissolved metals analysis must be field filtered with a 0.45 micron filter directly connected to the tubing. Mark "field filtered" or "FF" on the bottle label, field form, and chain of custody.
- Prior to filling or just after filling, label each bottle with the project name, sample name, and sample date and time, and make sure it is properly sealed. The sample containers may also be labeled with what analysis will be performed (confirm with Project Manager). Place in a cooler with ice and pack for transportation.
- As necessary, pull pump and discard tubing. Decontaminate the pump based on the decontamination procedures established for the site.
- Make sure all information is completed on the groundwater field form and sign and date it.
- Close and lock the well.
- Contain purge and decontamination water in the appropriate containers as established for the project.
- Dispose of used sampling supplies and other waste in appropriate container as established for the project.

If low-flow sampling is not used at the site, these procedures should be modified as appropriate. The objective is to provide high-quality groundwater samples representative of the aquifer. Modifications to this SOP should keep this objective in mind at all times.

After fieldwork is completed:

- Ensure that chain-of-custody form has necessary information including site name, project manager, sample names, date and time collected, requested analysis, special notes (field filtered, MS/MSD, etc.).
- Scan and save field sheets to project folder on server. Retain original field copies in project folder; these are legal documents and should be retained as per PBS guidelines for document retention.
- Report any sampling or well maintenance issues to the project manager for evaluation and remedy.
- Clean and store PBS equipment for use on next project. Report any equipment damage or malfunctions or missing/depleted calibration solutions to the office equipment manager.
- Ship rental equipment back to vendor immediately to minimize project costs. Borrowed PBS equipment should be returned promptly to the lending office.

**References**

Puls, R.W. and M.J. Barcelona. *Groundwater Issue Paper: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. US Environmental Protection Agency, EPA 540-S-95-504 (1996).

Yeskis, D. and Bernard Zavala. *Groundwater Issue Paper: Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*. US Environmental Protection Agency, EPA 542-S-02-001 (May 2002).

# Appendix B

## Project Forms

Daily Field Activity Report
Groundwater Sampling Field Form
Depth to Water/NAPL Form
Sample Chain of Custody

PBS

# DAILY FIELD REPORT

## PROJECT INFORMATION

| | | | |
|---|---|---|---|
| Project Number: | | Date: | |
| Project Name: | | PBS Staff: | |
| Purpose: | | Time Arrive: | |
| Weather: | | Time Depart: | |

## FIELD OBSERVATIONS AND COMMENTS

*Attach (as appropriate): Photographs, copy of field notes from permanent notebook, laboratory chain-of-custody*

## SIGNATURE

| PBS | PBS Engineering + Environmental | PROJECT: Camp Bonneville |
|---|---|---|
| | GROUNDWATER SAMPLING FIELD FORM | Clark County, Washington |
| | Revised: 1/31/2025 | PROJECT NO: 76151.013 |
| | | Date: / /2025 |

| | | | |
|---|---|---|---|
| Initial DTW (feet bgs) | | Monitoring Well ID: | |
| Screen Interval (feet bgs) | | Sample ID | |
| Well Depth (feet bgs) | | Sample Time | |
| Depth of pump (ft bgs) | | QC Sample type: | ☐ Not collected |
| Sampling Method | Dedicated Bladder Pump | | ID: |
| Purge rate (mL/min) | | | Time: |
| Field Personel | | Weather Conditions | |

**INITIAL WELL DATA & WELL PURGING INFORMATION** **More Info on Back? Yes/No**

| Time (0:00 - 23:59) | DTW (feet TOC) | Temp. (C) | Dissolved Oxygen (mg/L) | Specific Conductivity (µS/cm) | pH | ORP (mV) | Turbidity visual/meas. (NTUs) | Volume Purged (gallons/liters) |
|---|---|---|---|---|---|---|---|---|
| EPA Stab. goals | <0.3 ft | ±3% | ±10% or ±0.3 mg/L | ±3% µS/cm | ±0.1 | ±10% or 3 mV | ±10% | |
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| | | | | | | | **Total Volume Purged** | |

| Analytical Parameters | Number of bottles | Bottle size | Preserv. | Filtered? Y/N | Run? ✓ | Notes |
|---|---|---|---|---|---|---|
| Explosives, Nitroglicerin, PETN, Picric Acid by 8330 | 6 | 1 L amber | none | N | ☐ | |
| Perchlorates by EPA 6850 | 1 | 250 ml poly | none | Y | ☐ | Fill w/~120 mL water |
| VOCs by 8260B | 7 | 40 ml VOA | HCL | N | ☐ | |

Method of transportation of samples: Ship via FedEx to Anatek

| **Field Observations/Notes of Sampling Event:** |
|---|
| |
| |
| |
| |
| **Signature of Field Personnel:** **Date:** |

| | | | |
|---|---|---|---|
| PBS | **PBS Engineering and Environmental Inc.**<br><br>**DEPTH TO GROUNDWATER FORM**<br>Revised: 01/31/2025 | **PROJECT:**<br><br>**PROJECT NO:**<br>**Date:** | **Coleman Oil Bulk Facility**<br>**Yakima, Washington** |

| | |
|---|---|
| **Field Personnel:** | **Start Time:** |
| **Weather Conditions:** | **End Time:** |

**INITIAL DEPTH TO WATER MEASUREMENTS** **More Info on Back? Yes/No**

| Monitoring Well ID | Depth to Water Measurement (ft) | Measurment Taken from (e.g.,TOC/Metal Casing) | LNAPL Thickness (inches) | Time | NOTES |
|---|---|---|---|---|---|
| MW-1 | | | | | |
| MW-2 | | | | | |
| MW-3 | | | | | |
| MW-4 | | | | | |
| MW-5 | | | | | |
| MW-6 | | | | | |
| MW-7 | | | | | |
| MW-8 | | | | | |
| MW-9 | | | | | |
| MW-10 | | | | | |
| MW-11 | | | | | |
| MW-12 | | | | | |
| MW-13 | | | | | |
| MW-14 | | | | | |
| MW-15 | | | | | |
| MW-16 | | | | | |
| BNSF MW-1 | | | | | |
| BNSF MW-6 | | | | | |
| | | | | | |
| RW-1 | | | | | |
| EW-1 | | | | | |
| EW-2 | | | | | |
| EW-3 | | | | | |
| EW-4 | | | | | |
| | | | | | |
| | | | | | |

**Equipment Used:**

**Additional Notes/Observations:**

**Signature of Field Personnel:** **Date:**

# SAMPLE CHAIN OF COUSTODY

Report To______________________________

Company______________________________

Address______________________________

City, State, ZIP______________________________

Phone________________Email______________________

| SAMPLERS (*signature*) | |
|---|---|
| PROJECT NAME | PO # |
| REMARKS<br><br>Project Specific RLs - Yes / No | INVOICE TO |

Page # _________ of _________

| TURNAROUND TIME |
|---|
| Standard Turnaround<br>RUSH____________________<br>Rush charges authorized by:<br>______________________________ |
| SAMPLE DISPOSAL |
| Dispose after 30 days<br>Archive Samples<br>Other____________________ |

| | | | | | | ANALYSES REQUESTED | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Lab ID | Date Sampled | Time Sampled | Sample Type | # of Jars | NWTPH-Dx | NWTPH-Gx | BTEX EPA 8021 | VOCs EPA 8260 | PAHs EPA 8270 | PCBs EPA 8082 | | | | | | Notes |
| | | | | | | | | | | | | | | | | | |
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| SIGNATURE | PRINT NAME | COMPANY | DATE | TIME |
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| Relinquished by: | | | | |
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