Water & Environmental TECHNOLOGIES

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Groundwater Monitoring Plan for the Petroleum Release at the Former Red Door Lounge, 16 6th St S, Great Falls, Cascade County, Montana

Facility ID #56-13942 (TID 30612) | Release #4210 | Work Plan #35089

Prepared for:

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1 Executive Summary

Water and Environmental Technologies (WET) presents this Groundwater Monitoring Work Plan (WP) for the petroleum release at the former Red Door Lounge (Facility), as required in the Montana Department of Environmental Quality (DEQ) WP request letter dated August 22, 2025.

The proposed scope of work includes:

- Monitoring groundwater at MW-4 biannually for one year, which includes:
  - Gauging fluid levels at all Facility monitoring wells.
  - Collecting groundwater samples by low-flow sampling methodology according to DEQ's Groundwater Sampling Guidance.
  - Analyzing groundwater samples for volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH).
  - Disposing of purge water according to the DEQ Purge Water Disposal flow chart.
- Measuring depth to water in wells MW-1 and MW-3 during groundwater monitoring events.
- 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.
- Preparing and submitting a GW Report detailing the method and results of both 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, 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 an updated Release Closure Plan.

2 Facility History and Release Background

2.1 Facility History

The Facility is currently owned by Keilman and Trunkle Enterprises, LLC. The location of the Facility is shown in Figure 1. On May 21, 1999, construction workers doing repair work at the Facility parking lot detected petroleum odors emanating from the ground. Further work uncovered the presence of an Underground Storage Tank (UST) used for the storage of petroleum products. A 24-Hour Initial Release Response Report was filled out and filed with DEQ.

2.2 Release Background

Currently, detailed information about the site as a petroleum distribution facility does not exist. The discovery of the contamination and the UST were unintentional, and the presence of the tank was unknown to the construction workers and to the property owners at the time. A 30-Day Release Report submitted by Glacier Engineering indicates that other tanks were discovered during the site investigation and were removed. The tanks encountered during excavation activities included the following:

- 4,000-gallon steel UST

- 1,200-gallon steel UST
- 600-gallon steel UST
- 600-gallon steel UST

The volume of released petroleum is unknown as the tanks were discovered post usage. All of the tanks except for one were discovered to be empty. The single tank containing liquid was found to have residual waste oil within it. Piping to and from each of the tanks was not found to exist during excavation activities. According to the 30-day Release Report, approximately 480 cubic yards of impacted soil were removed from the site and transported to Montana Waste Systems Landfill. Impacted soil and tank removal activities occurred between May 24 and May 27, 1999.

An Initial Corrective Action Summary Report dated June 22, 1999, prepared and submitted by Glacier Engineering P.C. for the Release indicated that soil samples obtained upon completion of a remedial excavation exhibited laboratory analytical results below Montana's risk-based screening levels. In addition, a groundwater investigation did not take place in order to determine if groundwater is impacted by the petroleum release.

On January 21, 2022, DEQ issued a Work Plan Request to the current property owners requesting that further investigation be performed on the property to include a utilities investigation and receptor survey, further soil sampling, groundwater analysis and investigation, and soil vapor sampling. WET found that petroleum impacted soil and groundwater above applicable screening levels appeared to be limited to the northwest corner of the property. This location, when overlayed with a map from a previous report documenting a past excavation, coincides with an area not previously excavated, near the margin of the past excavation, which, at the time, was near a UST. Because USTs, piping, and dispensing islands have since been removed, sources of further contamination to vadose zone soils were no longer present.

3 Objectives of Groundwater Monitoring

The objectives of groundwater monitoring are to evaluate the status of petroleum contaminated groundwater and identify additional work needed to resolve the Release. These objectives will be achieved through biannual groundwater monitoring, which involves fluid level measurement and sampling. Samples collected will be analyzed for VPH and EPH.

4 Minimum Work Plan Tasks

WET's approach to complete the required work, except work plan preparation (Task 1), is detailed below.

4.1 Project Management (Task 2)

WET personnel will provide Keilman and Trunkle Enterprises, LLC (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.

4.2 Mobilization (Task 3)

Mobilization will include vehicle mileage and personnel travel time between the WET Great Falls office and the Facility to perform groundwater monitoring events. Each round trip is approximately four miles and 10 min of drive time. Two mobilizations are planned, one for each groundwater monitoring event. One hour of loading/unloading is included for each mobilization.

4.3 Groundwater Monitoring (Task 4)

Two groundwater monitoring events are planned for well MW-4. The groundwater sampling events will occur during high and low water months between 2025 and 2026.

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. SOPs are included as Appendix A. Any monitoring well containing free product will not be sampled. Because the boring logs indicate clay in the subsurface, if MW-4 has a water column less than 18 inches, it will be purged with a peristaltic pump for a single set of field parameter readings and sampled in order of analytical priority in the case that the well goes dry during purging. Priority shall be:

1. VPH
2. EPH

If MW-4 has more than 18 inches of water column, it will be purged and sampled using a bladder pump and low-flow sampling methodology in accordance with DEQ's Groundwater Sampling Guidance (2018) and SOP-8B: Groundwater Sampling – Low-Flow Method (Appendix A).

Groundwater field parameters to be monitored as specified in SOP-6: Measurement of Groundwater Field Parameters (Appendix A) and are subject to stabilization criteria listed in Table 1. Additionally, temperature and drawdown will also be monitored but are not subject to stabilization criteria. Turbidity will be measured with a turbidity meter, drawdown will be measured with the oil-water interface meter, and the rest of the field parameters will be measured with a YSI multi-parameter combination meter and flow-through cell. Field parameter readings should be recorded every 3-5 minutes until three consecutive readings are within stabilization range.

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	

Once parameters have stabilized, a groundwater sample will be collected and preserved for laboratory analysis of VPH and EPH. Sample collection will include the collection of one duplicate and one field blank for quality assurance/quality control (QA/QC) purposes as defined in the relevant sections of SOP-16: Quality Control Sampling (Appendix A). The field duplicate sample will be collected by splitting the natural sample in the field. The field blank will be collected in the field by pouring laboratory-grade deionized water into the containers and preserving accordingly. The field duplicate and blank samples will be submitted to the laboratory for the same analyses as the natural samples.

The oil-water interface probe and bladder pump will be decontaminated between each site using a laboratory-grade detergent and tap water mixture followed by distilled water in accordance with SOP-2: Equipment Decontamination (Appendix A). The oil-water interface probe will be sprayed, while the bladder pump will be flushed with approximately 700 mL of each decontamination media (to cover approximately three bladder volumes and tubing volume).

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. All non-reusable sampling equipment and spent personal protective equipment will be disposed of in garbage bags.

4.4 Water Level Measurement (Task 5)

During each sampling event, in addition to sampling MW-4, fluid levels will be measured with an oil-water interface meter in MW-1 and MW-3. The well locations are shown in Figure 2. The water levels will be measured in accordance with WET standard operating procedure (SOP) SOP-5: Measurement of Fluid Levels. SOPs are included as Appendix A.

4.5 Laboratory Analysis (Task 6)

Groundwater samples will be submitted to Energy Laboratories in Helena, Montana for analysis of VPH and EPH. If the results of the EPH screen are greater than 1000 µg/L, the sample will be further analyzed for EPH fractions.

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%). One duplicate groundwater sample and one field blank sample will be collected in conjunction with natural groundwater samples. The duplicate 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.

4.7 Data Validation (Task 7)

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.

4.8 Reporting (Task 8)

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.

5 Scheduling

WET will begin implementing this work plan upon DEQ approval of this GWM WP. A detailed project cost estimate is included as Appendix B.

Figures

NO. | DESCRIPTION | DATE | DRAFT | REVIEW
1
2
3
4
5

NOTES

SITE LOCATION

FORMER RED DOOR LOUNGE - GREAT FALLS, MT

FIGURE 1

JOB#: KTEM01

DATE:6/2/2023

Path: M:\KTEM01\KTEM01\KTEM01_1.aprx, Author: mshirley

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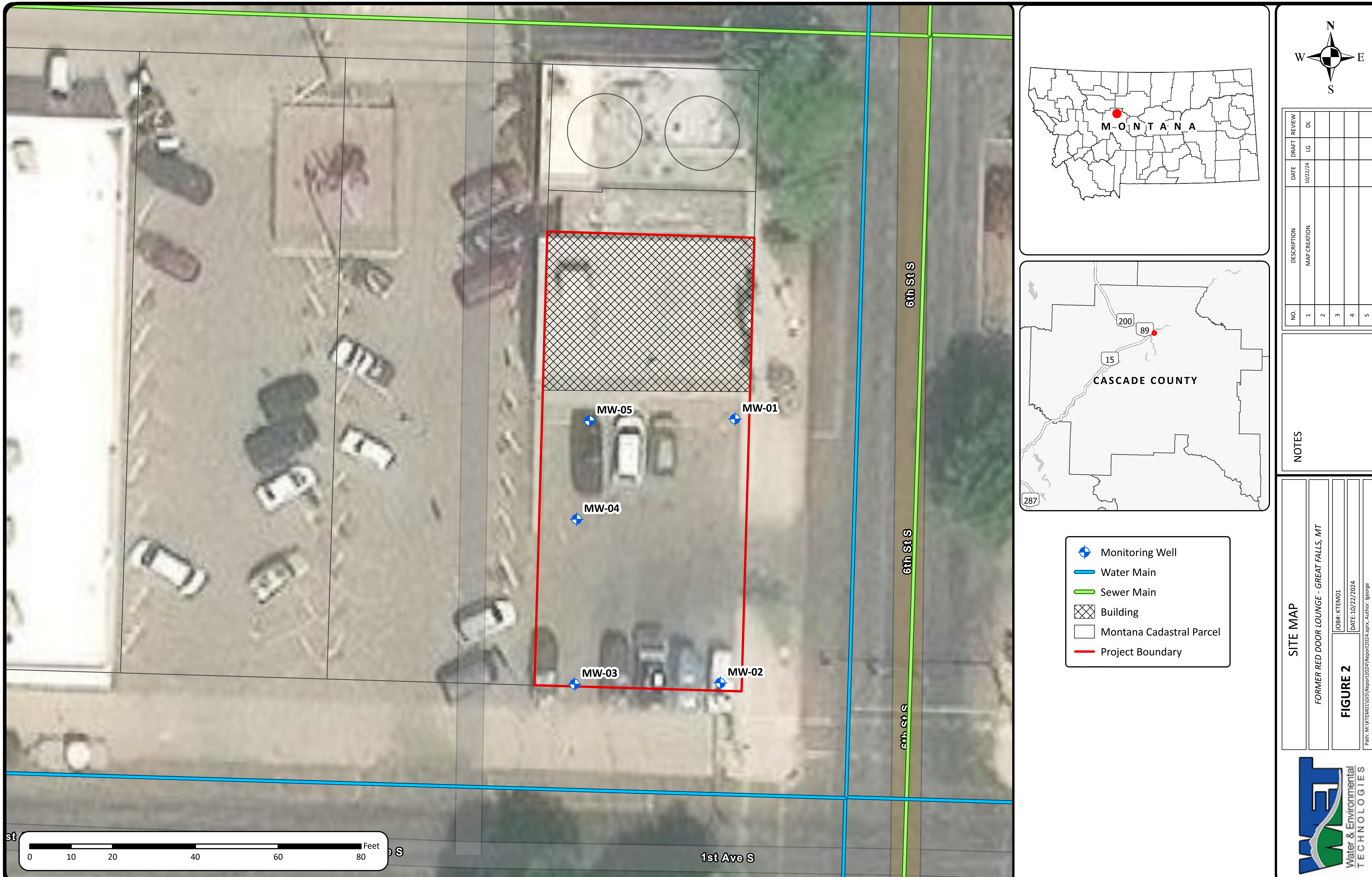

MW-01
MW-02
MW-03
MW-04
MW-05
6th St S
1st Ave S
Feet
0 10 20 40 60 80
N
S
E
W
MONTANA
CASCADE COUNTY
200
89
15
287
Monitoring Well
Water Main
Sewer Main
Building
Montana Cadastral Parcel
Project Boundary
NO.
DESCRIPTION
DATE
DRAFT
REVIEW
1
MAP CREATION
10/22/24
LG
DL
2
3
4
5
NOTES
SITE MAP
FORMER RED DOOR LOUNGE - GREAT FALLS, MT
JOB#: KTEM01
DATE:10/22/2024
FIGURE 2
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Appendix A—WET SOPs

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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).

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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: 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.

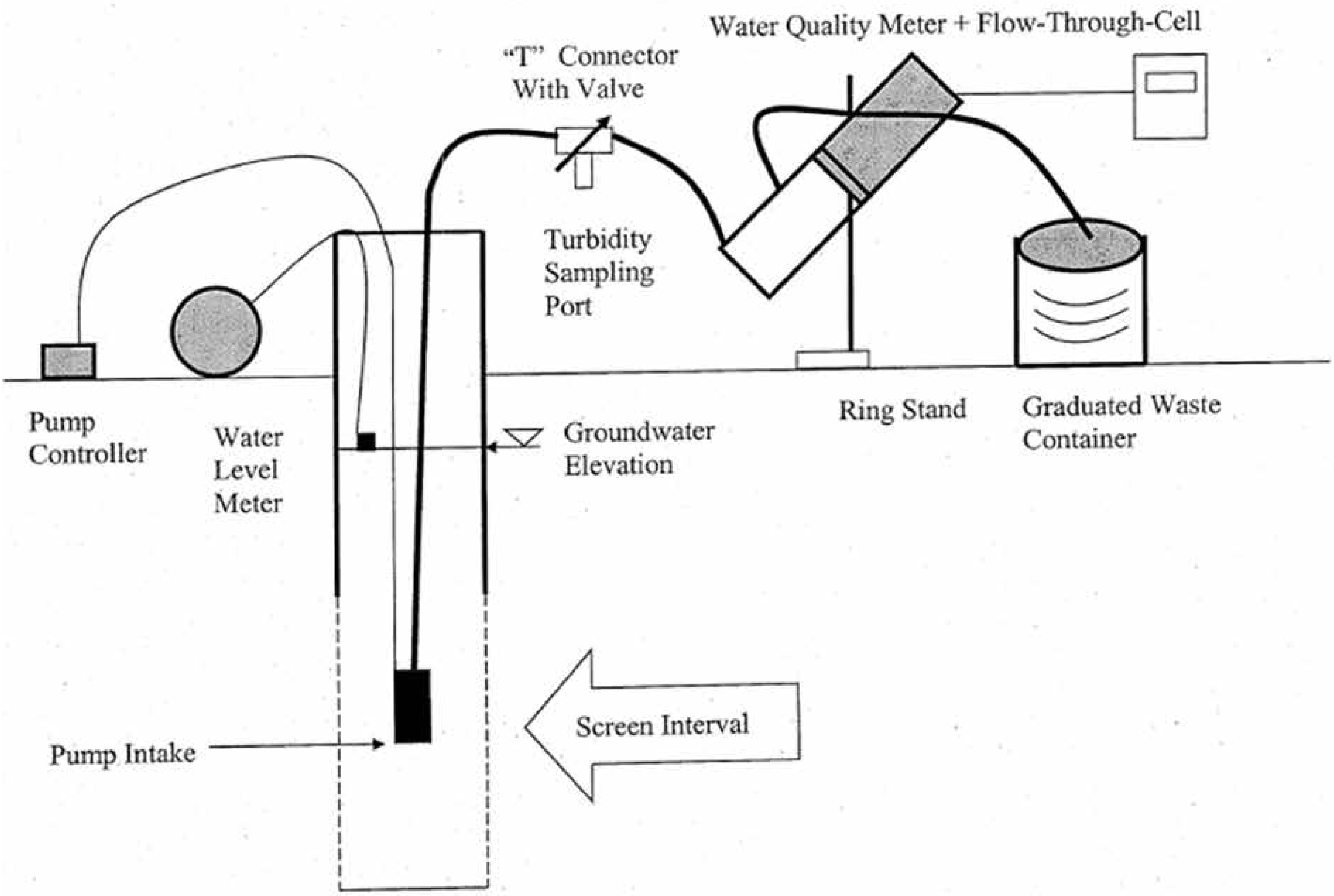
Table 1. Stabilization Criteria

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-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.