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Groundwater Monitoring Work Plan for the Former Scott's Auto Body

45 1st Street | Chinook | Blaine County | Montana
Facility ID 99-95030 (TID 17239) | Release 4486 | Work Plan 34906

Prepared for:
MDEQ—Petroleum Tank Cleanup Section
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Site Owner:
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October 8, 2024

Table of Contents

List of Tables

List of Figures

List of Appendices

1 Executive Summary

Water and Environmental Technologies (WET) presents this Groundwater Monitoring Work Plan (WP) for the petroleum release at the Former Scott's Auto Body (Facility), as required in the Montana Department of Environmental Quality (DEQ) WP request letter dated July 24, 2024.

The scope of work includes:

- Monitoring groundwater at Facility monitoring wells semiannually for one year, which includes:
  - Gauging fluid levels at monitoring well MW-3.
  - Collecting groundwater samples at monitoring well MW-3 by low-flow sampling methodology according to DEQ's Groundwater Sampling Guidance.
  - Analyzing groundwater samples for petroleum constituents as required by the DEQ Montana Risk-Based Corrective Action Guidance for Petroleum Releases.
  - Disposing of purge water according to the DEQ Purge Water Disposal flow chart.
- Validating all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF).
- Discussing ongoing WP tasks and results with DEQ's project manager (PM) and submitting written agreed-upon WP modifications as required to complete the WP objectives.
- Updating a Release Closure Plan (RCP) and discussing results with DEQ's PM.
- Preparing and submitting an interim data submittal (IDS) for the interim groundwater monitoring event including discussion, data, tables, and figures.
- Preparing and submitting a Groundwater Report detailing the method and results of all groundwater monitoring events completed under this WP, which will include:
  - Discussion of the monitoring method results, deviations from the approved WP, assessment of attenuation rates (on-site and off-site), recommendations, and conclusions.
  - Cumulative groundwater data tables.
  - Updated site features and potentiometric surface maps.
  - Appended groundwater monitoring field forms, laboratory analytical data, completed DVSFs, and the RCP.

2 Facility History and Release Background

2.1 Facility History

The Facility is currently owned and operated by Harold Miller. DEQ requested in their letter dated February 22, 2006 letter that Harold Miller conduct an investigation to deny or confirm the presence of contamination at the Facility. This investigation request was based on prior investigation conducted in December 1990 to evaluate the extent and magnitude of petroleum contamination in the subsurface along US Highway 2 in Chinook. Groundwater and soil investigation activities identified a petroleum release consisting of gasoline and diesel contamination had impacted groundwater and soil at the Facility. The contamination source at the Facility was suspected to be underground storage tanks (USTs) and an unknown quantity of petroleum was released. The site location and features are shown in **Figure 1**.

2.2 Release Background

In response to the February 22, 2006 WP request letter referenced above, WET conducted a soil and groundwater investigation in December 2006. Soil borings from various locations were confirmed to have petroleum stains and odors. Laboratory results for soil samples indicated concentrations of volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH) that exceeded screening levels. Laboratory results for groundwater samples indicated concentrations of C11 to C22 Aromatics, C9 to C10 Aromatics, C5 to C8 Aliphatics, C9 to C12 Aliphatics, and benzene that exceeded human health standards (HHS) or risk-based screening levels (RBSLs).

WET conducted additional groundwater monitoring events in May 2007 and October 2007 to continue monitoring natural attenuation. Benzene was the only contaminant exceedance preventing site closure and showed a decreasing trend in groundwater samples. Based on localized impacts, no offsite plume migration or impact to downgradient wells, and decreasing concentrations, WET suggested continuing groundwater monitoring with no additional investigation activities. Groundwater monitoring events continued, taking place in August 2012, March 2013, February 2015, September 2020, and April 2021. The concentration of benzene in MW-3 has steadily decreased since monitoring began and was above the HHS during the most recent monitoring event (April 2021).

3 Objectives of Groundwater Monitoring

The objectives of groundwater monitoring are to continue monitoring natural attenuation and resolve the release. These objectives will be achieved through semiannual groundwater monitoring, which involves fluid level measurement and the collection of groundwater samples for laboratory analysis. Samples collected will be analyzed for VPH, as approved by William Bergum, DEQ.

4 Minimum Work Plan Tasks

4.1 Work Plan Preparation

WET personnel prepared this WP in response to the DEQ WPR letter dated July 24, 2024.

4.2 Project Management

WET personnel will provide Harold Miller (Owner) and DEQ's project manager with any ongoing WP tasks and relevant results on an as-needed basis. Other duties associated with this task include scheduling field work, project reporting administration, monitoring the project budget and deliverables, and any submitted written agreed-upon WP modifications to complete the objectives.

4.3 Mobilization

Two total mobilizations for a Staff Engineer are required for this WP to conduct groundwater monitoring. Each round-trip mobilization is approximately 300 miles and includes one hour of loading/unloading time.

4.4 Groundwater Monitoring

WET will conduct two groundwater monitoring events of one monitoring well, MW-3. This well will be monitored semiannually to coincide with seasonally high and low groundwater. Fluid levels will be measured with an oil-water interface meter prior to purging the well in accordance with WET standard operating procedure (SOP) 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. SOPs are included as **Appendix A**. Any monitoring well containing free product will not be sampled. Monitoring wells will be purged and sampled using a peristaltic pump 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).

Groundwater field parameters for each well will be measured during purging activities by a YSI® Professional Plus Quatro Cable multi-meter, HACH turbidity meter, and an oil/water interface probe as outlined in 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.

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	

Reusable equipment (oil-water interface probe) will be decontaminated in accordance with WET SOP-2: Equipment Decontamination (**Appendix A**).

4.5 Laboratory Analysis

Groundwater samples will be submitted to Energy Laboratories in Helena, Montana for the analyses and methods listed in **Table 2**. Groundwater samples will be submitted for laboratory analysis following procedures outlined in WET SOP-3: Sample Nomenclature, Documentation, and Chain of Custody (**Appendix A**) and WET SOP-4: Sample Package and Shipping (**Appendix A**).

Table 2. Laboratory Analyses

Container(s)	Preservation	Analysis	Method
Three 40-mL VOA vials	HCl	VPH	MA-VPH

4.6 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) samples including duplicates and field blanks (water) will be collected at a minimum frequency of 1 per 20 natural samples (5%) as outlined in WET SOP-16: Quality Control Sampling (**Appendix A**). The duplicate will be collected at a random site by splitting a natural sample in the field. 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 using DEQ's Data Validation Summary Form (DVSF). This summary form will be included in the final report.

4.7 Investigation Derived Waste (IDW) Management, Characterization, and Disposal

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 audit or long-term pumping test. Therefore, the purge water from the groundwater sampling event will be discharged to pervious Facility ground. All non-reusable sampling equipment and spent personal protective equipment will be disposed of in garbage bags.

4.8 Reporting

Following the completion of each interim groundwater monitoring event, an interim data submittal (IDS) will be prepared and submitted. The IDS will include discussion, data, tables, and figures as described in DEQ's *Groundwater Monitoring Work Plan and Report Guidance for Petroleum Releases*. Upon completion of the WP tasks, WET will prepare a Groundwater Monitoring Report in the DEQ guidance format detailing the results of groundwater monitoring, including the following:

- Discussion of the monitoring method results, deviations from the approved work plan, assessment of attenuation rates (on-site and off-site), recommendations, and conclusions.
- Cumulative groundwater data tables.
- Updated site features and potentiometric surface maps.

- Appended groundwater monitoring field forms, laboratory analytical data, completed data validation summaries, and an updated Release Closure Plan.

5 Cost and Schedule

5.1 Cost

Work effort level has been estimated using best professional judgement and typical scenarios related to work of this type. A detailed cost estimate is included as **Appendix B**.

5.2 Schedule

WET will begin implementation of the WP immediately upon DEQ approval and obligation of funding by the Petroleum Tank Release Compensation Board. Notification for each event will also be sent to the Facility Owner and the DEQ Project Manager prior to activities.

Figure 1

Site Location & Features


1st St
2
MW-1
MW-3
MW-4
GARAGE
MW-2
FORMER
LUMBER
SHED
Illinois St
Idaho St
2nd St
0
50
100
200
300
400
Feet
M O N T A N A
BLAINE COUNTY
Property Boundary
Monitoring Wells
Active
Destroyed or Abandoned
N
W
E
S
NO.
DESCRIPTION
DATE
DRAFT
REVIEW
1
MAP CREATION
10/8/24
LG
LB
2
3
4
5
NOTES
SITE LOCATION & FEATURES
CHINOOK, MT
JOB#: MILLERM01
DATE:10/8/2024
FIGURE 1
Path: M:\MillerM01\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge
Water & Environmental
TECHNOLOGIES

Appendix A

WET Standard Operating Procedures

SOP-1

FIELD LOGBOOK AND FIELD SAMPLING FORMS

All pertinent field investigation and sampling information will be recorded on a field form 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 on the field forms. No general rules can specify the extent of information that must be entered on the field form. However, field forms 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:

- Date and time of starting work and weather conditions.
- Names of field crew leader and team members.
- Project name and type.
- Description of site conditions and any unusual circumstances.
- Location of sample site, including map reference, if relevant.
- Details of actual work effort, particularly any deviations from the field work plan or standard operating procedures.
- Field observations.
- 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 (ex., low-flow groundwater monitoring). Sampling field forms contain fill-in-the-blank type information in order 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:

- Time and date samples were collected.
- Number and type (natural, duplicate, QA/QC) of samples collected.
- Analysis requested.
- Preservative added to samples.
- Sampling method, particularly deviations from standard operating procedures.

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, photocopies of the original field forms will be made and used as working documents; 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 nondedicated 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. Every precaution must be taken by personnel to prevent contaminating themselves with the wash water and rinse water used in the decontamination process.

EQUIPMENT

- 5-gallon plastic tubs
- Liquinox (detergent)
- 5-gallon plastic water containers
- Hard bristle brushes
- 5-gallon carboy containing deionized water
- Garbage bags
- 1-gallon cube of 10% HN03
- Latex or nitrile sample gloves
- 1-gallon container or spray bottle of 10%
- Methanol or pesticide grade Acetone for organics
- Spray bottles
- Paper towels
- Aluminum foil

PROCEDURES

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

1. Set up the decontamination zone upwind from the sampling area to reduce the chances of wind borne contamination.
2. Visually inspect sampling equipment for contamination; use stiff brush to remove visible mate rial.
3. The general decontamination sequence for field equipment includes wash with Liquinox or an equivalent degreasing detergent; deionized water rinse; 10% dilute nitric acid rinse; rinse with deionized water three times.
4. Rinse equipment with methanol in place of the nitric acid rinse if sampling for organic contam ination. Follow with a deionized water rinse.
5. Decontaminated equipment that is used for sampling organics should be wrapped in alumi num foil if not used immediately.
6. Clean the outside of sample container after filling sample container.

Alternatively, field equipment can be decontaminated by steam cleaning, rinsing with 10% dilute nitric acid, and rinsing with deionized water.

All disposable items (e.g., paper towels, latex gloves), as well as rinse and wash water generated during decontamination, should be disposed in accordance with SOP-17 – Management of Investigation-Derived Waste.

SOP-3

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 preprinted carbonless triplicates, enabling copies to be filled 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 the field crew leader is certain field personnel are 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
- Chain-of-Custody
- Custody Seal

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.

FIELD EQUIPMENT

- Indelible ink pen
- Chain-of-custody forms
- Custody seals

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:

- Project number/site name
- Sampler’s name and signature
- Date and time of sample collection
- Unique sample identification number or name
- Number of containers
- Sample media (e.g., soil, water, vapor, etc.)
- Sample preservative (if applicable)
- Requested analysis
- 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 1) 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 4. 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, as long as all of 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.

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 particular 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.

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.

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-5

FIELD MEASUREMENT OF GROUNDWATER LEVELS/LIGHT NON-AQUEOUS PHASE LIQUID LEVELS

INTRODUCTION

In general, groundwater levels [and Light Non-Aqueous Phase (LNAPL) levels, if applicable] in wells will be measured prior to commencing development, purging, sampling, pumping tests, or other activities that disturb the fluid pressure relationships in the well. Measurements may be taken during such events for purposes other than determining static conditions and may also be taken to determine static conditions after such activities if an appropriate period of time has elapsed to allow steady-state conditions to return.

EQUIPMENT

- Electronic water level monitoring probe (for water levels only)
- Electronic multi-phase interface monitoring probe (for measuring water levels and LNAPL levels)
- Keys for well locks
- Tools to open well covers (e.g., socket wrench, spanner wrench, etc.)
- Watch or stopwatch
- Pens and field logbook or other appropriate field forms (e.g., groundwater purge and sample forms)
- Monitoring well construction data (for total depth and screen intervals of well)
- Personnel and equipment decontamination supplies (refer to SOP-2)

PROCEDURES

1. If more than one well will be measured, conduct measurements in the order of lowest to highest chemical concentrations previously detected in samples from the monitoring wells.
2. Allow the well to equilibrate by removing the protective cap and leaving the well open for a period before beginning taking measurements. Generally, removing all site well caps prior to collecting the first liquid level measurement provides sufficient time to reach equilibrium.
3. Examine the monitoring well for any structural damage, poorly fitting caps, and leaks into the inner casing. Record all well maintenance issues on the appropriate field sampling form or field log book.
4. If LNAPL is not present, use a pre-cleaned water level probe or equivalent to measure depth to water from the indicated survey mark on the well casing. If a mark is not present, measure from the top of the northern side of the well casing.
5. If LNAPL may be present, use a pre-cleaned, electric, multi-phase interface probe to measure the depth of the LNAPL and depth to water. Record both measurements on the sampling form or field logbook. Unless otherwise instructed, always measure depths to LNAPL layer and groundwater from the indicated survey mark. If a mark is not present, measure from the top of the northern side of the well casing.

6. Repeat measurements at least once by lifting the probe tape at least one foot out of the well allowing the measurer to confirm the accurate foot, tenth-of-a-foot, and hundredth-of-a-foot mark on the tape.
7. Follow personnel and equipment decontamination procedures outlined in SOP-2.

SOP-6

MEASUREMENT OF FIELD PARAMETERS: pH, DISSOLVED OXYGEN, SPECIFIC CONDUCTANCE, TURBIDITY, OXIDATION RE DUCTION POTENTIAL, AND TEMPERATURE

INTRODUCTION

This guideline describes the procedures typically used to measure the pH, dissolved oxygen, specific conductance, turbidity, oxidation reduction potential (ORP, also referred to as redox potential), and temperature 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 meter 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. Connect the probe sensor to the flow-through cell. If the flow cell is not used, make sure the probe sensor guard is installed.
4. 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.
5. Provide a constant flow of fresh water across the probe module to actuate readings.
6. Observe the meter's LCD display and record the values on the groundwater purge and sample form or field logbook.

7. Remove the probe from the water and rinse (soak) with distilled water.
8. Place the probe sensor in the transport/calibration cup with 1/2 inch of potable water for short-term storage. The transport/calibration cup should be sealed to prevent evaporation.

SOP-08B

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 a 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.

SUPPLIES

Documentation Items

- Field sampling forms or field tablet with appropriate electronic 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)

Equipment/Instrumentation

- Water level or interface meter
- Pump (peristaltic or bladder)
- Pump controller with built-in compressor
- Tubing
- Appropriately sized t-splitter
- Multi-parameter meter (temperature, dissolved oxygen [DO], specific conductance [SC], pH, oxidation/reduction potential [ORP]) with flow through cell
- Turbidity meter
- Graduated container

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

GENERAL PROCEDURES—PURGING

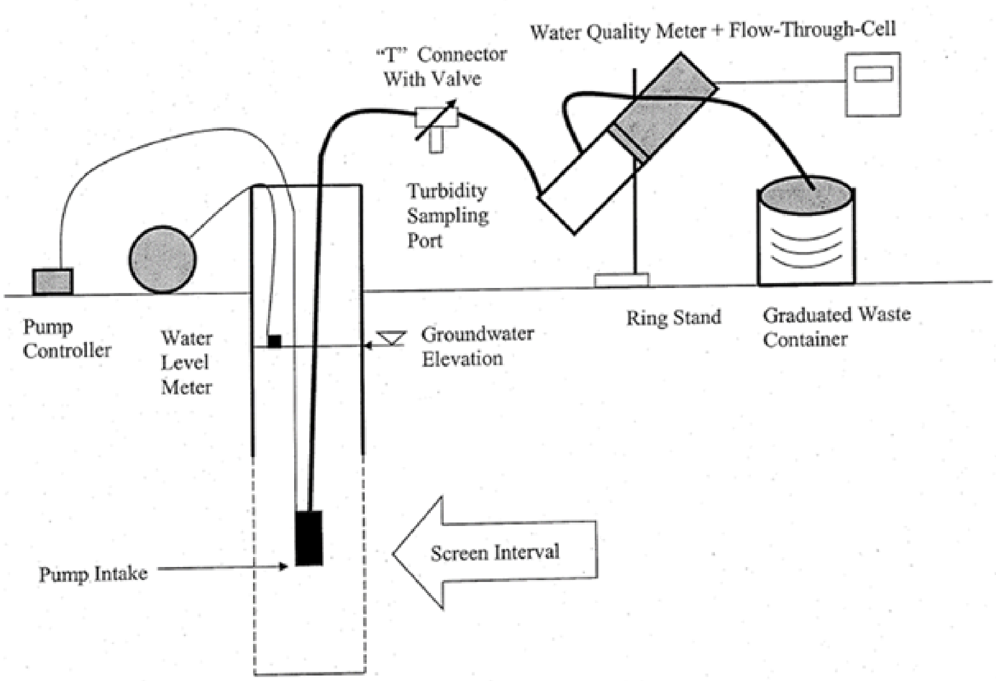
1. Review well installation information. Record well depth, length of screen or open interval, and depth to top of the well screen. Determine the pump's intake depth (e.g., mid-point of saturated screen /open interval).
2. On the day of sampling, check security of the well casing, perform any safety checks needed for the site, and set up the equipment.
3. Check well casing for a reference mark. If missing, make a reference mark. 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. 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.
5. Install the pump's intake to the appropriate depth (e.g., midpoint) of the saturated 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. The pump should be installed slowly to minimize disturbance to the water column.
   a. attach the pump discharge line to the t-splitter.
   b. Attach tubing between the other side of the t-splitter to the lower stem of the multi-parameter meter flow through cell. Tubing lengths should be kept as short as possible to minimize heating of the groundwater. Heat may cause the groundwater to degas and adversely affect data quality.
   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 for the collection of turbidity readings prior to entry to the flow through cell.
   d. Attach tubing from the upper stem of the multi-parameter meter flow through cell and direct it to a purge tank or pervious ground in accordance with the site sampling and analysis plan or DEQ's Disposal of Untreated Purge Water from Monitoring Wells flow chart (if applicable).
6. Start the pump at a low rate and slowly increase the flow rate until the water level begins to drop. Flow rate should not exceed milliliters per minute (mL/min).
   a. Slow the rate if drawdown occurs until water level stabilizes. Water levels should not drop below 0.3 feet of the initial water level.
   b. If the rate cannot be reduced enough to avoid excess drawdown (>0.3 ft), pump at the lowest achievable rate and record on the sampling form. If the water level stabilizes after exceeding 0.3 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. 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 sample 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. Once the water level is stable, record the pump settings and purge rate using a graduated container and a timing device.
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

8. Once criteria are 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: For sites requiring capture of all purge water, 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 30 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.
   b. Volatile organic compound samples and dissolved gas samples should be collected first, followed by semi-volatile organic compounds, then inorganic parameters, or as required by the sampling and analysis plan.
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-16

QUALITY CONTROL SAMPLING

INTRODUCTION

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:

Code	Type	Description
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.
FD	Duplicate Sample	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.
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. 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 field precision.	1 per 20 natural samples per media
Rinsate Blanks	Evaluate effectiveness of equipment decontamination and sample handling procedures.	1 per 20 natural samples per media
Field Blank	Assess possible cross-contamination of samples due to ambient conditions during sample collection.	1 per 20 natural samples per media, or 1 per day
Trip Blank	Evaluate sample preservation, packing, shipping, and storage.	1 per cooler containing samples with volatile constituents