Water & Environmental TECHNOLOGIES

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Additional Corrective Action Work Plan for the Petroleum Release at the Former Bermel's Store

110 Swan River Road, Bigfork, Montana, Facility ID 15-007361, TID (20728), Release 2697 Work Plan 35151

Prepared for:
MDEQ Petroleum Tank Cleanup Section
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1 EXECUTIVE SUMMARY

The Former Bermel Store (Facility) consists of an unpaved lot occupied by Bigfork Outdoor Rentals and four rental cabins. The Bermel Store building was destroyed by a fire in 2008. Known previous cleanup actions include an underground storage tank (UST) removal in 1995, during which the gasoline release #2697 was discovered from the 1,000 gallon UST, dispenser removal in 2002, excavation activities during which two unknown 750 gal USTs were removed in 2024, remedial investigations to install soil borings and groundwater monitoring wells, and periodic groundwater monitoring.

DEQ issued a workplan request letter (WPR) dated February 17, 2026, requesting additional Remedial Investigation at the Facility. The scope of work outlined in DEQ's WPR includes boring and monitoring well installation, soil sample collection, and groundwater monitoring. These activities will be conducted in accordance with the Standard Operating Procedures (SOPs) listed below, and any site-specific clarifying notes or proposed deviations from the SOPs are provided in the subsequent sections of this work plan.

- SOP-1: Field Logbook and Forms
- SOP-2: Equipment Decontamination
- SOP-3: Sample Nomenclature, Documentation, and Chain of Custody
- SOP-4: Sample Package and Shipping
- SOP-6: Measurement of Field Parameters
- SOP-8B: Groundwater Sampling – Low Flow Method
- SOP-9C: Subsurface Soil Sampling – Borehole and Excavation
- SOP-10: Monitoring Well Construction
- SOP 11: Monitoring Well Installation with Direct Push Equipment
- SOP-12: Photoionization Detector
- SOP-13: Monitoring Well Development
- SOP-16: Quality Control Sampling
- SOP-17: Management of Investigation Derived Waste

Implementation of this work plan is proposed to begin in May 2026 and take approximately 14 months to complete.

2 FACILITY HISTORY AND RELEASE BACKGROUND

The petroleum release at Former Bermel Store in Bigfork, Montana was discovered in August 1995 when a 1,000-gallon gasoline underground storage tank (UST) was removed by Northwest Fuel Systems. Over-excavation of petroleum contaminated soil was conducted in the tank basin to a depth of 10 feet below ground surface (bgs). Three other USTs were removed at this time (one 10,000-gallon, one 6,000-gallon, and one 2,000-gallon); no other leaks were reported. The location of this tank basin was not recorded and is unknown. Five monitoring wells (MW-1, MW-2, MW-3, MW-2-1, and MW-2-2) were installed at the site between 1996 and 1997 and groundwater monitoring was conducted intermittently. The Bermel Convenience Store building was destroyed in a fire in 2008. Monitoring well MW-1 was destroyed during the razing of the building after the fire.

A new retail space was constructed on the western portion of the property in 2018, which is currently operated as Bigfork Outdoor Rentals. The western half of the property is also occupied by four rental cabins and the drainfield that serves the entire property.

Four monitoring wells were installed at the site in 2019: MW-1R, MW-4, MW-5, and MW-6. Soil samples collected from the borings of MW-5 and MW-1R exhibited concentrations of volatile petroleum hydrocarbon (VPH) analytes above risk-based screening levels (RBSLs). Eleven soil borings were installed at the Facility in 2022 to further delineate the extent of petroleum contamination.

DEQ issued a workplan request letter (WPR) dated October 28, 2022, requesting additional corrective action at the Facility. The scope of work outlined in DEQ's WPR includes soil excavation, confirmation soil sampling, monitoring well installation, and groundwater monitoring to assess excavation effectiveness. Water & Environmental Technologies (WET) created a work plan and completed soil excavation, confirmation soil sampling, monitoring well installation, and groundwater monitoring. During the soil excavation two 750-gallon USTs were discovered and removed in 2024.

DEQ issued a WPR dated February 17, 2026, requesting additional remedial investigation at the Facility. The scope of work outlined in DEQ's WPR includes:

- Install soil borings and monitoring wells to determine the extent and magnitude of petroleum contamination in soil and groundwater and assess potential remedial strategies.
- Collect soil samples from the interval in each boring with the highest petroleum contamination based on field screening or the soil/groundwater interface.
- Complete two soil borings as groundwater monitoring wells, screened at similar depths of the existing on-site monitoring wells.
- Conduct two groundwater monitoring sample events, during seasonal high and low groundwater table conditions.
- Analyze soil and groundwater samples for petroleum constituents as required by the Montana Risk-Based Corrective Action (RBCA) Guidance for Petroleum Releases.
- Dispose of purge water according to the Disposal of Untreated Purge Water from Monitoring Wells flowchart under the Guidance dropdown at the Petroleum Tank Cleanup Section (PTCS) webpage.
- Validate all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF) found online under the Guidance dropdown at the PTCS webpage.
- Discuss ongoing WP tasks and results with DEQ's project manager; submit written agreed-upon WP modifications as required to complete the WP objectives.
- Prepare and submit the Remedial Investigation Report detailing the results of the investigation. The Report is expected to include all the content outlined in the Remedial Investigation Report format.

These proposed actions will delineate the magnitude and extent of soil and groundwater contamination and inform further remedial actions at the Facility, if warranted. The remaining sections of this WP detail WET's proposed approach to completing these specified tasks.

3 CURRENT FACILITY CONDITIONS

Installation of four additional groundwater monitoring wells was completed by WET in July 2019. During well installation, the soil borings were logged, and soil samples were collected and underwent analysis for VPHs and extractable petroleum hydrocarbon (EPH) screen. Groundwater monitoring at all six site wells (MW-1R, MW-2, MW-3, MW-4, MW-5, and MW-6) was conducted by WET in August 2019. Measured depth to groundwater was between 6.69 feet and 9.49 feet below ground surface (ft bgs) and the flow direction was to the northeast at a gradient of 0.0016. Groundwater samples were analyzed for VPHs, EPH screen, volatile organic compounds (VOCs), lead scavengers (1,2-dichloroethane [1,2-DCA] and 1,2-dibromoethane [EDB]), and biodegradation parameters (methane, ferrous iron, manganese, nitrate, and sulfate). A hydraulic conductivity assessment was conducted to evaluate characteristics of groundwater flow at the site.

Soil sample analyses exhibited Tier 1 Subsurface Soil (>2 feet) RBSL exceedances of VPH analytes in soil samples from soil borings SB-1R at a depth of 8.5-8.6 feet bgs and SB-5 at depths of 7.75-8.25 feet bgs and 10.5-11.0 feet bgs. Groundwater samples collected from monitoring wells MW-1R, MW-3, MW-4, and MW-5 exhibited Tier 1 RBSL exceedances of VPH analytes and lead scavenger 1,2-dibromoethane.

There is one onsite private domestic well (GWIC ID 80388) that was constructed in 1985 to a total depth of 240 feet bgs. The well is sealed from ground surface to 50 ft bgs with bentonite. According to the well log report, there is a confining layer of hardpan clay from a depth of 180 feet to 210 feet bgs. There is also clay with sand, gravels, and boulders present from ground surface to 225 feet bgs, where the water bearing gravel was encountered.

4 PURPOSE AND OBJECTIVES

The purpose of the proposed investigation work is to delineate the magnitude and extent of contamination both vertically and laterally, which will ensure subsequent cleanup actions are scoped appropriately. The objectives for the investigation are to collect sufficient information and data needed eliminate data gaps in the conceptual site model.

5 MINIMUM WORK PLAN TASKS

5.1 PROJECT MANAGEMENT

WET personnel will provide Dale Whalen (Big Fork Rentals) and DEQ's project manager with updates on ongoing WP tasks and relevant results on an as-needed basis. Other duties associated with this task include scheduling field work, construction administration, obtaining permits and access agreements, traffic control measures, project reporting administration, monitoring the project budget and deliverables, and any submitted written agreed-upon WP modifications to complete the objectives.

5.2 MOBILIZATION

Nine mobilizations are planned from WET's Kalispell office to the site. Mobilizations include one for marking drill locations for utility locates, three for soil boring/well installation oversight, one for well development, one mobilization for groundwater monitoring, and one to assist with survey activities. Each round-trip mobilization from the Kalispell office to the Facility is approximately 52 miles and one hour of travel time. Additionally, one mobilization is planned from the Butte office to complete a survey of the well locations and top of casing elevations. The cost for this mobilization will be combined with another site in the area. The round trip from Butte to the Facility is approximately 414 miles and 7 hours of travel time. One hour of loading/unloading is included for each mobilization, except the one for marking drill locations, for a total of 9 hours loading/unloading. Although a survey was planned for the previous workplan, because additional borings/wells were going to be necessary to delineate the extent of contamination, that work was postponed to ensure all wells could be surveyed at once.

5.3 LODGING/PER DIEM

One day of per diem and one night of lodging is included for completion of this workplan. The cost of lodging will be split with another site.

5.4 SOIL BORING AND MONITORING WELL INSTALLATION

Three bids were solicited for soil boring and well installation activities; Wiley Drilling submitted the low bid and will be awarded the work. Contractor bids are included as **Appendix B**. As outlined in the Release Closure Plan prepared for the Facility earlier this year, soil and groundwater contamination is not fully delineated. A minimum of three and up to seven soil borings are proposed to delineate the extent of contamination at the site. Borings SB-12, SB-13, and SB-14 (shown with red symbols on **Figure 1**) will be completed first. If evidence of contamination is noted in any of those soil boring locations, step-out soil borings will be completed as necessary to ensure contamination is delineated. Elevated PID readings will be the primary criteria for the determination to install a step out boring and will be defined as anything over 150 parts per million (ppm). If more than seven borings are required to delineate the extent and magnitude of contamination, WET will consult with DEQ and PTRCB prior to the installation of additional borings. At least two of the soil borings will be completed as monitoring wells to ensure the extent of groundwater contamination is bound to the north/northwest and east.

Soil borings and monitoring wells will be installed using direct push methodology, as described in WET SOP-11: Monitoring Well Installation with Direct Push Equipment (**Appendix A**). Soil cores will be logged and continuously screened for evidence of contamination using a PID and the heated headspace method. One soil sample will be collected from boring to delineate the extent and magnitude of contamination and support development of the conceptual site model, as outlined by WET SOP-9B: Subsurface Soil Sampling – Borehole and Excavation (**Appendix A**):

- The most impacted interval as determined by PID readings; or
- The soil/groundwater interface if elevated PID readings are not present.

Samples will be placed in an ice filled cooler immediately after collection and shipped to the laboratory following the procedures outlined in WET SOP-4: Sample Nomenclature, Documentation, and Chain of Custody and WET SOP-3: Sample Package and Shipping (**Appendix A**).

Two of the seven borings will be completed as monitoring wells to delineate the magnitude and extent of groundwater contamination; one well will be installed to the west/northwest of the 2023 excavation and one will be installed to the east. Monitoring wells will be constructed with 2-inch, schedule 40 PVC casing and 0.010-inch factory slotted screen installed across the shallow aquifer water table, with a total of 10 feet of screen. Additional completion procedures are outlined in WET SOP-10: Monitoring Well Construction (**Appendix A**). Anticipated total depth of Facility wells based on historical groundwater data is 15 ft bgs; exact screen intervals and total depths will be determined in the field based on observed zones of contamination, lithology, and historical water level data.

5.5 WELL DEVELOPMENT

Newly installed wells will be developed in accordance with WET SOP-13: Monitoring Well Development (**Appendix A**). If LNAPL is present in a well, that well will not be developed. During development, the following water quality parameters and observations will be recorded:

- Depth to water;
- Development time and volume;
- Flow rate
- pH, temperature, specific conductance, and turbidity;
- Other observations as appropriate (color, presence of odors, sheen).

Development should continue until water quality parameters have stabilized and the turbidity of the discharge is low.

5.6 GROUNDWATER MONITORING

WET will conduct one groundwater monitoring event of all site wells (MW-1R, MW-4, MW-5R, MW-7, MW-8, and two new wells). Because there was significant variability in concentrations between the samples collected in spring and fall 2025, collecting samples from all site wells during the same event will provide a comprehensive data set that will allow future remediation activities to be scoped appropriately. Fluid levels will be measured with an oil-water interface meter prior to purging the well in accordance with WET SOP-5: Measurement of Fluid Levels and recorded on the WET Groundwater Sampling Form in accordance with WET SOP-1: Field Logbook and Field Sampling Forms (**Appendix A**). Monitoring wells will be purged using a peristaltic pump (with new tubing for each well) and following procedures specified in this workplan and WET SOP-8B: Groundwater Sampling – Low Flow Method (**Appendix A**) and DEQ's Groundwater Sampling guidance (2018). Any monitoring well containing free product will not be sampled.

Groundwater field parameters for each well will be measured during purging with a YSI® Professional Plus Quatro Cable multi-meter, HACH turbidity meter, and an oil/water interface probe in accordance with WET SOP-6: Measurement of Field Parameters (**Appendix A**). Field parameter measurements consist of recording initial depth to water, temperature, specific conductivity (SC), dissolved oxygen (DO), pH, oxidation reduction potential (ORP), turbidity, final depth to water, and volume during purging. Temperature and drawdown will be monitored but are not subject to stabilization criteria. Field parameter readings should be recorded every 3-5 minutes until three consecutive readings are within stabilization range. Once parameters stabilize according to the criteria in Table 1, a groundwater sample will be collected in laboratory-supplied bottles. Upon completion of sample collection, the sample will immediately be placed in an ice filled cooler and shipped to the laboratory following the procedures outlined in WET SOP-4: Sample Nomenclature, Documentation, and Chain of Custody and WET SOP-3: Sample Package and Shipping (**Appendix A**).

Table 1. Stabilization Parameters

Water Quality Parameter	Unit	Stabilization Range	Exception
pH	standard units (s.u.)	±0.1 s.u.	
Specific Conductance (SC)	microsiemens per centimeter (μS/cm)	±3%	
Dissolved Oxygen (DO)	milligrams per liter (mg/L)	±10%	<0.50 mg/L
Turbidity	nephelometric turbidity units (NTU)	±10%	<5 NTU
Oxidation/Reduction Potential (ORP)	millivolts (mV)	±10 mV	

5.7 FIELD WORK

WET personnel will direct and oversee soil boring and well installation activities. During well installation, soils will be classified according to the unified soil classification system (USCS). All pertinent field investigation and sampling information will be recorded on field sheets or in a field notebook, as described in WET SOP-1: Field Logbook and Field Sampling Forms (**Appendix A**).

5.8 SURVEY

One survey event is planned to complete the scope of work. The newly installed monitoring wells will be surveyed for location and top of casing elevation by a licensed surveyor. The location coordinates will be presented in the 1983 North American Datum (NAD83), Montana State Plane with units of international feet. Elevations will be expressed in units of feet above mean sea level (AMSL) relative to the 1988 North American Vertical Datum (NAVD88).

5.9 LABORATORY ANALYSIS

All samples will be analyzed for volatile petroleum hydrocarbons (VPHs), extractable petroleum hydrocarbons (EPHs), and the lead scavengers 1,2-DCA and EDB in accordance with the Montana Tier 1 RBCA Guidance for Petroleum Release Sites. If the result of the EPH screen of a soil or groundwater sample is above 200 mg/kg or 1,000 μg/L, respectively, the sample will be further analyzed for EPH fractions without polycyclic aromatic hydrocarbons.

5.10 QUALITY ASSURANCE/QUALITY CONTROL – DATA VALIDAITON SUMMARY FORMS

Quality assurance/quality control (QA/QC) samples including duplicates (soil and water) and field blanks (water) will be collected at a minimum frequency of 1 per 20 natural samples (5%), or one per event as outlined in the relevant sections of WET SOP-16: Quality Control Sampling. Up to two soil duplicate samples will be collected. One duplicate groundwater sample and one field blank sample will be collected during each event in conjunction with natural groundwater samples. The duplicate will be collected from a well that exhibited evidence of contamination during installation and will be collected simultaneously with its parent sample. The field blank will be collected during representative sampling conditions at the Facility by pouring laboratory provided organic-free deionized water into laboratory provided sample containers. QA/QC samples will be analyzed for the same constituents as the natural samples.

Energy Laboratories will conduct all analyses of collected soil and groundwater samples and provide a laboratory QC report for each analysis. WET personnel will validate all laboratory analytical data in accordance with WET's Data Verification and Data Validation SOG using DEQ's DVSF. This summary form will be included in the final report. An estimated three laboratory reports and DVSFs will be generated during the completion of this work plan.

5.11 INVESTIGATION DERIVED WASTE (IDW) MANAGEMENT, CHARACTERIZATION, AND DISPOSAL

Work plan implementation will generate soil IDW through drilling activities, groundwater IDW from well development and purging, and non-indigenous IDW including worker trash, personal protective equipment, and disposable sample tubing. IDW will be managed in accordance with WET SOP-17: Management of Investigation-Derived Waste (**Appendix A**).

<u>Soil</u>

Soil will be continuously screened using a PID. Any soil containing free product or exhibiting a PID reading greater than 200 ppm will be placed in a labeled bucket with a lid or a drum and sampled. Once analytical results are available, appropriate disposal will be arranged.

<u>Water (Groundwater Monitoring)</u>

Following the DEQ disposal of untreated purge water from monitoring guidance dated July 15, 2015, the purge water originates from the shallowest aquifer, is not likely to result in an exceedance of soil screening levels, is not discharged to a surface water, and is not from a mine adit or long-term pumping test. Therefore, the purge water from the groundwater sampling event will be discharged to pervious Facility ground.

<u>Non-indigenous IDW</u>

Non-indigenous IDW such as disposable sampling scoops, bailers, nitrile gloves, ziplock bags will be bagged and placed in a trash receptacle for disposal in a landfill.

6 COST, SCHEDULE, AND REPORTING

6.1 COST

Work effort level has been estimated using best professional judgement and typical scenarios related to work of this type. A detailed cost estimate for the required work is provided in **Appendix D**.

6.2 SCHEDULE

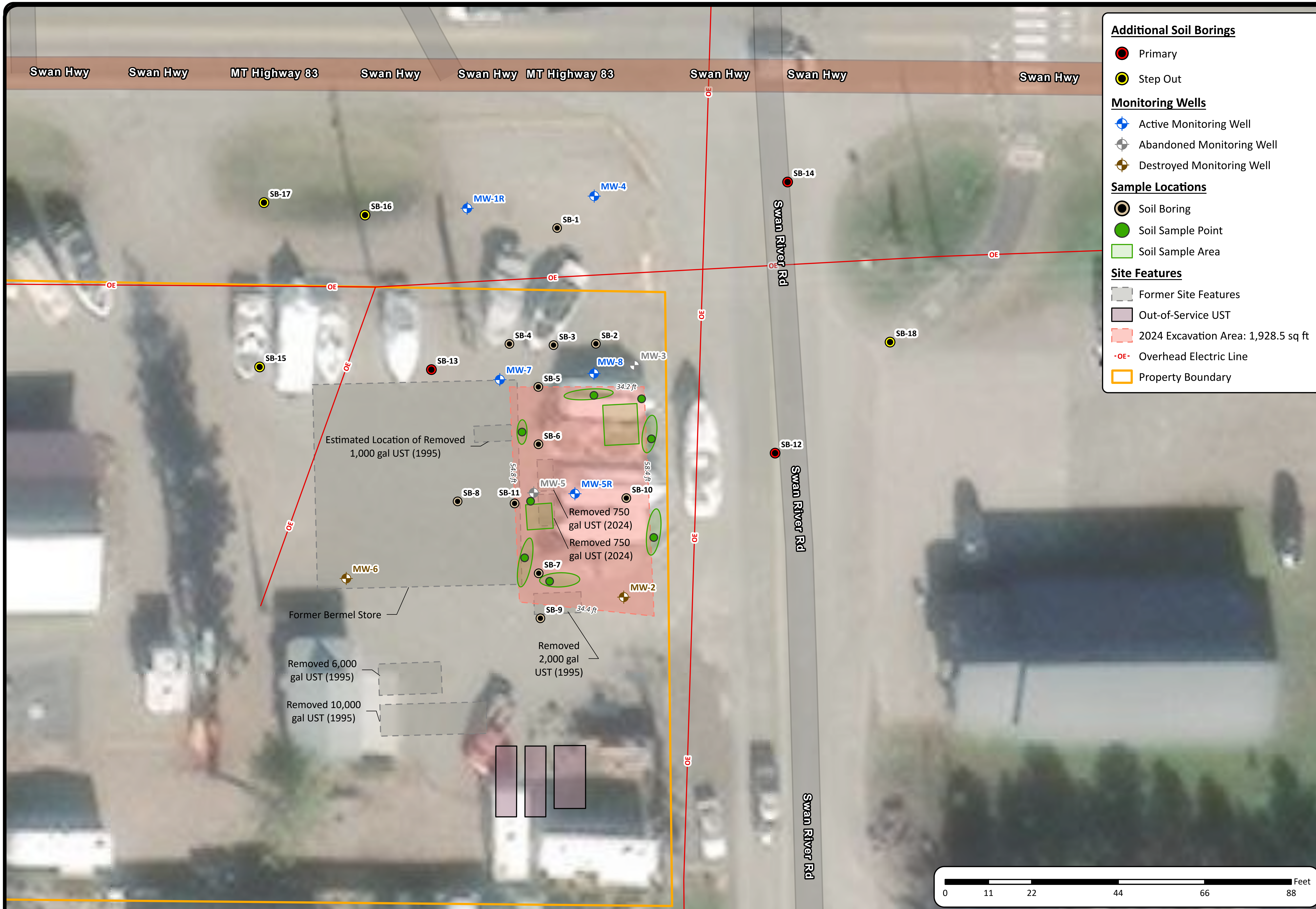
WET will begin implementation of the WP upon DEQ approval. All work, including reporting, is anticipated to be completed by the end of 2026.

6.3 REPORTING

Following completion of the second monitoring event, WET will submit a Remedial Investigation Report which will contain all of the content outlined in the Remedial Investigation Report format. WET will also update the release closure plan and include it as an appendix to the RI report.

Figure 1

Proposed Boring Locations



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	3/26/26	LG	DL
2	ADD OE & EDIT BORINGS	4/23/26	LG	DL
3				
4				
5				

NOTES

PROPOSED BORING LOCATIONS

FORMER BERMEL STORE PETROLEUM RELEASE

FIGURE 1

JOB#: 933-17

DATE:5/1/2026

Path: P:\PROJECTS\Whalen_Dale\933-17 Bermel Store Petro Site\350-Mapping\GIS\ReportFigures\ReportFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES

Appendix A

Standard Operating Procedures

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SOP-1

FIELD LOGBOOK AND FORMS

All pertinent field investigation and sampling information will be recorded in a field logbook, field form, or a Daily Activity Log (DAL) during each day of the field effort and at each sample site. The field crew leader will be responsible for ensuring that sufficient detail is recorded in the field logbook or DAL. No general rules can specify the extent of information that must be entered in the field logbook or form. However, field logbooks, field forms, or DALs must contain sufficient information such that someone could reconstruct all field activities without relying on the memory of the field crew. All entries shall be made in indelible ink, weather conditions permitting. Each day's or site's entries will be initialed and dated at the end by the author.

At a minimum, entries on the field sheet or in field notebook must include:

- Project information and location
- Project and task number
- Date and applicable times
- Name(s) of field personnel
- Environmental, site, or weather conditions
- Safety briefing attendance
- Details of actual work effort, particularly any deviations from the field work plan or standard operating procedures
- Comments or observations regarding any unusual circumstances
- Any field measurements made (e.g., PID readings, pH, temperature)

For sampling efforts, specific details for each sample should be recorded using a standardized field form designed specifically for the sampling activity being conducted (e.g., low-flow groundwater monitoring, soil gas sampling). Sampling field forms contain fill-in-the-blank type information to ensure that all pertinent information will be recorded. In addition to the items listed above, the following information is recorded on field forms during sampling efforts:

- Sample identification
- Date and time samples were collected
- Sampling methods, particularly any deviations from field work plan or standard operating procedures
- Field data and measurements
- Containers used to collect samples
- Sample preparation (filtration, preservation)
- Analyses and methods requested
- Note any QA/QC samples collected (duplicates, blanks)

Strict custody procedures will be maintained with the field forms. Field forms must always remain with the field team while being used in the field. Upon completion of the field effort, the original field forms will be scanned and copied to the project folder. Original field forms will be filed in an appropriately secure manner.

SOP-2

EQUIPMENT DECONTAMINATION

INTRODUCTION

The purpose of this section is to describe general decontamination procedures for field equipment. Decontamination will be performed on all non-dedicated and non-disposable sampling equipment that may contact potentially contaminated media. Field personnel must wear disposable latex or nitrile gloves while decontaminating equipment at the project site and change gloves between every sample. Personnel must take every precaution to prevent contaminating themselves with the wash water and rinse water used in the decontamination process.

EQUIPMENT

- Liquinox (or equivalent laboratory-grade detergent)
- Sufficient volume of tap water
- Sufficient volume of deionized water
- Sufficient volume of methanol or pesticide-grade acetone for organics
- Sufficient volume of any other decontamination solutions specifically required by the project work plan.
- Necessary containers for each decontamination station (totes or tubs, graduated cylinders or similar tubes, spray bottles, etc.)
- Tarp or other platform to form barrier between decontamination stations and ground (if necessary)
- Applicable brushes (if necessary)
- Aluminum foil (for soil sampling devices)
- Latex or nitrile gloves
- Paper towels
- Garbage bags

PROCEDURES

The following should be done in order to complete thorough decontamination:

1. Set up the decontamination zone downwind from the sampling area to reduce the chances of windborne contamination.
2. Visually inspect sampling equipment for contamination; use brush to remove visible material.
3. The general decontamination sequence for field equipment includes washing with Liquinox (or equivalent laboratory-grade detergent), deionized water rinse, additional solution rinse specified by project work plan, and triple deionized water rinse.
4. Store equipment in clean containment or according to project work plan if not used immediately.
5. All disposable items (e.g., paper towels, latex gloves), as well as rinse and wash water generated during decontamination, should be disposed of in accordance with SOP-17 (Management of Investigation-Derived Waste).

SAMPLE NOMENCLATURE, DOCUMENTATION, AND CHAIN OF CUSTODY

INTRODUCTION

Sample documentation is an important step to ensure the laboratory, project manager, and field personnel are informed on the status of field samples. Depending on the specifics required for each project, several forms will need to be filled out. Most sample documentation forms are pre-printed carbonless triplicates, enabling copies to be filed or mailed from labs or offices. The forms will be completed by field personnel, who have custody of the samples. The office copy will be kept in the project file and subsequent copies sent to the laboratory, or other designated parties.

Responsibility for completing the forms will be with each field crew leader. It is important that the field crew leader is familiar with the completion process for filling out forms, and the expected information is included.

Potential documents to be completed clearly in indelible ink for each sample generated include:

- Field form(s) or field logbook
- Chain-of-custody forms
- Custody seal(s)

A chain-of-custody form will be generated for all samples collected in the field for laboratory analysis. The sampler may use a project-specific chain-of-custody form or a chain-of-custody form provided by the laboratory. It is of the upmost importance that the chain-of-custody form be filled out correctly. This form is the first thing that third parties and regulators verify when assessing the quality of the job.

FIELD EQUIPMENT

- Indelible ink pen(s)
- Field form(s) or field logbook
- Chain-of-custody form(s)
- Custody seal(s)

PROCEDURES

Sample custody records must be maintained from the time of sample collection until the time of sample delivery to the analytical laboratory and should accompany the sample through analysis and final disposition. The information to be included on the chain-of¬-custody form will include, but is not limited to:

- Accounting and reporting information
- Project number and/or site name (If there are any questions about this, contact the project manager)
- Sampler’s name, information, and signature
- Unique sample identification number or name
- Date and time of sample collection

- Number of containers
- Sample media (e.g., soil, water, vapor, etc.)
- Sample preservative (if applicable)
- Requested analyses
- Comments or special instructions to the laboratory

Each sample will be assigned a unique sample identification number or name. The information on the chain-of-custody form, including the sample identification number or name, must correspond to the information recorded by the sampler on the field forms (refer to SOP-01) and the label on the sample container.

A sample is considered under a person's control when it is in their possession such that tampering is prevented. This includes placing the samples in an area of controlled access such as a building or locking the samples in a vehicle. When custody of a sample is relinquished by the sampler, the sampler will sign and date the chain-of-custody form and note the time that custody was relinquished. The person receiving custody of the sample will also sign and date the form and note the time that the sample was accepted into custody. Samples will be shipped to the analytical laboratory following the procedures in SOP-04. If an overnight shipping service is used to transport the samples to the laboratory, custody of the samples will be relinquished to the shipping service. The shipping service will not sign the chain-of-custody form; however, the samples can be tracked while in the custody of the shipping service. More than one sample may be included on a chain-of-custody form, if all the samples are for the same project. Copies of the chain-of-custody form will be maintained in the project file, in accordance with standardized or project-specific data management procedures.

SOP-4

SAMPLE PACKAGE AND SHIPPING

PACKAGING

All environmental samples collected should be packaged and shipped using the following procedures:

1. Label all sample containers with indelible ink (on the side, not on the cap or lid). Place labeled sample bottles in a high-quality cooler containing an adequate amount of ice (sealed inside two Ziploc bags) to maintain a temperature of 4°C or less inside the cooler. Freeze packs, or "Blue Ice" is NOT to be used. Ensure the cooler drain plug is taped shut.
2. Place the samples in an upright position and wrap the samples with absorbent, cushioning material for stability during transport. Samples should not be loose; the cooler should be able to withstand tough handling during shipment without sample breakage.
3. Fill out the appropriate shipping forms and place in a Ziploc bag then tape it to the inside lid of the shipping container. Shipping forms usually consist of a chain-of-custody form, which documents the samples included in the shipment and specifies the laboratory analyses for each sample.
4. Close and seal the cooler using strapping tape.
5. Place completed sample custody seals on the cooler such that the seals will be broken when the cooler is opened. The custody seal must contain, at minimum, the signature of the person relinquishing custody of the samples and the date the cooler is sealed. Secure the custody seals on the cooler with clear strapping tape.
6. Secure the shipping label with address, phone number, and return address clearly visible.

Note—A chain-of-custody form should be totally unique to a single cooler or shipping container. A cooler should only contain samples that are listed on the chain-of-custody form inside that cooler, and the chain-of-custody form should not list any samples that are not in that cooler. For large sample efforts requiring samples be shipped in two or more coolers, DO NOT fill out a single chain-of-custody form for the entire set of samples and place multiple copies of the same form in multiple coolers. Place only one chain-of-custody in one of the coolers.

SHIPPING HAZARDOUS MATERIALS/WASTE

Hazardous materials need to be shipped using procedures specified under Federal Law. Samples need to be shipped in Ziploc bags or paint cans filled with packing material, depending on the level of hazard. Special package labeling may be needed. Consult the project manager for specific shipping procedures.

SOP-6

MEASUREMENT OF FIELD PARAMETERS: Temperature, Dissolved Oxygen (DO), Specific Conductance, pH, Oxidation Reduction Potential, and Turbidity

INTRODUCTION

This guideline describes the procedures typically used to measure the temperature, DO, Specific Conductance (SC), pH, Oxidation Reduction Potential (ORP), also referred to as redox potential, and turbidity of ground- or surface water.

EQUIPMENT

- Multi-parameter water quality meter
- Flow-through cell or plastic cup
- Transport/calibration cup
- Probe sensor guard
- Operations manual
- Spare batteries
- Standard conductivity calibration solutions [447, 1413, 2074, 8974 microSiemens per centi meter (µS/cm)]
- pH buffers (4.00, 7.00, 10.00)
- ORP calibration solution
- Pens, field logbook, and/or appropriate field forms (e.g., groundwater purge and sample form)
- Personnel and equipment decontamination supplies

PROCEDURES

Calibrate multi-parameter water quality meter at the office prior to commencement of field activities to check instrument is in proper working order. At a minimum, calibrate before use each day (or more frequently as necessary) as indicated below. The initial daily calibration may be performed at the office (if located in proximity to the site), motel, or in the field.

1. Press the On/Off key. Check the battery charge indicator located at the bottom of the liquid crystal display (LCD) screen. Replace batteries if the battery charge indicator is low.
2. Calibrate the meters according to the manufacturer's instructions. *Note: The meter must be calibrated for each field parameter in accordance with the instructions in the operations manual at the beginning of each sampling day. Additional calibrations may be performed during the day if deemed necessary.*
3. If instruments were used in humid or wet environmental conditions, store them in the case open overnight for evaporation so that moisture and mold do not infiltrate sensitive parts.
4. Multi-parameter water quality meter use:
    a. Connect the probe sensor to the flow-through cell. If the flow cell is not used, make sure the probe sensor guard is installed.
    b. Begin passing water into the flow-through cell. If the flow-through cell is not used, place the probe module into a sample of the water or directly into the body of water being evaluated. Be sure to completely immerse all sensors into the water.
    c. Provide a constant flow of fresh water across the probe module to actuate readings.

   d. Observe the meter's LCD display and record the values on the groundwater purge and sample form or field logbook.
   e. Once purging is complete, remove the probe from the sample water and rinse the probes and flow-through cell with distilled water.
5. Place the probe sensor in the transport/calibration cup with 0.5-1 inch of 4.00 pH buffer for short-term/overnight storage for optimal calibration conditions the next day. Place the probe sensor in the transport/calibration cup with 0.5-1 inch of potable water for long-term storage. The transport/calibration cup should be sealed to prevent evaporation. *Note: Storing the probes in dry conditions will damage the sensors.*
6. Turbidity meter use:
   a. Fill a turbidity meter sample vial with water to the fill indication line. Cap the vial securely.
   b. Dry the outside of the sample vial. Line the arrow or alignment indication line on the vial with the arrow or alignment indication line on the turbidity meter. Push the vial all the way into the sample vial port. Ensure that the cap/cover is closed all the way.
   c. Ensure that the turbidity meter is on a level surface and will not be disturbed during the analysis process. Press the Read key. Do not disturb the turbidity meter or open the cap/cover during reading.
   d. Record the value provided. If the reading seems inaccurate, ensure that the sample vial is dry and does not have any streaking or staining and re-read the sample.

SOP-8B

GROUNDWATER SAMPLING—LOW FLOW METHOD

INTRODUCTION

These instructions are in general accordance with the United States Environmental Protection Agency (EPA) Region One Low-Stress (Low-Flow) Standard Operating Procedure (September 2017), and are applicable for using an adjustable rate submersible, peristaltic, or bladder pump with the pump's intake placed at the midpoint of a 10-foot or less well screen or an open interval. Field instruments are already calibrated. The equipment is set up according to the diagram at the end of these instructions.

EQUIPMENT

- Documentation Items:
  - Field sampling forms or field tablet with appropriate Survey123 sampling forms
  - Pens and indelible markers
- Sampling Items:
  - Sample bottle(s)
  - Preservative(s)
  - Coolers for sample bottle(s)
  - Ice for cooler(s)
  - Filter(s) (if required)
  - Laboratory-grade deionized (DI) water (for field blanks)
- Equipment/Instrumentation:
  - Water level or interface meter
  - Pump
  - Pump controller
  - Tubing (poly and silicone)
  - Appropriately sized t-splitter
  - Bailer(s) and rope
  - Multi-parameter meter (temperature, dissolved oxygen [DO], specific conductance [SC], pH, oxidation/reduction potential [ORP]) with low-flow cell
  - Turbidity meter
  - Graduated cup
- Power (if required)
  - Generator
  - Air compressor
  - Fuel
- Investigation-Derived Waste (IDW)
  - Sampling tote with elevated rack (if necessary)
  - Five-gallon bucket(s)
  - Purge water tank (if necessary)
  - 2L graduated cylinders (for decontamination)
  - Decontamination liquids (tap water, laboratory-grade detergent, distilled or DI water, acids, etc.)

All sampling equipment shall be inspected for damage and repaired, if necessary, prior to arriving on-site.

GENERAL PROCEDURES—PURGING

1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of screen/open interval).
2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, and set up the equipment.
3. Check well casing for a reference mark. If missing, make a reference mark on the northern side of the casing and notate in the field sampling form. Measure the water level (initial) to 0.01 ft. and record this information.
4. Measure product level, if present, and water level and record this information on the field sampling form. For wells of 2-inch diameter or less, the water level or interface meter will have to be removed from the well to install the pump, but then lowered back down the well after the pump is installed to monitor water level during the purge.
    a. If free product is present, the well is not to be sampled.
    b. If the water column is less than the length of the pump being used, or 12" if using a peristaltic pump, bailing the sample is the best option. See step 6c for bailing instructions.
5. Install the pump's intake to the appropriate depth (e.g., midpoint) of the well screen, which is often the midpoint of the screen interval for fully submerged well screens, or at the midpoint of the portion of screen penetrating the saturated zone for well screens straddling the water table.
    a. a. Attach the pump discharge line to the t-splitter.
    b. b. Attach tubing between the other side of the t-splitter to the lower stem of the multi-parameter meter low-flow cell.
    c. c. Attach tubing to the lower part of the t-splitter and either a valve end or a clamp on the end of the tubing. This is for turbidity readings, as they must be collected prior to entering the low-flow cell.
    d. d. Attach tubing from the upper stem of the multi-parameter meter low-flow cell and run it to a purge tank or bucket.
6. Start the pump and monitor the water level to assess if drawdown is occurring.
    a. a. Slow the rate if drawdown occurs until water level holds stable or is drawing down slowly enough that it will not exceed the 0.33 ft max or below the top of the well screen.
    b. b. If the rate cannot be lowered enough to avoid excess drawdown (>0.33 ft), then record this deviation in the sampling form. If the water level stabilizes after exceeding 0.33 ft, calculate the volume of water between the initial water level and the stabilized water level and purge at least that amount of water before collecting a sample.
    c. c. If the well runs dry or the water level gets to a point where the pump can no longer produce water, then a bailer can be used. Collect samples for containers in order of priority, and if enough water is left in the well, collect a sample for the multi-parameter storage cup for a single set of parameters.
    d. d. Once the water level is stable, record the pump settings and purge rate using a graduated cup and a timing device. *Note: Flow rate should not exceed 500 mL/min.*
7. After starting the pump, turn on the multi-parameter and turbidity meters and take readings every three to five minutes. Three consecutive readings must be within stabilization criteria before collecting a sample. Stabilization criteria may be set by the specific project, but otherwise, use the stabilization criteria defined in table 1 below.

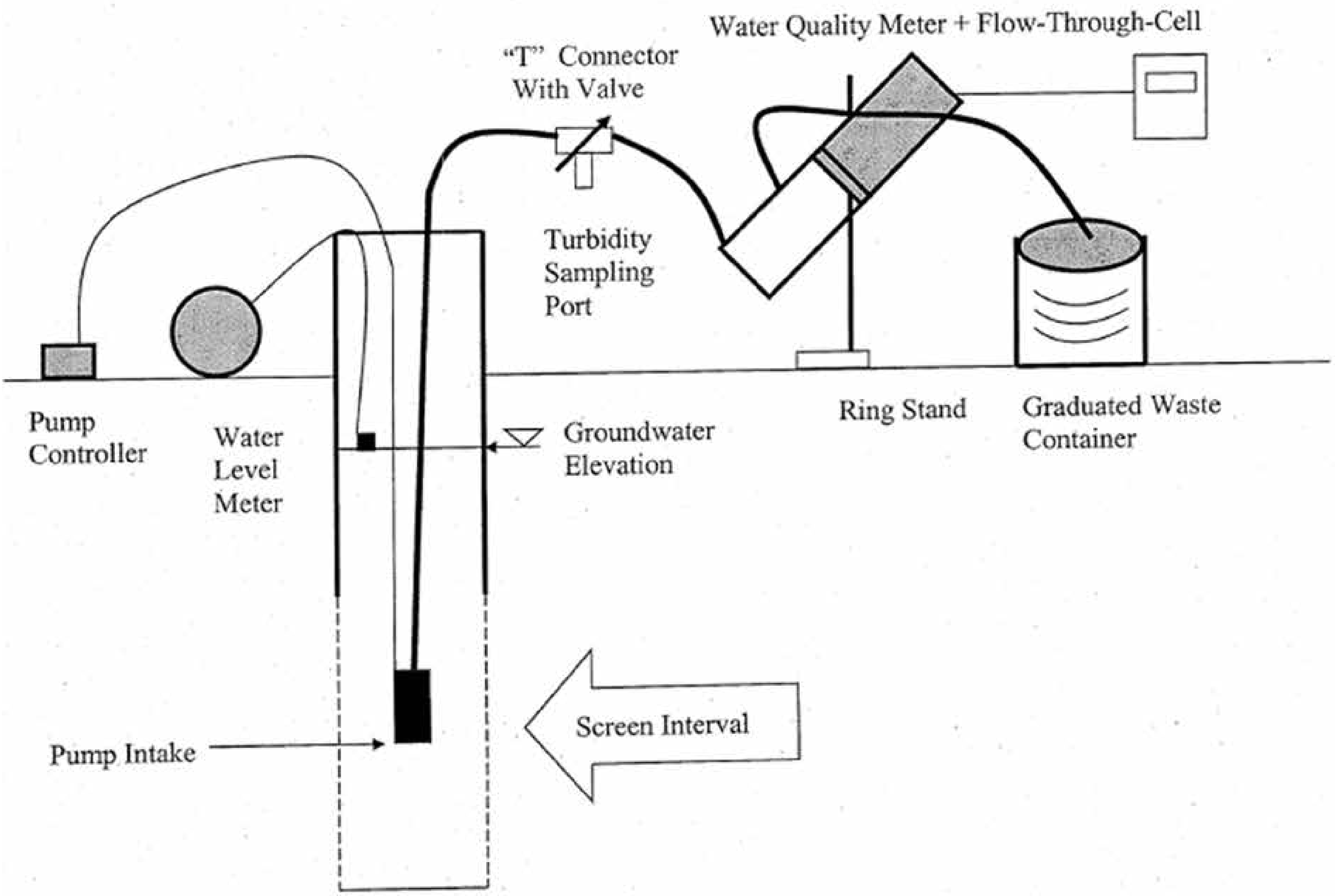
Table 1. Stabilization Criteria

Parameter	Unit	Stabilization Criteria	Exception
Dissolved Oxygen (DO)	milligrams per liter (mg/L	10%	<0.50 mg/L
Oxidation/Reduction Potential (ORP)	millivolts (mV)	±10 mV	
pH	standard units (s.u.)	±0.1 s.u.	
Specific Conductance (SC)	microsiemens per centimeter (µS/cm)	3%	
Turbidity	nephelometric turbidity units (NTU)	10%	<5 NTU

If these parameters do not stabilize by 30 minutes since start of purge, collect the sample and note a deviation of non-stabilized parameters and list which ones in field documentation.

8. Once criteria is met to collect a sample, turn off the multi-parameter and turbidity meters and disconnect the pump discharge tubing from the t-splitter and begin collecting water in the sample containers in order of priority. Collect, preserve, close, and store samples as soon as possible and according to the analytical method(s). *Note: Make sure sample collection takes place over a containerized area (sampling tote or bucket) so that spills are captured.*
    a. If collecting samples for organic compounds, including petroleum hydrocarbons, ensure that all engines (vehicles, generators, etc.) operate 20 feet downwind of the sampling area. Engines will be shut down prior to opening sample collection containers. During sample collection, pumps and meters should be powered using the vehicle battery or a portable battery. Use of disposable gloves will be used whenever fueling generators, to eliminate the possibility of cross-contamination of samples.
    b. Volatiles and dissolved gas analysis samples should be collected first, followed by semi-volatile organic compounds, then inorganic parameters, as required by the sampling and analysis plan.
    c. Field duplicate samples should be collected in conjunction with the natural/original/parent sample.
    d. Field equipment rinse samples should be collected in the same manner as a natural sample, after the decontamination process.
    e. Field blank samples are collected by pouring laboratory-grade DI water into sampling containers.
9. Once samples are collected, acquire a final depth-to-water measurement, and turn off the pump. Record the total purged volume by calculating the time from pump start to stop with the purge rate. Remove the pump from the well and decontaminate the sampling equipment.

Low-Flow Setup Diagram



SOP-9C

SOIL, SEDIMENT, AND ROCK SAMPLING ROCK CORING

Although rock samples are not generally analyzed for chemical contaminants, quality assurance procedures are still important because rock coring is often performed in aquifer zones. Monitoring wells, however, are commonly installed in cored holes. Therefore, adequate decontamination of equipment is required. Contamination of the aquifer or water bearing unit either vertically or between boreholes is undesired.

Boreholes in rock are most often drilled utilizing a rotary hydraulic or compressed air, percussion rig (or combination). Rigs can be truck-mounted, skid-type, etc. depending on accessibility of a borehole location.

Core barrels for rock sampling are available in a variety of designs and sizes, and typically provided by the drill contractor. In general, subsurface conditions dictate selection of the method and such determinations are routinely made by geologists and geotechnical engineers.

Equipment

- Drill Rig (Contractor Provided)
- Appropriate Tooling for Drill Method Chosen (Contractor Provided)
- Stakes, Flagging, or Spray Paint (Site Dependent) to Mark Sampling Locations
- Rock Core Boxes—Must Be Ordered Specifically
- Pens, Field Logbook, Plog Tablet, Protractor, Wax Pencils, Measuring Tape, White Board, and Appropriate Field Forms (E.g., Boring Logs)
- Personnel And Equipment Decontamination Supplies
- Spt Sampling Supplies And Equipment—Driller Provided
- Sample Shipping and Packaging Supplies
- Proper Containment for Waste

Procedures

1. Mark sampling locations as specified in the project-specific sampling and analysis plans (SAPs). If sampling locations are based on a grid pattern, use stakes, or flagging to define the grid layout as needed.
2. Spray paint should be avoided unless known to not contain site chemicals of concern.
3. Sampling locations may need to be relocated based on presence of underground utilities.
4. Clear sample locations for underground utilities and structures by notifying Montana's one-call notification center (1-800-424-5555) (required) at least 2 but not more than 10 business days prior to commencement of field activities.
5. In addition, contact knowledgeable site operations personnel and use a private utility locator service (if necessary) to identify possible underground utilities. Locators typically use spray paint as marking, so request flagging for marking if possible, or collect samples away from markings.
6. Because project goals (e.g., hazardous waste site investigations vs well installation), site

conditions, and sampling requirements vary it is important to make sure use the appropriate pLog form (or paper form if pLog is unavailable) for the project.

7. The project sampling and analysis plan (SAP) will contain all the information needed to determine which log is best.
8. If the SAP specifies additional/custom logging criteria custom forms can be created but must be approved by the Project Manager.
    - Bore hole logs should include (but are not limited to) the following information:
    - Borehole identification (ID) (e.g., name or number of the borehole)
    - Borehole location information (coordinates, elevation, site name, boundaries)
    - Borehole orientation and inclination
    - Date/Time drilling begins
    - Date/Time drilling ends
    - Name/affiliation of driller, driller helper and logger
    - Owner/client name and/or project number
    - Method of drilling, and sampling, and drill rig type
    - Record of drilling progress (location of drilling runs, samples, in situ tests)
    - Use, extent and diameter of casing
    - Detailed information on drilling rate vs depth, changes in drilling speed, drill chatter and circulation (if using water) are useful to take note of.
    - Detailed description of groundwater level, changes in standing water level, loss of drilling fluids (rotary hydraulic), or gain of water (percussion)
    - Inspector's signature, dates of drilling and completion
    - Method and description of borehole closure (if applicable)
    - Well Completion Information (if applicable)
    - ID, Location, Date, Time, and Number of SPT Samples Collected (if applicable). SPT samples are uncommon but can be used for density determinations.
    - ID, Location, Date, Time, and Number other Cores Collected for Laboratory analysis or later reference (if applicable)
    - Detailed geologic/engineering classification/characterization of materials vs depth. The information from properly classified/characterized boreholes should include:
        - Rock/soil classified in general accordance with the visual-manual procedure of the Unified Soil Classification System (ASTM D 2488-90)
        - Color descriptions (the Munsell Color Classification is a helpful tool)
        - Degree of Weathering
        - Micro-structure or Fabric
        - Grain Size
        - Primary Features
        - Core Recovery
        - RQD
        - Fracture Frequency, Spacing, Width and Orientation
        - Fracture filling material (mineralization, breccia, gouge, sediment infillings)
9. Cores that are collected should be stored in core boxes labelled with the appropriate borehole ID, run number, project number, and date and time of collection
10. Cores delivered to a laboratory should be packed to ensure the integrity of the sample is maintained
11. Waste materials generated from coring activities should be stored and/or disposed of according to the project SAP and in accordance with the Water & Environmental Technologies (WET) SOP-17 for Management of IDW
12. Between boreholes proper equipment decontamination procedures should be followed as detailed in the project SAP

MONITORING WELL CONSTRUCTION

INTRODUCTION

This guideline describes procedures to construct and develop monitoring wells. Monitoring well construction will be consistent with applicable state and local requirements, such as Administrative Rules of Montana—Montana Board of Water Well Contractors guidance (ARM 36.21.801 to 809) for work in Montana.

Monitoring wells will be constructed using a contractor licensed in the state in which the work is being conducted, such as a licensed monitoring well constructor as defined by Montana Code Annotated (MCA 85-2-516) for work in Montana.

EQUIPMENT

- Drill rig
- Schedule 40 polyvinyl chloride (PVC) blank casing
- Schedule 40 PVC slotted casing, of appropriate slot size
- Schedule 40 PVC threaded and slip caps
- Schedule 40 stainless steel blank casing
- Schedule 40 stainless steel, wire-wrapped casing, of appropriate slot size
- Stainless steel threaded and slip caps
- Stainless steel well centralizers (for deep wells)
- Mild steel isolation casing with welded centralizers
- Locking standpipes
- Ground-level, traffic-rated, watertight well housing enclosure
- Locking expansion plugs
- Combination or key lock
- Filter pack sand
- Type I or II Portland cement
- Concrete
- Bentonite powder
- Bentonite pellets or chips
- Personnel and equipment decontamination supplies
- Personal protective equipment as specified in the Site-Specific Health and Safety Plan (HASP)

PROCEDURES

1. Arrive on-site with the appropriate drilling equipment and materials for site conditions. The driller shall properly decontaminate all drilling equipment and materials prior to arrival on-site. Decontamination usually includes steam or hot water cleaning methods.
2. Drilling muds or drilling solutions of any kind are not to be used during drilling activities in conjunction with monitoring well construction. Acceptable drilling techniques include air-rotary, cable tool, roto sonic, and hollow-stem auger. If unconsolidated material is encountered, it may be necessary to drive steel casing during drilling to maintain borehole integrity.
3. Hydraulic jacks or the drill rig can be used to pull back the steel casing following emplacement of plastic casing.
4. A detailed lithologic log shall be completed during drilling activities. Water bearing characteristics of the formations should also be denoted on the log. In addition, details of monitoring well construction should also be described on the well log including total depth, perforated interval, sizes and types of construction materials, etc.
5. After completing a boring, verify the monitoring well screen and blank casing specifications stated in the task-specific work plans (if applicable). Assemble and install the monitoring well
6. screen and blank casing through the center of the hollow stem auger, drive casing, or open boring. The assemblage typically consists of a slotted section of threaded Schedule 40 PVC or stainless-steel wire-wrapped screen with a threaded bottom cap and a threaded blank
7. section of well casing long enough to reach the ground surface (or higher if a standpipe monument is used). Affix a slip cap or watertight expansion plug to the top of the casing during
8. installation to prevent debris from entering the well. Typically, the casing string is held in tension and supported with a wire line while it is being lowered into the boring and, if possible, while the drilling string is being removed.
9. If appropriate based on formation characteristics, place clean, appropriately sized, commercial sand (filter pack) around and to 2 or 3 feet (as specified in the task specific work plans)
10. above the slotted section of the monitoring well casing. If pre packed screens are used, it may not be necessary to place extra sand above the pre-packed screened casing.
11. However, this step may still be appropriate to prevent well-seal materials from entering the filter-pack. Carefully pour the filter pack through the drill string annular space as the auger or temporary casing is removed from the boring. If possible, use a measuring device to observe the height of the sand column and monitor for bridging of the material.
12. Place a 2- to 3-foot-thick bentonite seal above the sand or natural filter-pack while the auger and conductor casing is removed from the boring. If required in the well construction permit, notify the appropriate inspector before placing the well seal.
13. Fill the remainder of the annulus between the well casing and the borehole wall with bentonite chips, cement/bentonite grout (with approximately 5 percent bentonite), or a high-solids bentonite slurry (typically 11 to 13 pounds per gallon), to a depth of approximately 1 foot bgs.
14. If the water level is higher than the seal, use a tremie pipe to place the grout/slurry. In sand and gravel formations, a minimum of 10 feet of surface seal shall be used unless the zone of monitoring is higher.
15. Install a protective well monument over the casing.
    a. For a flush-mounted monument, cut off the blank well casing so that it is approximately 4 inches below the ground surface (unless otherwise specified by local requirements). Install a threaded cap or a locking, watertight, expansion plug on the monitoring well. Cover the casing opening and pour rapid-setting cement into the upper foot of the boring around the casing. Set a traffic-rated, pre-cast concrete or steel, well enclosure with a watertight rubber seal into the cement (to approximately 1 foot bgs), with the upper rim of the monument extending approximately 1 inch above grade (unless otherwise specified by local requirements). Construct a concrete apron around the monument to

direct precipitation runoff away from the well.

b. For aboveground completion, extend the well casing to a sufficient height above the ground surface (2 to 2.5 feet) (unless otherwise specified by local requirements). Pour cement into the upper 1 foot of the well boring and install a 5 to 6-foot-long, locking, steel well housing in the cement around the well casing so that the monument extends approximately 2 to 3 feet bgs. Construct a circular or square concrete pad (approximately 4 square feet) around the monument and extending approximately 4 inches above grade. Install at least 3 traffic bollards (at least 3-inches in diameter around the well monument pad in a triangular array, if the well is located in an area where vehicular traffic may reasonably be expected. Install a threaded cap or a locking, watertight, expansion plug on the monitoring well and a padlock on the monument lid hasp.

Safety equipment required on-site of the drill rig is mandatory. Personal protective equipment includes (at a minimum): hard hat, safety glasses, steel toed boots, gloves, first aid kit, and site safety plan-with routes to hospitals known by all personnel on-site.

Water & Environmental TECHNOLOGIES

SOP-11

MONITORING WELL INSTALLATION WITH DIRECT PUSH EQUIPMENT

1. Arrive on-site with the appropriate drilling equipment and materials for site conditions. The driller shall properly decontaminate all drilling equipment and materials prior to arrival on-site. Decontamination usually includes steam or hot water cleaning methods.
2. A detailed lithologic log shall be completed during drilling activities. Water bearing characteristics of the formations should be denoted on the log. In addition, details of monitoring well construction should also be described on the well log including total depth, perforated interval, sizes and types of construction materials, etc.
3. Advance the direct push drill rods to the desired depth for monitoring well installation. Soil samples may be collected in new, disposable acetate sleeves during drilling.
4. The monitoring well shall be constructed of Schedule 40 or 80 PVC casing and factory-slotted well screen up to 1-inch in diameter. Once the drill rods are at the desired depth, lower the well screen and casing through the drill rods.
5. Begin retracting the drill rods out of the borehole while placing a chemically-inert silica sand around the screen interval to one foot above the well screen.
6. Install a bentonite plug above the sand at least 2 feet in thickness. Above the bentonite, back fill the remaining well annulus with a bentonite slurry or grout to ground surface.
7. Place locking protective well cover over the well casing after the drill rods have been removed from the borehole.
8. Place bentonite plug below bottom of well cover; grout the cover in place and lock with high quality lock.
9. Safety equipment required on-site is mandatory. Personal protective equipment includes (at a minimum): hard hat, safety glasses, steel toed boots, gloves, first aid kit, and site safety plan-with routes to hospitals known by all personnel on-site.

SOP-12

PROCEDURES FOR FIELD SCREENING USING A PHOTOIONIZATION DETECTOR

This guideline describes the procedures typically followed during operation of a photoionization detector (PID).

EQUIPMENT

- RAE Systems model Plus, Classic, or equivalent
- Calibration gas with regulator and tubing
- Locking storage bags or pint plastic jars with aluminum foil covering
- Toolkit
- Operations manual
- Spare batteries
- PPE including gloves
- Pens, field logbook, and/or appropriate field forms

PROCEDURES

Calibrate PID at the office prior to commencement of field activities to check instrument is in proper working order. At a minimum, calibrate before use each day (or more frequently as necessary) as indicated below. The initial daily calibration may be performed at the office (if located in proximity to the site), motel, or in the field. Calibration checks must also be completed at the end of each sampling day.

1. Check the battery charge level. If in doubt, charge the battery as described in the manual. The battery should typically be recharged daily after use.
2. Turn unit on. Do not look into the sensor (ultraviolet radiation hazard)—the probe or pump should make an audible sound (whine or solid tone) confirming operation.
3. Perform zero and calibration procedures as described in the operating manual. Calibration can be performed for specific compounds so that the instrument response is proportional to calibration gas concentration. If typical isobutylene calibrant is utilized; the instrument manual provides response factors for other compounds.

Note: Verify that the ionizing lamp in the PID is suitable for the compounds being evaluated. Consult the table below, or the operator's manual for ionization potentials and response factors for common compounds. A PID is not suitable for detecting methane. The instrument should be calibrated under ambient conditions to account for temperature and humidity. Use instrument manufacturer designed moisture trap on probe when testing saturated soil or water samples.

4. Once calibrated, the unit is ready for use. Place a filter on the intake before use! Position the filtered intake assembly close to the area in question because the sampling rate allows only for localized readings.
5. A slow, sweeping motion of the intake assembly helps to prevent the bypassing of problem areas.

6. Use the heated headspace method below:
   - Place a consistent amount of soil into a sealable plastic bag (i.e., approximately 100 grams of soil).
   - Seal the plastic bag. If environmental conditions are warm/hot (vehicle heater use unneces sary), then set the bag outside to warm up, preferably in the sun. If environmental conditions are cool/cold (vehicle heater use necessary), then set the bag on the windshield vent heater.
   - Wait a consistent amount of time (typically several minutes).
   - Open the bag slightly, insert the intake assembly into bag, and observe the peak reading.

   Note: Static voltage sources, such as power lines, radio transmissions, or transformers, may interfere with measurements. Consult the operating manual for a discussion of necessary considerations.
7. Record the measurements on the field logbook or other appropriate field form.

SPECIAL NOTES

Read the operator's manual thoroughly. As with any field instrument, accurate results depend on the operator being completely familiar with the unit. Be aware that moisture may affect readings. Clean and maintain the instrument and accessories to obtain representative readings.

In the event the instrument must be shipped via a courier service (i.e., UPS, FedEx, etc.) from the office to a field location, ship the instrument (including calibration gas) via ground in accordance with Department of Transportation regulations and courier service requirements.

PID Lamp Selection

Lamp	Description	Typical Compounds Detected
9.8 eV	Most Selective Lamp	Benzene, aromatic compounds, and amines.
I0.6 eV	Standard PID Lamp	All compounds detected by 9.8 eV lamp as well as chlorinated compounds, including vinyl chloride, DCE, TCE, PCE, and chlorobenzene.
11.7 eV	Detects Broadest Range of Analytes	All compounds detected by 10.6 eV lamp as well as methylene chloride, carbon tetrachloride, chloroform, and 1,1,1-trichloroethane.

SOP-13

MONITORING WELL DEVELOPMENT

EQUIPMENT

- 2- or 4-inch-diameter vented surge block
- Centrifugal surface pump
- Submersible pump (4-inch-diameter wells or larger)
- 55-gallon Department of Transportation (DOT)-approved drums
- Teflon®, stainless steel, or PVC bailer
- Teflon®-coated bailer retrieval wire
- Airlift pump with foot valve and compressor
- Bladder pump (2-inch-diameter wells only)
- Electric water level monitoring probe
- Multi-phase interface monitoring probe
- Multi-parameter water quality meter
- Sample labels, pens, and field logbook or other appropriate field forms (e.g., groundwater well development form)
- Personnel and equipment decontamination supplies
- Personal protective equipment as specified in the Site-Specific Health and Safety Plan (HASP)

PROCEDURES

1. After allowing the well seal and monument to cure for a sufficient period, develop the well unless development will compromise the potential usability of the well or exacerbate turbidity problems. [Note: In general, wells containing light non-aqueous phase liquid (LNAPL) should not be developed.] The purpose of developing a monitoring well is to remove drilling fluids and fines from the borehole/filter pack.
2. Prior to development activities, measure and record the total casing and groundwater depth.
3. If applicable, evaluate the well for the presence of LNAPL.
4. If the depth to water in the monitoring well is less than 25 feet bgs, the well may be developed using a centrifugal surface pump with flexible, discharge tubing. If the depth to water in the well is greater than 25 feet bgs, a submersible impeller or airlift pump (with an oil trap and filter) may be used. In some cases, a well may be developed by hand bailing using either a pre-cleaned stainless steel or PVC bailer.
   A surge block of appropriate size can be moved up and down inside the screened section of the well casing to create a surging action that hydraulically stresses the filter pack. When an impeller pump is used for development, the pump itself can be moved up and down in the casing to create a surging action.

5. During development of the well, record the following water quality parameters and observa tions on a groundwater well development form:
- Depth to water
- Development time and volume
- Development (flow) rate
- pH, temperature, specific conductance, and turbidity
- Other observations, as appropriate (e.g., color, presence of odors, or sheen).

6. Continue developing the well until water quality parameters have stabilized and the turbidity of the discharge water is low.

Note: If fine-grained materials are present, low turbidity may not be achievable. Stop development if the development process is causing an increase in the turbidity of the produced groundwater.

7. Follow personnel and equipment decontamination procedures outlined in SOG-2.

Note: It is customary to wait 1 to 3 days after developing a well before sampling; however, the appropriateness of sampling a well after development should be determined on a case-by-case basis. In general, wells completed in highly transmissive formations can be sampled immediately following development without concern that development will introduce bias into sampling results.

SOP-16

QUALITY CONTROL SAMPLING

Quality Control (QC) samples are submitted along with natural samples to provide supporting laboratory data to validate laboratory results. QC samples are submitted blind except for matrix spikes and trip blanks, and do not have any unique identifying codes that would enable the lab or others to bias these samples in any way. Usually, the time or sampling location is modified in a way which will separate blank and standard samples from the rest of the sample train. QC samples are identified only on field forms and in field notebooks. The following codes are typically used:

N	Natural Sample	Soil, water, air, or other of interest material from a field site
SP	Split Sample	A portion of a natural sample collected for independent analysis; used in calculating laboratory precision
D	Duplicate Sample	Two samples taken from the same media under similar conditions; also used to calculate precision Two samples taken from the same media under similar conditions; also used to calculate precision
FB	Field Blank	Deionized water collected in sample bottle; used to detect contamination introduced during the sampling process.
RB	Rinsate Blank	Deionized water run through or over decontaminated equipment; used to verify the effectiveness of equipment decontamination procedures
MS/MSD	Matrix Spike/Matrix Spike Duplicate	Certified materials of known concentration; used to assess Spike Duplicate laboratory precision and accuracy
TB	Trip Blank	Inert material (deionized water or diatomaceous earth) included in sample cooler; sent by the lab, the sample is used to detect any contamination or cross-contamination during handling and transportation.

In general, selected QC samples will be inserted into the sample train within a group of twenty samples. QC samples will be prepared in the field, apart from trip blanks. Trip blanks will be supplied by the laboratory and will accompany each sample cooler containing samples for analysis of volatile organic compounds.

Typical QC sample collection frequencies are presented in the table below. However, at some sites, especially ones where streams or ponds are sampled, QC samples may need to be taken at a higher frequency. Refer to the project-specific sampling and analysis plan or quality assurance plan for the appropriate QC sample frequency. Each field crew leader will be responsible for all QC samples prepared by that crew.

QC Sample	Purpose	Collection Frequency
Field Duplicate	Measure analytical precision	1 per every 20 samples
Matrix Spike/ Matrix Spike Duplicate	Measure analytical accuracy	1 per every 20 samples
Equipment Rinse Blanks	Evaluate effectiveness of equipment decontamination and sample handling procedures.	1 per sampling event per media type
Field Blank	Assess possible cross-contamination of samples due to ambient conditions during sample collection	1 per sampling event
Trip Blank	Evaluate sample preservation, packing, shipping, and storage	1 per cooler containing samples with volatile constituents

Methods for computing data validation statements can be found in EPA documents or obtained from Geomatrix.

SOP-17

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

INTRODUCTION

This SOP describes the management of investigation-derived waste (IDW). The project specific Sampling and Analysis Plan should be referenced for additions or deletions to the methods noted below.

EQUIPMENT

- Department of Transportation (DOT)-approved packaging (typically DOT 17E or 17H drums) or other appropriate containers
- Funnel
- Bushing wrench
- 15/16-inch socket wrench
- Shovel
- Appropriate markers (spray paint, paint pen) and labels
- Plastic sheeting
- Drip pans
- Pallets
- Personal protective equipment as specified in the Site-Specific Health and Safety Plan (HASP)

PROCEDURES

Preparing Containers

1. Place each container on a pallet if it is to be moved with a forklift after it is full.
2. Ensure that packaging materials are compatible with the wastes to be stored in them. Bung-type drums should be used to contain liquids. If a liquid is corrosive, a plastic or polymer drum should be used.
3. Solids should be placed in open-top drums. Liners are placed in the drums if the solid material is corrosive or contains free liquids (other than water). Gaskets are also used on open-top drum lids.

KNOWN OR ASSUMED NON-HAZARDOUS WASTE

1. As waste materials are generated, place them directly into storage containers. Alternatively, depending on quantity, soils may be contained onsite on plastic sheeting and covered pending analytical results. In certain instances, if it is known that the IDW is not hazardous, it can be disposed of onsite (e.g., dispose the purge water on the ground, place soils back into test pits).
2. If the IDW is placed into a container, do not fill storage containers/drums completely. Provide sufficient space so that containers will not be overfull if their contents expand.
3. After filling a storage container/drum, seal it securely. Use a bung wrench or socket wrench, for a bung-type or open-top drum, respectively.
4. Label the container indicating its content, date, and origin/location.
5. If it is known that the IDW is not hazardous, arrange for disposal of the IDW as a solid waste.

6. If no information exists as to determine whether the IDW is hazardous (e.g., records, analytical results, of other knowledge of the IDW properties), the IDW must be profiled to determine disposal options.
7. To profile the waste:
   a. Contact the proposed disposal facility to obtain the type of information the disposal facility will need before accepting the IDW, including necessary analytical data.
   b. If analytical data are needed, collect a sample or samples of the IDW and submit to an analytical laboratory.
   c. Upon receiving the analytical results, arrange for the proper disposal of the IDW.

Note: The disposal facility will rely on you to provide information regarding the types of constituents that may be present in the IDW.

HAZARDOUS WASTES

1. As waste materials are generated, place them directly into storage containers.
2. Do not fill storage containers/drums completely. Provide sufficient space for expansion.
3. After filling a storage container/drum, seal it securely. Use a bung wrench or socket wrench, for abung-type or open-top drum, respectively.
4. Label drums or other packages containing hazardous waste. To comply with marking and labeling requirements, affix a properly filled out yellow hazardous waste marker. Do not mark drums with Water & Environmental Technologies' name. All waste belongs to the client. Include the accumulation start date on the label.
5. During an ongoing investigation, use a paint marker to mark the contents, station number, date, and approximate quantity of material on each drum or other container.
6. Do not mix IDW with one another or with other materials. Do not place items such as Tyvek® suits, gloves, equipment, or trash into drums containing soils or liquids, and do not mix water and soil. Disposable protective clothing, trash, soil, and water materials should be disposed of in separate containers.
7. Place the containers in a secured area equipped with a secondary containment system, if appropriate.
8. While storing the IDW, the substantive standards in 40 Code of Federal Regulation (CFR) Parts 264 and 265 Subparts I and J or State equivalent must be complied with.
9. Dispose the IDW upon completion of the field work or incorporate the IDW into the remedial action upon initiation of the final remedy. If the IDW will be disposed offsite, the IDW will need to be manifested for transportation in accordance with federal or state requirements.

SUPERFUND REQUIREMENTS

Testing and management of IDW originating from within a Superfund area, such as operable of the Butte/Anaconda NPL Sites, must be addressed in Site-Specific SAPs.

REFERENCE

Montana Department of Environmental Quality. (Undated). Technical Guidance Document #10 - Options for Discharge of Hydrocarbon-Contaminated Wastewater. Montana Department of Environmental Quality, Remediation Division, Petroleum Release Section, Helena, Montana.

Appendix B

Contractor Bids

Appendix C

DEQ Communication

From: Miner, Reed
To: Danny Leas
Cc: Raye Surratt
Subject: RE: Petro Release 2697, WP 35151 new borings and wells
Date: Monday, March 30, 2026 11:24:23 AM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.png

The proposed locations and approach described below are reasonable.

Thanks for the opportunity to comment.

Reed Miner I *Environmental Project Officer*
Tanks, Brownfields, and Federal Facilities Bureau
Montana Department of Environmental Quality
Office: 406-755-8982
Cell: 406-250-9157

From: Danny Leas <dleas@waterenvtech.com>
Sent: Monday, March 30, 2026 10:06 AM
To: Miner, Reed <RMiner@mt.gov>
Cc: Raye Surratt <rsurratt@waterenvtech.com>
Subject: [EXTERNAL] Petro Release 2697, WP 35151 new borings and wells

Hello Reed,
Prior to completing the Investigation Work Plan 35151 for Petroleum Release 2697, we would like to have you review and approve the locations of the additional soil borings and wells (see attached). “Clean” borings will be defined as those with PID readings <150 ppm and little to no staining/hydrocarbon odor.

We are planning up to seven additional borings. The first couple borings will be located to the North Northwest of the Release. A power line and site sign limit the locations we can install the borings. We are planning two primary borings starting with SB-12 (see attachment) and moving north to SB-13. If PID readings in the primary borings are over 150 ppm along with hydrocarbon observations, then two additional step out borings to the north and west will be drilled.

The next couple of borings will be to the East side of the Release. A highway and power lines limit how far east we can go before we must cross the road. We are planning on two primary borings starting with SB-15 (see attachment) and moving north to SB-14. If PID readings in the primary borings are over 150 ppm along with hydrocarbon observations, then one additional step out boring across the road to the east will be installed.

We are planning two additional wells to delineate the extent of groundwater impacts. The first well will be set in one of the borings to the North Northwest of the release that has PID readings of less than 150 ppm with little to no hydrocarbon observations. The second well will be set in one of the borings to the East of the release that has PID readings of less than 150 ppm with little to no hydrocarbon observations. Wells will be set in the “clean” boring located closest to the plume.

Let me know if you have any comments or questions.

Thanks,

Water & Environmental TECHNOLOGIES
Danny Leas
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From:	Miner, Reed
To:	dalewhalen@gmail.com
Cc:	Danny Leas; Raye Surratt; Hidalgo, Autumn; Jacobs, Wendee
Subject:	RE: WP Extension Request - Bermel"s Store, Release 2697
Date:	Monday, March 30, 2026 1:22:13 PM
Attachments:	image001.png 2697_17Feb26_WPR.pdf

WARNING - This email originated from an EXTERNAL SOURCE. Do not reply, click any link or open attachments unless you can confirm the sender. *Please report suspicious emails to itsupport*

Dale,

Per your consultant's request, the due date for the work plan requested in the attached letter has been extended to April 30, 2026.

Reed Miner l *Environmental Project Officer*
Tanks, Brownfields, and Federal Facilities Bureau
Montana Department of Environmental Quality
Office: 406-755-8982
Cell: 406-250-9157

From: Raye Surratt <rsurratt@waterenvtech.com>
Sent: Monday, March 30, 2026 9:04 AM
To: Miner, Reed <RMiner@mt.gov>
Cc: Danny Leas <dleas@waterenvtech.com>
Subject: [EXTERNAL] WP Extension Request - Bermel's Store, Release 2697

Good morning, Reed,
Can I get an extension to the end of April on the above mentioned workplan? I've been drowning and just haven't been able to get to it. Danny, cc'd, will be reaching out to you regarding proposed boring/well locations in the near future.
Thanks,
Raye

Water & Environmental TECHNOLOGIES
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Appendix D

WET Project Cost Estimate