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Analysis Plan/Quality Assurance Project Plan

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List of Abbreviations

°C degree(s) Celsius

μm micron(s)

BC Brown and Caldwell

bgs below ground surface

BTEX benzene, toluene, ethylbenzene, and total xylenes

COC chain of custody

CSV comma-separated values

DI deionized

DO dissolved oxygen

DQO data quality objective

Ecology Washington State Department of Ecology

EDD electronic data deliverable

HASP Health and Safety Plan

ID identifier

IDW investigation-derived waste

mg/kg milligram(s) per kilogram

mg/L milligram(s) per liter

mL/min milliliter(s) per minute

mV millivolts

MW monitoring well

NTU nephelometric turbidity unit

ppm part(s) per million

PQL practical quantitation limit

PPE personal protective equipment

QAPP Quality Assurance Project Plan

QA/QC quality assurance/quality control

RPD relative percent different

SAP Sampling and Analysis Plan

SB soil boring

Site Budd Inlet Treatment Plant

SS slight sheen

SVE soil vapor extraction

USEPA United States Environmental Protection Agency

WSDOT Washington State Department of Transportation

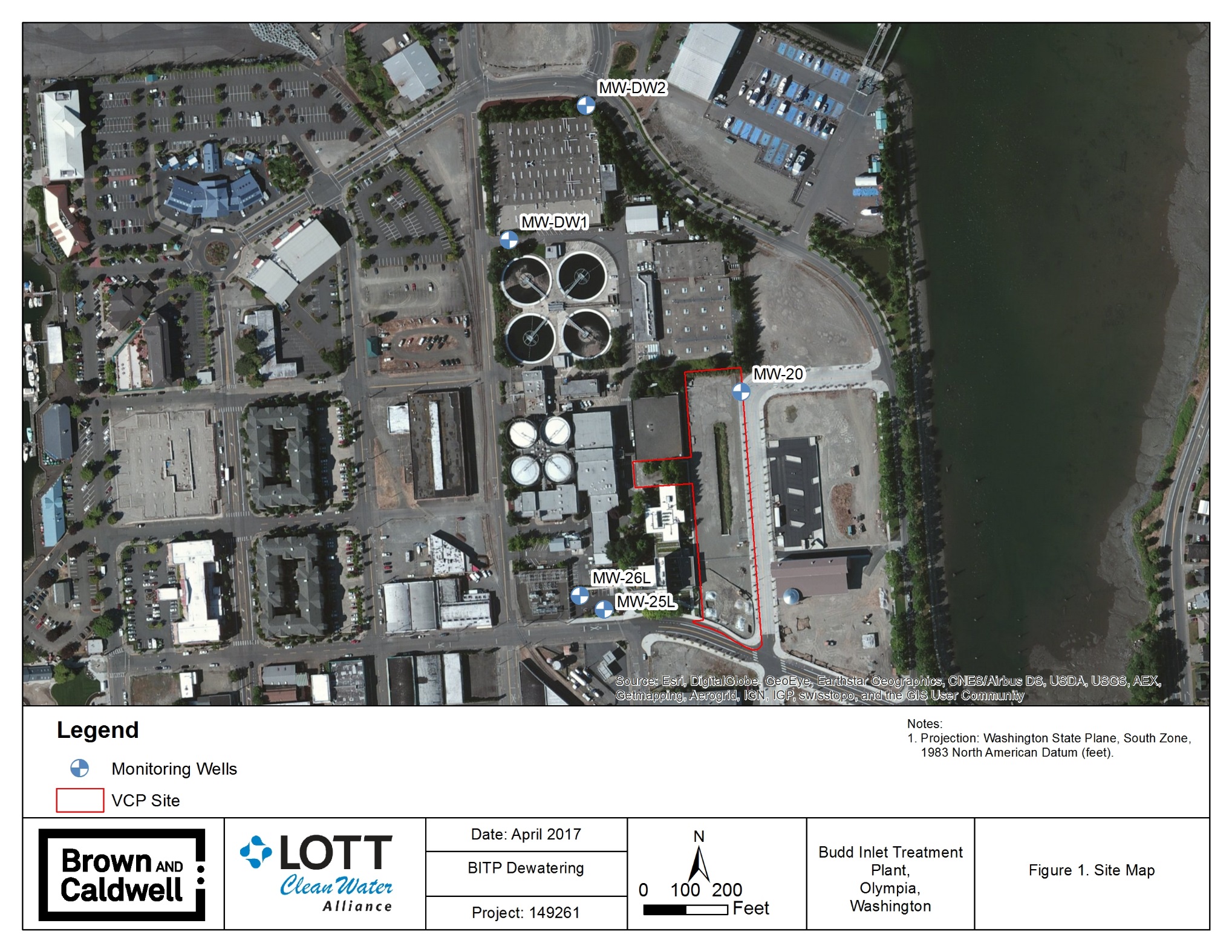
Introduction

The Washington State Department of Ecology has reviewed past documentation of the LOTT Clean Water Alliance (LOTT) cleanup activities at the Budd Inlet Treatment Plant (BITP) site within the State’s Voluntary Cleanup Program (VCP). Interim actions (IAs) have been completed at BITP, to expand the plants’ infrastructure and remove soil contamination within the construction footprints. Ecology has requested additional information from LOTT to document the existing residual contamination, zones of extensive buried infrastructure, and additional groundwater monitoring. Screening to establish the requirements for an exclusion from a terrestrial ecological evaluation (TEE) is also needed.

To meet Ecology’s request for additional groundwater monitoring, LOTT will collect additional samples from the on-site groundwater monitoring wells following the methods and procedures outlined in this Sampling and Analysis Plan (SAP). Field and laboratory quality assurance objectives are also described herein.

The LOTT Facility is located near the Port of Olympia in Olympia, Washington and includes Parcel 8 of the East Bay Redevelopment Project (Parcel 66130000408) and a small section of the adjacent property (Parcel 91002601000) west of Parcel 8. The properties are part of the BITP and together define the Site (Figure 1). This SAP provides guidance to field and project personnel involved in the groundwater sampling activities to meet data quality objectives. Any future changes to the sampling program (such as changes in sampling frequency or chemical analyses) will be described in addenda to this SAP.

Specific protocols for sampling, sample handling and storage, chain of custody (COC), and laboratory and field analyses are described in this SAP. This plan was developed in accordance with the Washington State Department of Ecology’s (Ecology) *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology’s *Guidance for Remediation of Petroleum Contaminated Sites*, and United States Environmental Protection Agency’s (USEPA’s) *Guidance for Quality Assurance Project Plans* (Ecology 2004, 2011; USEPA 2002).



Sampling Locations:

Groundwater monitoring locations were selected from a network of existing wells in the immediate vicinity of the Site. Monitoring wells MW-25L, MW-26L, and MW-20 were installed during previous site characterization activities and provide spatial coverage for hydraulic gradients and water quality from the southern and eastern sides of the site. Monitoring wells DW-1 and DW-2 were installed in October 2016, as part of a geotechnical study for structural buoyancy and settlement risks from variable groundwater levels. DW-1 and DW-2 provide gradient and water quality coverage of the northwest and northern area of the Site. Additionally, based on groundwater levels collected in March 2017, groundwater flow appears to be towards the northwest, indicating that DW-1 and DW-2 are in areas down-gradient of the site.

Groundwater samples will be collected by LOTT staff. Groundwater samples will be collected following standard low-flow groundwater sampling procedures as described in sections below.

Required Materials

General materials required for conducting groundwater sampling are listed below.

* Personal protective equipment (PPE) (as required by the Site Health and Safety Plan [HASP])
* Peristaltic pump (Sigma Portable Pump Model 913)
* Peristaltic pump power source (12v 6 amp hour gel electrolyte battery)
* Drive Head Tubing – silicon; refer to Table 1 for size and quantity information
* Peristaltic down-hole and sample line tubing – low-density polyethylene (LDPE) refer to Table 1 for size and quantity information
* Water level meter (Waterline Envirotech LTD, Model 200)
* Decontamination supplies (5-gallon buckets, decontamination fluids, squirt bottles)
* Water quality monitoring equipment/ meter, capable of measuring DO, temperature, conductivity, pH, turbidity
* Calibration standards for water quality meter (check expiration dates)
* Purge water collection containers (5-gallon buckets or drums)
* Graduated measuring container (approximately 1-liter)
* Disposable nitrile non-powder gloves
* Duct tape
* Permanent/Rite in the Rain® marking pens
* Field notebook
* Field data forms for each well
* Calculator
* Measuring tape
* Toolbox stocked with basic tools
* Sample containers
* Shipping labels and chain of custody (COC) forms
* Shipping coolers and ice
* Filters (0.45 micron [μm]), if appropriate
* Plastic garbage bags, zip-lock storage bags, roll of plastic sheeting
* Stopwatch
* Batteries
  + Peristaltic Pump – contained gel electrolyte battery from manufacturer or 120 v electrical power source
  + Water Level Meter – 9 volt battery (1)
  + Water Quality Meter (3 AA Alkaline or rechargeable Nickel Metal Hydride batteries)
* Keys for well locks, if applicable

Each monitoring well will require new tubing. Reference the table below for the tubing requirements of each well:

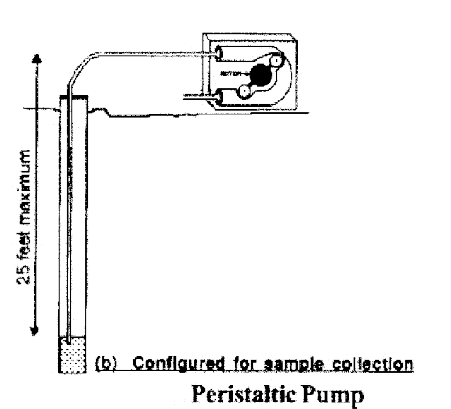
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 1. Monitoring Well Depth and Tubing Information | | | | | |
| Monitoring Well ID | MW-DW1 | MW-DW2 | MW-20 | MW-25L | MW-26L |
| Depth of Well (feet below land surface) | 20 | 20 | 11.3 | 14.7 | 13.2 |
| Length of LDPE Down-Hole Tubing (3/8” inner diameter LDPE tubing) | 20 feet | 20 feet | 11 feet | 14 feet | 13 feet |
| Length of Silicon Drive Head Tubing (3/8” inner diameter silicone pump tubing) | 6 inches | 6 inches | 6 inches | 6 inches | 6 inches |
| Length of Sample Line Tubing (3/8” inner diameter LDPE tubing) | 5 feet | 5 feet | 5 feet | 5 feet | 5 feet |

Sampling Event Preparation

1. Gather field equipment and verify functions/performance. Check all electronic devices (including water level meter, water quality meter, and peristaltic pump) for fully charged batteries, and/or verify replacement batteries are readily available.
2. Clean and decontaminate any down-well equipment (including the down-well portions of the water level and water quality meters, tubing does not need to be cleaned, comes pre-cleaned) and store in new/clean garbage bags.
3. Measure and cut appropriate lengths of down-hole, drive head, and sample line tubing (see Table 1) for each well. Please note that new tubing should be used for each sampling event and the tubing should be disposed of when sampling is complete. This work should be completed in a clean area, such that tubing does not come in contact with the ground surface or any other potential source of contamination. Store the tubing in clean plastic garbage bags labeled for each specific well. Tubing lengths are determined based on the assumption that the bottom of the tubing will be even with the center of the well screen and approximately 3 feet of tubing will extend from the well head to allow connection to sampling pump and equipment.
4. Complete an equipment checklist and verify team readiness for sampling.

Sampling Procedures

1. Prior to beginning sampling activities each day, the water quality meter shall be calibrated to stock calibration solutions. Groundwater parameters will be monitored in an airtight flow cell equipped with a Hach sensION MM156 multiprobe field meter. Water quality instruments will be calibrated at the beginning of each field day. Equipment calibration will be documented in the field notebook. At the end of each day, a calibration check will be performed to verify that the water quality meter remained calibrated throughout the day and results will be documented in the field notebook.
2. Unlock and uncap all monitoring wells, and allow each well to equilibrate to atmospheric conditions for approximately 15 minutes.
3. Collect groundwater level measurements using a down-hole water level meter, record level on the field form to the nearest 1/100 of a foot. Collect groundwater level measurements from all wells prior to sampling the first well.
4. Lay enough plastic sheeting around the well head to stage all equipment and begin equipment set up.
5. Gently lower the new down-hole peristaltic tubing into each well with the bottom of tubing at a depth within the center of the well screen. Based on the pre-measured tubing lengths, 3 feet of tubing will extend from the top of the well casing. Secure the tubing to the top of the well head with a wrap of duct tape around the outer well casing. Connect the top of the down-hole tubing to the silicon drive head tubing, and connect the other end of the drive head tubing to the sample line tubing. The sample line tubing discharges to the flow-through cell of the Hach sensION MM156. Connect a discharge line from the flow through cell to the purge water bucket.



1. Prior to turning on the pump, gently lower the water level tape into the well and verify the level measurement. Allow the tape to remain in the well, slightly above the water level for monitoring drawdown during sampling.
2. Pumping/ purging the groundwater will be done under low flow conditions in order to collect representative samples while exerting minimum stress on the water-bearing formation.
   1. Set the pump discharge rate to approximately 25% of maximum.
   2. Begin purging the monitoring well and measure the water level in the well and the discharge rate on approximately 30-second to one-minute intervals and adjust discharge setting as needed
   3. Measure the discharge rate by discharging the water into a graduated cylinder for 1 minute and noting the amount of water collected. This measurement will be in milliliters per minute (mL/min).
   4. Begin recording water quality measurements from the flow through cell after 5 minutes of purging.
   5. Restrict flow rates during purging to 100 to 500 mL/min. The goal is to induce a steady flow rate while minimizing drawdown.
   6. Initially, the purge flow rate should start at approximately 200 mL/min and water level should be frequently monitored (approximately once per minute until the groundwater level and flow rate are stabilized).
   7. Flow rate should be adjusted so that drawdown does not exceed 0.3 foot. If historical data from the well indicate there is no drawdown of the aquifer at the higher pumping rate of 500 mL/min, then the purge rate can be established at this higher rate.
3. Purging methods and actual purge volume, upon completion of groundwater sampling, will be recorded in the field notebook. Collect discharge water in a 5-gallon bucket. Water generated from purge activities will be disposed of by spreading on the ground surface in areas where runoff will not impact the monitoring wells or site boundaries.
4. Field parameters will be recorded every 5 minutes, a frequency established to ensure a full change of water in the flow cell. Parameter-based criteria include three consecutive readings that meet the following:
   * + Temperature: ±3 percent relative percent different (RPD)
     + Specific conductivity: ±3 percent RPD
     + pH: ±0.1 pH standard unit
     + Dissolved oxygen (DO): ±10 percent RPD or ±0.1 milligram per liter (mg/L) if < 2 mg/L ( ±0.3 when < 1.0)
     + Turbidity: < 10 nephelometric turbidity units (NTUs) or 10 percent RPD if > 10 NTUs

If these parameters have not stabilized after 1 hour, the sample may be collected and a note will be made in the field book and/or on the field data form.

1. After the purge water quality parameters have stabilized, sample collection may begin. To collect the samples, disconnect the peristaltic discharge line from the flow through cell. Remove the lid from a sample container and begin filling. Note, sample bottles may contain a preservative; do not overflow these containers. Vials used for volatile organic analyses must be filled with caution to avoid overflow as well as complete fill with zero air or headspace remaining in the sealed vial. After each container is filled, seal the container, verify the sample label is complete, and place the samples on ice in the sample cooler.

Groundwater Sampling Equipment Decontamination

Sampling will be conducted using disposable sampling equipment to the maximum extent practical. When reusable groundwater sampling equipment is required (e.g., water level meter), equipment will be decontaminated prior to and following each sample collection by washing with a DI water/ Alconox detergent /DI water rinse. ***Note that water quality meters, however should be decontaminated using only DI water, as detergent can negatively impact the meter’s water quality sensors****.*

Sample Handling and Custody Documentation

Sample possession and handling must be traceable from the time of sample collection, through laboratory and data analyses, to the time sample results are reported. Field logbook entries will be completed for each location and each sample collected.

Sample Handling

To control the integrity of the samples during transit to the laboratory and prior to analysis, established preservation and storage measures will be taken. Sample containers will be labeled with the client name, project number, sample number, sampling date and time, required analyses, and initials of the individual who collected the sample. Samples will be placed into laboratory-supplied and labeled sample containers, with the lid tightly sealed, and placed in a cooler on ice. All samples, field duplicate samples, and equipment blank samples will be immediately placed into a cooler with ice and kept at or below 4 degrees Celsius (°C) until custody is transferred to a Washington accredited environmental laboratory (lab). A fresh set of nitrile gloves will be donned prior to the collection of each sample.

The field manager will check all container labels, COC form entries, and field notebook entries for completeness and accuracy at the end of each sampling day.

Sample Nomenclature and QA/QC Sampling

The sample number format will be “sample location number-month/day/year of collection.” A groundwater sample for a sample collected from MW-1 on April 6, 2016, would be labeled MW-1-040616. Other information included on the sample bottle label will include the date, time, analyses, and initials of the sample collector.

Field Duplicate Samples

One duplicate sample will be collected (preferably from a monitoring well expected to have detections) during each sampling event. Samples will be collected immediately following the collection of the primary sample. The location of each field duplicate will be recorded in the field and sampling logs. Field duplicates will be analyzed for the same constituents as the primary samples.

A duplicate groundwater sample, following the example above, would be labeled MW-1-040616-DUP.

Equipment Blank Samples

Equipment rinsate blanks will be collected to assess the decontamination procedures for the water level meter, which is the only non-disposable piece of sampling equipment. Samples will be collected at the end of the day. Following equipment decontamination procedures, equipment blank samples will be collected by pouring distilled water over and/or through the decontaminated equipment directly into the sampling container. Equipment blanks will be analyzed for the same constituents as the primary samples.

An equipment rinsate sample collected following the examples above would be named “EB-040616.” The “EB-“at the beginning of the sample name signifies that this sample is an equipment blank sample.

Field Blank Samples

Groundwater field blanks will be collected when performing groundwater sampling to assess the potential introduction of VOCs. One field blank will be collected per day. Field blanks will be collected at the location of one of the primary samples. Field blanks will be collected by pouring distilled water directly into the sampling container.

A field blank sample collected will be assigned a sample identifier (ID) that has a monitoring well identifier that is known not to exist to field staff but is unknown to the laboratory. For example, if only six monitoring wells will be installed, a viable field blank name for a sample collected on April 6, 2016, would be MW-7-040616. The name of field blank samples will be recorded in the field notebook.

Trip Blanks

The lab will provide trip blanks to evaluate the potential for contamination resulting from laboratory-prepared sample containers and sample transport. Trip blanks will be analyzed at a frequency of one per sample shipment.

Sample COC

COC procedures will be strictly followed to provide an accurate written record of the possession of each sample from the time it is collected in the field through laboratory analyses. Adequate sample custody will be achieved by means of approved field and analytical documentation. Such documentation includes the COC record, which is initially completed by the sampler and is thereafter signed by those individuals who accept custody of the sample. A sample will be considered to be in custody if it meets one or more of the following criteria:

* In someone’s physical possession
* In someone’s view
* Locked up or secured in a locked container or vehicle or otherwise sealed with a custody seal so that any tampering would be evident
* Kept in a secure area, restricted to authorized personnel only

The laboratory will provide sufficient copies of blank COC forms. All sample information (i.e., sample date/time, sample matrix, number of containers, etc.) including all required analyses, will be logged onto a COC form prior to formal transfer of sample containers to the analytical laboratory. Any instance where possession of the samples is transferred, the individuals relinquishing and receiving the samples will respectively sign, date, and note the time of transfer on the COC form. This form documents the transfer of custody of samples from the sampler to the laboratory.

The person responsible for transfer/transport of the samples to the laboratory will complete and sign the COC form, keeping a copy for future reference. The sampler will place the original form in a clear zip-lock bag inside the sample cooler with the samples. One COC form will be completed and placed inside each individual cooler.

Sample Preservation

Samples requiring field preservation will be placed into pre-preserved sample jars supplied by the laboratory. Immediately after the sample jars are filled, they will be placed in the appropriate cooler with a sufficient number of ice packs (or crushed ice) to keep them cool through transport to the laboratory. All samples will be preserved by keeping cool to 4°C and following analyses.

Sample Transport and Shipment

Table 1 is a table that will be completed once a lab is chosen, to summarize sample size requirements, container type, preservation method, and holding times for groundwater analytes. Technical field staff will be responsible for all sample tracking and custody procedures in the field. The field manager will be responsible for final sample inventory and will maintain sample custody documentation. At the end of each day, and prior to transfer, COC form entries will be made for all samples. Each sample cooler will be accompanied by COC forms. Copies of all forms will be retained and included as appendices to QA/QC reports to management.

Prior to transport and/or shipping, sample containers will be wrapped and securely packed inside the cooler with ice packs or crushed ice by field staff. The original, signed COC forms will be transferred with the cooler. Samples will be delivered to the laboratory under custody following completion of sampling activities on a daily basis, or at maximum every other day.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Table 2. Sample Analysis Methods | | | | | | |
| Medium | Method | | Sample container | Number of containers | Preservative | Method Detection Limit | MTCA-A Limits | Hold Time |
| Water | NWTPH-Dx (Diesel and Heavy Oil Range Organics) | | Liter AG | 2 | none | 11 ug/L | 1 mg/L | 7 days |
| Water | NWTPH-Gx (Gasoline Range Organics) | | 40 mL | 2 | HCl | 12 ug/L | 0.5 mg/L | 14 days |
| Water | USEPA 8270 SIM (cPAHs, naphthalene) | | 500 mL AG | 2 | none | 0.0016 ug/L-  0.001 ug/L | 0.1 ug/L\*  160 ug/L | 7 days |
| Water | USEPA 8290 (Dioxins/Furans) | | Liter AG | 2 | none | 3-60 pg/L | 0.1 ug/L\* | 30 days |
| Water | USEPA 6020 (Metals –  Arsenic,  Cadmium,  Chromium,  Copper,  Lead, and  Nickel) | | 125 mL plastic | 1 | HNO3 | 0.004-0.4 ug/L | 5 ug/l  5 ug/l  50 ug/L  2.5 ug/L  15 ug/L  8.2 ug/L | 180 days |
| Water | USEPA 5030B/8260  (Benzene  Toluene  Ethylbenzene  Xylenes) | | 40 mL | 3 | HCl | 0.05-0.11 ug/L | 5 ug/L  700 ug/L  1000 ug/L  1000 ug/L | 14 days |
| Water | USEPA 8082 (PCBs) | | 125 mL AG | 2 | none | 0.0094 ug/L | 0.1ug/L\* | 7 days |

AG – Amber Glass \* Denotes TEF method used for MTCA A limit

Sample Receipt

The designated sample custodian at the laboratory will accept custody of the samples and verify that the COC matches the sample received. The lab staff will properly sign the COC form upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms. Any notification provided by the lab that discrepancies exist between COC forms and the sample shipment upon receipt will be immediately relayed to the BC project manager. The lab representatives will specifically note any coolers that do not contain ice packs or are not sufficiently cold upon receipt.

Additional Field Documentation

Field documentation will consist of logbook entries that include the following information:

* Date and time of activities
* Location of activities
* Site and weather conditions
* Personnel present
* Subcontractors present
* Regulatory agency representatives present
* Level of health and safety protection
* Sampling methodology and information
* Sample locations
* Chronological description of field activities
* Manufacturer, model, serial number, and most recent calibration date and time of any field instruments used
* Description of any conditions that could potentially affect sample results
* Records of any deviation from the work plan (including a clear description of the reason for the deviation)
* Records of phone conversations
* Records of decontamination procedures

Sampling logs will include a record of the source of samples, sample identifications, sample date and time, sample container types and preservatives, and lot numbers for bottles and preservatives.

Sample containers will be labeled with a unique sample identifier, date and time of sample collection, and the Site name.

COC forms will be completed on site. COC forms will include the sample identification, sample date and time, sample matrix, number of containers, and requested analyses. COC forms will be signed and dated by the individuals relinquishing and receiving samples.

Quality Assurance Objective of Laboratory Analysis Program

Groundwater samples collected will be analyzed for the following constituent groups using the methods presented below (Section 5.2). Chemical analyses will be performed by the lab.

Contract Laboratory Requirements

In completing chemical analyses for this project, the contract laboratory is expected to meet the following minimum requirements:

* Adhere to the methods outlined in this document, including methods and detection limit 9+.referenced for each analytical procedure
* Deliver fax, hard-copy, and electronic data as specified
* Meet reporting requirements for deliverables
* Meet turnaround times for deliverables
* Implement QA/QC procedures, including the QAPP data quality requirements, laboratory QA requirements, and performance evaluation testing requirements
* Allow laboratory and data audits to be performed, if deemed necessary

Reporting Limits

The analytical methods identified in this SAP/QAPP result in the lowest analytically achievable method detection limits and reporting limits or practical quantitation limits (PQLs). Reporting limits are goals only, insofar as instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achieving the desired reporting limit and associated QC criteria. In such instances, the laboratory will report the reason for any deviation from these reporting limits.

Sample Archival

Remaining groundwater sample volumes will be archived in the ALS laboratory freezer if additional analysis is needed.

Data Reduction, Validation, and Management

Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory’s QA manual. QC data resulting from methods and procedures described in this document will also be reported.

Data Reduction and Laboratory Reporting

The laboratory will be responsible for internal checks on data reporting and will correct errors identified during the QA review. Close contact will be maintained with the laboratories to resolve any QC problems in a timely manner. The analytical laboratories will be required, where applicable, to report the following:

* Project/case narrative: This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to, QC, sample transport/shipment, sample storage, and analytical difficulties. Any problems encountered (actual or perceived) and their resolutions will be documented in as much detail as necessary.
* Sample IDs: Records will be produced that clearly match all blind duplicate QA samples with laboratory sample IDs.
* COC records: Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.
* Sample results: The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
* Field sample identification code and the corresponding laboratory identification code:
* Sample matrix
* Date of sample extraction
* Date and time of analysis
* Weight and/or volume used for analysis
* Final dilution volumes or concentration factor for the sample
* Identification of the instrument used for analysis
* Method reporting and quantitation limits:
* Analytical results reported with reporting units identified
* All data qualifiers and their definitions
* Electronic data deliverables (EDDs)
* QA/QC summaries: This section will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (refer to above). No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested.
* Method blank analysis: The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
* Surrogate spike recovery: All surrogate spike recovery data for organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed.
* Matrix spike recovery: All matrix spike recovery data for metals and organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed. The RPD for all duplicate analyses will be reported.
* Matrix duplicate: The RPD for all matrix duplicate analyses will be reported.
* Blind duplicates: Blind duplicates will be reported in the same format as any other sample. RPDs will be calculated for duplicate samples and evaluated as part of the data quality review.

Data Validation

BC will review the field data sheets for consistency with low flow sampling procedures along with the laboratory reports for internal consistency, transmittal errors, laboratory protocols, and for adherence to the data quality objectives (DQOs) as specified in this SAP/QAPP. BC will validate all analytical data. A Level III Data Quality Review (Summary Validation) will be performed on all the analytical data.

A Level III Data Quality Review (Summary Validation) includes the following:

* Evaluation of package completeness
* Verification that sample numbers and analyses match those requested on the COC form
* Review of method-specified preservation and sample holding times
* Verification that the required detection limits and reporting limits have been achieved
* Verification that the field duplicates, MS/MSDs, and laboratory control samples were analyzed at the proper frequency
* Verification of analytical precision and accuracy via replicate analysis and analyte recoveries
* Verification that the surrogate compound analyses have been performed and meet QC criteria
* Verification that the laboratory method blanks are free of contaminants
* Review of instrument performance—initial calibration, continuing calibration, tuning, sensitivity, and degradation
* Data validation, which will be based on the QC criteria as recommended in the methods identified in this SAP/QAPP

Data usability, conformance with the DQOs, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the lab project manager and data validator in consultation with the BC QA manager and may include qualification or rejection of the data.

Data Management

BC will maintain a custom database used to store and query environmental chemistry results. This database will be used during the groundwater monitoring activities and data can be queried as needed. All collected field data will be entered into the database. Analytical laboratory data will be received in an EDD format suitable for importation into the database. Both laboratory data qualifiers and external data validation qualifiers are stored in the database.

Toxic equivalency factor (TEF) methodology is used to assess the risk of environmental mixtures of groups of analytes such as dioxins/furans, PCBs, and c-PAHs. Once the data quality is verified for each group of chemicals (dioxins/furans, PCBs, and c-PAHs) the result of each individual compound within the group is converted to a weighted quantity measure of the most toxic compound within the group (known as the reference chemical). This converts each individual compound in the grouping into a fraction of the reference chemical. Ecology has established cleanup levels for a single reference chemical for dioxins/furans, PCBs, and c-PAHs.

Data will be mapped in ArcGIS as needed. Specialized queries may be written to aid in data analyses. Queried data will be tabulated in Excel spreadsheet format. Excel spreadsheets will be formatted to be compatible with export of data to comma-separated values (CSV) format. All numerical data such as coordinates, concentration values, distances, and depths will be entered into the Excel spreadsheet as numbers.

References

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Washington State Department of Ecology (Ecology). 2005. *Implementation Guidance for the Ground Water Quality Standards.* Publication No. 96-02. October.