

Standard Operating Procedure for the Waste Management and Remediation Division

Data Review and Verification of Third-Party Petroleum Data Submittals

SOP WST-2014-7, Version 1



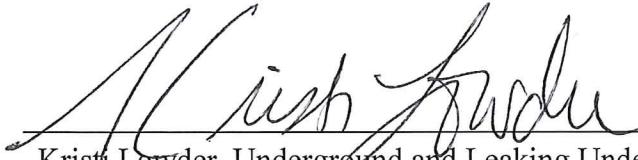
**State of Idaho
Department of Environmental Quality
Waste Management and Remediation**

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Approval Signatures

This statewide standard operating procedure (SOP) becomes effective on the date of the last approval signature.



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1 Purpose and Applicability

This standard operating procedure (SOP) was created for Idaho Department of Environmental Quality (DEQ) Waste Management and Remediation Division (WMR) staff to conduct data review and verification for third-party petroleum assessment and corrective action data submittals. This SOP identifies the steps DEQ Waste Management and Remediation Division staff, typically the Regional Office Project Manager or other technical staff assigned to the project, will take in conducting the data review and verification. The data review and data verification checklists are included in Appendix B of the Third-Party Petroleum QAPP (DEQ 2014). Data review and data verification methods are presented in Section 23 of the Third-Party Petroleum QAPP (DEQ 2014). This SOP supplements the Third-Party Petroleum QAPP.

1.1 Mission and Authority

This SOP provides a process for conducting data review and verification of third-party petroleum assessment and corrective action data submittals.

1.2 Program Objectives

The objective is statewide consistency for conducting data review and verification of third-party data submittals. The goal of data review is to ensure the data and information submitted to DEQ is recorded correctly. The goal of data verification is to evaluate the completeness, correctness, conformance and compliance of the data and information submitted against specific acceptance criteria established in the Third-Party Petroleum QAPP. The third-party data and information submitted to DEQ are reviewed for completeness and content, and evaluated against project requirements.

2 Definitions

Accuracy: The closeness of agreement between an observed value and an accepted reference value. Typically, spiked sample recoveries are used to assess laboratory accuracy as well as satisfactory performance of blank analyses. Accuracy requirements are identified in the specific third-party data QAPP under which the data is being evaluated.

Analyte: The element, ion, compound, or aggregate property of a sample for which an analysis seeks to determine its quantity and/or presence.

Blank sample: Samples of known matrix free of the specific constituents selected for analysis. Blank samples are typically submitted to the laboratory blind and are used to measure data accuracy. Blank samples may also reveal contamination problems due to sample collection method or sampling conditions.

Completeness: The percentage of total measurements completed that are not qualified thus increasing the degree of confidence in the reported result. Completeness requirements are identified in the specific third-party data QAPP under which the data is being evaluated.

Data Package: A collection of information that includes data from analysis of all samples associated with a work request, including field and analytical samples, re-analyses, blanks, duplicates, and spikes.

Data Validation: A technical review performed to compare data with established quality criteria to ensure the data are adequate for the intended use. Data validation confirms that the verified results meet the overall quality requirements of the intended use.

Data Verification: An evaluation of the completeness, correctness, consistency and conformance/compliance of the data against pre-determined requirements, and to ensure that the records associated with the data reflect actual activities.

Duplicate samples: Two samples collected from the same location and representing the same sampling event which are carried through all assessment and analytical procedures in an identical manner. Duplicate samples are collected sequentially, or nearly so, from the same sample location or split from the same container and analyzed for the same analytes. Duplicate samples may be “replicates” (samples taken one immediately after the other, separated only by the actual time required to fill the sample container), or “splits” (subsamples drawn from the same initial volume of sample matrix). Duplicate samples are analyzed to verify sampling and analytical reproducibility and sample repeatability; i.e. precision.

Equipment blank: A sample matrix of known constituent quantity that has passed through or over non-dedicated sampling equipment to verify the cleaning procedure (decontamination) between samples.

Field blank: A clean sample of known matrix that is placed into a sampling container and otherwise treated the same as other samples collected to verify general sampling and handling procedures.

Holding Time: The time period from sample collection to laboratory analysis. For some analyses, the time from sample collection to sample preparation or extraction must also be considered.

Matrix: The dominant material of which the sample to be analyzed is composed. Matrix is not synonymous with phase (solid, vapor, or liquid).

MDL: Method detection limit (MDL) is the lowest concentration of a substance that can be measured with 99% confidence that the substance is present in the sample.

Precision: The agreement among a set of replicate measurements without assumption of knowledge of the true value. Precision is calculated by means of duplicate/replicate analyses. These samples will contain concentrations of analyte above the MDL, and may involve the use of matrix spikes. The most commonly used measures of precision are the relative percent difference (RPD) when comparing duplicate and standard samples. Precision requirements are identified in the specific third-party data QAPP under which the data is being evaluated.

Professional Judgment: Discernment that is a cumulative result of scientific and technical training, experience in analytical testing and reporting, and good understanding of specific method-required quality assurance and quality control (QA/QC) procedures.

Trip blank: Generally pertain to volatile organic compound (VOC) samples. A trip blank is a clean sample prepared by the laboratory prior to the sampling event and transported with the sample containers to the site and back to the laboratory with the samples collected in the field (i.e., trip blanks accompany sample containers throughout the sampling event). Trip blanks are analyzed for VOCs or dissolved gasses to verify that the sample containers are clean and free of contamination through outside influences.

Usability: The percentage of the total measurements requested that are not rejected and deemed usable.

3 Personnel Qualifications

DEQ staff conducting data review and verification of third-party data submittals under this SOP must have experience in petroleum assessment and remediation requirements typical of an Analyst 3 or 4, as well as a working knowledge of QA/QC requirements.

4 Procedures

4.1 Review Applicable Reference Documents

The data reviewer and verifier, typically the Regional Office Project Manager or technical staff assigned to the project, will be familiar with the Third-Party Petroleum QAPP (DEQ 2014) under which the data review and data verification is conducted.

The data reviewer and verifier may also need to review and utilize various reference documents, either directly (e.g., specifically referenced/cited by the third-party) or indirectly (e.g., general guidance documents) applicable to the specific activities conducted by the third-party. If the third-party does not specify which published procedure was used, states that industry practices were followed with no other information, or does not state anything about following industry practices, the data reviewer and data verifier will use professional judgment in identifying the necessary reference documents to utilize. The following standards and guidance documents, as well as others not listed, may be utilized by project staff:

- ASTM standards (available from Regional Office Remediation Managers)
 - D4840-99 (2010) Standard Guide for Sampling Chain-of-Custody Procedures
 - D5283-92 (2009) Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation
 - D5956-96 (2006) Standard Guide for Sampling Strategies for Heterogeneous Wastes
 - D6044-96 (2009) Standard Guide for Representative Sampling for Management of Waste and Contaminated Media
 - D6051-96 (2006) Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities
 - D6233-98 (2009) Standard Guide for Data Assessment for Environmental Waste Management Activities

- D6311-98 (2009) Standard Guide for Generation of Environmental Data Related to Waste Management Activities: Selection and Optimization of Sampling Design
- D6597-10 Standard Practice for Assessment of Attaining Clean Up Level for Site Closure
- E1903-11 Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process
- E1943-98 (2010) Standard Guide for Remediation of Ground Water by Natural Attenuation at Petroleum Release Sites
- E2531-06e1 Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous-Phase Liquids Released to the Subsurface
- API Guidance
 - API Recommended Practice 1604, "Closure of Underground Petroleum Storage Tanks"
- SW846 methods (<http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>)
- DEQ Guidance
 - DEQ statistical guidance for determining background groundwater quality and degradation, March 2014 (<http://www.deq.idaho.gov/water-quality/ground-water/degraded-ground-water.aspx>)
 - The 2012 risk evaluation manual for petroleum constituents (<http://www.deq.idaho.gov/waste-mgmt-remediation/remediation-activities/risk-evaluation-manuals.aspx>)
 - DEQ Used Oil UST Closure and Release Sampling Standard Operating Procedures (TRIM 2016BAF24)
- ITRC Guidance
 - ITRC Incremental Sampling Methodology, February 2012 (<http://www.itrcweb.org/Guidance>)
 - ITRC Biofuels Release Prevention, Environmental Behavior and Remediation, September 2011 (<http://www.itrcweb.org/Guidance>)
- EPA guidance
 - Use of Monitored Natural Attenuation at Superfund, RCRA and UST sites, April 1999 (<http://www.epa.gov/oust/directiv/d9200417.pdf>)
 - Performance Monitoring of MNA Remedies for VOCs in Ground Water, April 2004, and multiple other monitored natural attenuation guidance documents (<http://www.epa.gov/superfund/health/conmedia/gwdocs/monit.htm>)
 - Groundwater Sampling Guidelines for Superfund and RCRA Project Managers, May 2002 (http://www.epa.gov/superfund/remedytech/tsp/download/gw_sampling_guide.pdf)
 - RCRA Waste Sampling Draft Technical Guidance, August 2002 (http://www.epa.gov/solidwaste/hazard/testmethods/sw846/samp_guid.htm)
 - Brownfields Technology Primer: Vapor Intrusion Considerations for Redevelopment, March 2008 (<http://www.brownfieldstsc.org/pdfs/BTSC%20Vapor%20Intrusion%20Consideration%20for%20Redevelopment%20EPA%20542-R-08-001.pdf>)
 - Groundwater sampling and monitoring with direct push technologies, August 2005 (<http://www.clu-in.org/download/char/540r04005.pdf>)

- Other Guidance
 - Alaska draft Multi-Increment Sampling guidance
http://dec.alaska.gov/spar/csp/guidance/multi_increment.pdf

4.2 Data Review

Data review is conducted to ensure that data and information submitted to DEQ is correctly recorded and applies to activities conducted in the field as well as in the analytical laboratory. Therefore, the data reviewer must review the submitted information and documents regarding field activities and laboratory analysis of samples collected by the third-party.

4.2.1 Field Data

Submission of field activity information and data may include:

- Field Instrument calibration records.
- Field notebook or daily activity logs which record field activities via written notes by field personnel.
- Sample collection logs or records of samples collected.
- Driller logs for borings or records of soil, geology, and hydrogeology at sample locations.
- Monitoring well logs or records of well completion information.
- Chain-of-custody (COC) documents or proof that samples were not tampered with and samples were under appropriate security at all times.

Each project may not have all of the identified records above submitted to DEQ by third parties for field and analytical laboratory activities. The data reviewer will document what records were submitted and included as part of the data review process.

4.2.2 Laboratory Data

Submission from the analytical laboratory may include:

- Sample receipt information including identification of the condition and status of samples upon delivery to the laboratory (e.g., temperature, sealed cooler, broken containers, air pockets/bubbles for VOC samples, etc.)
- Sample identification and analysis information including preparation dates and times, analysis dates and times, analytical methods, analytical results, reported unit values, sample size, dilution factors, and MDLs.
- Chain-of-custody documentation or proof that samples were not tampered with and that samples were under appropriate security at all times.

Each project may not have all of the identified records above submitted to DEQ by third parties for field and analytical laboratory activities. The data reviewer will document what records were submitted and included as part of the data review process.

4.2.3 Minimum Acceptance Criteria

The data reviewer will ensure that the minimum data and information required for DEQ to evaluate the site assessment and/or corrective action activities conducted by third parties, and to determine further necessary actions at petroleum sites, are provided to DEQ (see minimum acceptance criteria below from Section 18.6 of the Third-Party Petroleum QAPP [DEQ 2014]):

1. Identification of the petroleum release subject to the assessment including only certain petroleum products (e.g., gasoline, diesel, fuel oil, heating oil, motor oil, aviation gas, and/or jet fuels), and/or used oil. Minimum Acceptance Criteria 18.6.1.a.
2. Sample collection information.
 - a. Type, location and depth (elevation) of soil, soil vapor, surface water, ground water, and other media samples. Sampling activities may be performed in phases; with soil sampling conducted during the first phase, and surface water and/or ground water and/or other media sampling, if deemed necessary, conducted during subsequent phases. Minimum Acceptance Criteria 18.6.1.b and c.
 - b. Sample collection procedures. This includes information and other documentation on sample collection method (e.g., 5035 for VOC soil samples), sampling equipment used (e.g., scoop, hand auger, push-probe, peristaltic pump, etc.) as well as the sampling method(s) employed (e.g., discrete, composite or multi-incremental sampling for soil; and use of a low-flow pump for ground water sampling). Deviations from standard practice (industry accepted practices) or written procedures accepted by DEQ should be noted. Minimum Acceptance Criteria 18.6.1.d and g.
 - c. Sample handling documentation. Minimum Acceptance Criteria 18.6.1.e.
 - d. Sample location map. Map depicting the site and locations of samples collected as part of the petroleum release investigations or UST closure activities. Minimum Acceptance Criteria 18.6.1.f.
3. Current analytical data (within the last 12 months). Minimum Acceptance Criteria 18.6.1.h.
4. Sample analytical methods used. Minimum Acceptance Criteria 18.6.1.i.
5. List of chemicals or analytes included in the analysis. Minimum Acceptance Criteria 18.6.1.j.
6. Sample containers and sample preservatives used. Minimum Acceptance Criteria 18.6.1.k.

7. Sample preparation, including extraction, and analysis dates. Minimum Acceptance Criteria 18.6.1.l.
8. Trip blank samples analyzed when collecting volatile organic compound (VOC) samples. Minimum Acceptance Criteria 18.6.1.m.
9. Laboratory reporting limits and MDLs, including measurement units for sample analysis. Minimum Acceptance Criteria 18.6.1.n.
10. Laboratory control sample and/or duplicate analyses. Minimum Acceptance Criteria 18.6.1.o.
11. Matrix spike and/or spike duplicate analyses. Minimum Acceptance Criteria 18.6.1.p.
12. Chain of custody documentation, including project identification or name, sample date and time, sample numbers, sample matrix, sample container and preservation, sample analytical methods, and sample transfer dates, times, and signatures. Minimum Acceptance Criteria 18.6.1.q.
13. Laboratory data reports. Data reports may include items above. Minimum Acceptance Criteria 18.6.1.r.
14. Field duplicate samples collected of soil and/or surface water/ground water. Minimum Acceptance Criteria 18.6.1.s.
15. Rinsate blank samples collected to evaluate decontamination practices. Minimum Acceptance Criteria 18.6.1.t.
16. Field blank samples collected to evaluate sample collection, handling, and analysis processes. Minimum Acceptance Criteria 18.6.1.u.

Any missing data or information may be requested from the third-party prior to conducting data verification. If sampling activities were conducted using specific SOPs, copies of those SOPs will be provided to DEQ for review as part of the submittal.

If missing data or information is not available, the Regional Office Project Manager may discuss the situation with the Regional Office Program Manager, Regional Office QAO, and State Office Program Manager to determine if continuation to data verification activities will occur and the potential for modification of minimum acceptance criteria (see Section 18.4 of the Third-Party Petroleum QAPP [DEQ 2014]).

4.2.4 Supplemental Data

The third-party may provide DEQ with additional data, considered as supplemental, that may be used to make decision regarding further necessary actions at petroleum sites. Supplemental data may include the following (see below from Section 18.6 of the Third-Party Petroleum QAPP [DEQ 2014]):

1. DEQ on-site during site assessment and corrective action activities. Field activities (i.e., site assessment and corrective action activities) conducted by third parties observed and documented by DEQ staff.
2. Field data (Level I – see Appendix A) summary, readings, and field instrument calibration, if collected.

4.3 Data Verification of Field Activities

The data verifier will conduct the following analysis, as applicable, based on information provided by the third-party:

4.3.1 Field Records.

1. Evaluate submitted field records for consistency. Field records will include field instrument calibration data, if instruments are used. For non-passive ground water sampling events field records will also include appropriate field parameter data collected during purging prior to the collection of ground water samples, unless passive ground water sampling techniques are employed. For many chemicals of concern, no-purge or passive sample collection methods under certain subsurface condition yield better results than active purge and sample collection methods for ground water. As the goal is to ensure collection of representative samples, the verification process will evaluate if the sample collection process may have biased the samples. Active purging may have the effect of volatilizing some constituents and may not be the most “appropriate” collection method

Some examples of warning signs for improper field records include:

- Unexpected field conditions (e.g., adverse terrain or inclement weather) may prompt ‘cutting of corners’ to collect samples.
- Absence of field instrument calibration data or unusual calibration data for photoionization detector (or other field instrument) result in potential improper screening of soil borings and collection of soil samples (or other media sample locations or samples).
- Absence of field parameter calibration data or unusual calibration data for multi-parameter instruments (e.g., pH, dissolved oxygen, reduction potential, conductivity) or insufficient well purge timeframe (i.e., ground water parameters did not stabilize during purging timeframe before sample collection) result in potential improper purging of monitoring wells and collection of non-representative ground water samples.
- Homogenized or composited samples for VOC analysis result in loss of volatile compounds (contaminants) unless collected using appropriate methods such as EPA Method 5035 and the analytical data would be biased low and not representative of actual conditions.

2. Verification. Any field record inconsistencies, discrepancies, or missing information must be documented with an explanation provided in a verification narrative.

4.3.2 Sample Collection and Handling.

The type of petroleum product (e.g., gasoline, diesel, heating oil, and/or jet fuels) contained in the PST and/or use of a PST for used oil determines the chemicals of concern, sampling requirements and analytical method requirements. Review submitted sample collection and handling information, including specific sample collection procedures. If DEQ staff were on-site during all or part of the field activities, review DEQ field records and third-party records to identify potential warning signs or sampling problems.

1. Appropriate sample collection and handling methods were used, through implementation of standard of practice or industry standard practices, or in accordance with published standards and guidance (e.g., ASTM, company SOPs, EPA or other agency, etc.). If third parties do not have a written SOP, a general description of sample collection methods would suffice. However, there are certain aspects of sampling that are considered 'standard' or accepted industry practices that must be followed whether the third-party specifically identifies it or not.
 - a. Soil, soil vapor, surface water, ground water, and other matrix sampling procedures must be conducted in a manner that minimizes the loss of VOCs and limits the potential for contamination.
 - i. VOC soil sampling. The required method for the collection and analysis of soil samples for VOC analysis is EPA Method 5035A, as specified by EPA Region 4 (<http://www.epa.gov/region4/sesd/fbqstp/Soil-Sampling.pdf>) (EPA 2004). Method 5035 is a best management practice for minimizing loss of volatiles and providing a representative sample for VOC analysis. Use of this method significantly reduces the losses of chemical constituents by volatilization. Sampling by this method typically involves the use of a soil syringe or similar tool to take a small 5 gram sample which can either be extruded in the field into a pre-weighed 40 mL vial with a Teflon coated septum-sealed screw-cap which either contain a preservative (such as sodium bisulfate for low-levels, or methanol for high levels), or are frozen/chilled for shipment to the laboratory within 48 hours of collection.

Laboratories will often supply the sampling equipment, along with pre-weighed sampling containers containing the preservative. Soil moisture content will be assessed at each sampling location to allow the laboratory to calculate chemical concentrations on a dry weight basis which is collected in a separate 2 oz clear sample jar.

- ii. PAH soil sampling. The method for collection of soil samples for PAH analysis is to place the soil samples directly into laboratory provided containers (e.g., 4-ounce clear glass jar with Teflon lid) using clean dedicated or decontaminated soil sampling devices (e.g., hand auger, soil corer, split spoon, direct push probe, backhoe, or hand tool). The PAH soil sample preservative is to place the samples on ice to 4°C.
- iii. Halogenated solvent soil sampling (for used oil release assessment and corrective actions). For used oil release assessment and corrective actions, soil samples for halogenated solvent analysis are required. The required method for collection and analysis of soil samples for halogenated solvent soil samples is the same as identified above for VOC soil sampling.
- iv. Metal soil sampling (for used oil release assessment and corrective actions). For release assessment and corrective actions, soil samples for total metals analysis are required. The total metals analysis should include the RCRA 8 metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). The method for collection of soil samples for metals analysis is to place the soil samples directly into laboratory provided containers (e.g., 4-ounce amber jar) using clean dedicated or decontaminated soil sampling devices (e.g., hand auger, soil corer, split spoon, direct push probe, backhoe, or hand tool). Preservatives are not necessary for soil samples for total metals analysis.
- v. Soil vapor sampling. Vapor points may be installed as subsurface or as sub-slab (below a concrete slab) points. Vapor points should be installed within permeable strata deep enough to minimize potential short-circuit or withdrawal of atmospheric vapor and shallow enough to measure potential risks from soil vapor to indoor air quality. Prior to sample collection leak detection for the vapor monitoring points should be performed. The tracer gas method, with helium as the tracer gas, is generally used. Vapor point sampling should occur immediately following leak detection activities. *Reference Handbook for Site- Specific Assessment of Sub-Surface Vapor Intrusion to Indoor Air* (2005).
- vi. Indoor/Ambient air sampling. Collection of these data provides the best opportunity for developing multiple lines of evidence in determining if vapor intrusion presents a building-specific risk. Collection of indoor air data should, at a minimum, be accompanied with concurrently collected outside ambient air, an inventory of potential indoor chemical sources, and information on building construction and heating/cooling system design and

operation. In many cases, collection of subslab and subsurface soil vapor data can help determine if subsurface petroleum releases are contributing to vapor intrusion risk. Specifically, deeper subsurface soil vapor data collected under the building may establish that chemical concentrations detected in the subslab originate, in whole or in part, from indoor air rather than from subsurface contamination. Indoor air/ambient air samples must be collected in a method that allows for laboratory detection limits below the applicable risk screening level for the contaminants of concern. Typical collection methods are EPA Method TO-15 or EPA Method TO-17.

- vii. Ground water sampling. Ground water samples will be representative of ground water quality upgradient, underlying, and downgradient of the site, and will be collected by appropriate methods (e.g., pumps, in-situ, etc.) and placed into appropriate containers. Samples for VOC analysis will be collected directly into, or transferred using clean equipment with as little disturbance as possible, to 40 ml VOA glass vial with a Teflon coated septum-sealed screw-cap. No air space will be present in the sample container. This can be checked by inverting the bottle and checking for air bubbles. The presence of air bubbles may mean the samples are not acceptable for laboratory analysis. Laboratories may analyze samples with air bubbles, if the bubbles are small, and note the presence of the bubble on the COC or data sheet. VOC samples will not be collected near a source (e.g., running engine) that may bias the results.
 - viii. PAH Ground Water Sampling. The method for collection of ground water samples for PAH analysis is to place the water samples directly into laboratory provided containers (e.g., 40 ml glass VOA with Teflon lid) using clean dedicated or decontaminated water sampling equipment. The PAH ground water sample preservative is to place the samples on ice to 4°C.
- b. IDAPA 58.01.24.800.01 (Table 1) includes the list of petroleum-related chemicals (volatile organic compounds (VOC), semi-VOCs (SVOCs), and polyaromatic hydrocarbons (PAHs)) to include in sampling and analysis based on various petroleum products known or suspected to have been released.
 - c. Ethylene dibromide (EDB) [also known as 1,2-dibromoethane] by Method 8260 for soil samples and by Method 8011 for ground water samples, and ethylene dichloride (EDC) [also known as 1,2-dichloroethane] by Method 8260B will be included in the sampling and analysis for petroleum assessment and corrective action sampling for sites that are known or suspected to contain leaded regular gasoline or aviation gas (see IDAPA 58.01.24.800.01, Table 1).

- d. For used oil UST assessments and confirmation activities, sampling must include total metals (e.g., arsenic, cadmium, chromium and lead) and halogenated solvents as shown in Table 1 unless the Third Party can demonstrate otherwise through process knowledge of operations or if the soil will be designated as a hazardous waste (see DEQ Used Oil UST Closure and Release Sampling Standard Operating Procedures (TRIM 2016BAF24)). Used oil means any oil that (as a result of use) has become contaminated by physical or chemical impurities. Examples of used oil include, but are not limited to, motor oils, metal cutting oils, and hydraulic fluids. Waste oil means oil that is discarded or spilled before use.

Media	Parameter	EPA Methodology
Soil	BTEX, PAHs	8260, 8270
	Solvents	8260,8270
	Total Metals	6010, 6020
	Total Mercury	7470
Water	BTEX, PAH's	8260, 8270
	Solvents	8260,8270
	Total Metals	6010, 6020
	Total Mercury	7470

For used oil assessments, soil sampling must include TCLP metals (e.g., arsenic, cadmium, chromium and lead) if the total metal concentrations exceed the Rule of 20 limit, unless the soil will be treated as a hazardous waste (see DEQ Used Oil UST Closure and Release Sampling Standard Operating Procedures (TRIM 2016BAF24)). If soil exhibits the toxicity characteristic (see Table 2), it is considered to be a hazardous waste. Contact the hazardous waste compliance manager to discuss.

If the concentration of total halogenated compounds determined by VOC analysis using method 8260 is greater than 1,000 mg/kg, the soil is presumed to be hazardous waste, unless the generator can rebut this presumption to the satisfaction of DEQ hazardous waste management staff through previous knowledge or chemical analysis.

Table 2. Used Oil Tank TCLP Analysis for Metals

Metal	TCLP Limit (mg/L)	Rule of 20 (mg/kg)
Arsenic	5	100
Barium	100	2,000
Cadmium	1	20
Chromium	5	100
Lead	5	100
Mercury	0.2	4
Selenium	1	20
Silver	5	100

- e. Samples must be collected using appropriate equipment that has been properly decontaminated and procedures appropriate to site-specific factors including the matrix, the parameters to be analyzed, and the sampling objectives.
 - f. Soil, surface water, ground water, and other media sampling procedures must be conducted in a manner that minimizes cross-contamination. To minimize or avoid cross-contamination, all non-disposable sampling equipment must be cleaned and properly stored/handled between sample locations.
2. Appropriate types and volumes of samples will be collected. Types of samples collected will be based on the potential contaminants (see IDAPA 58.01.24.800.01 (Table 1) for petroleum product and DEQ Used Oil UST Closure and Release Sampling Standard Operating Procedures (TRIM 2016BAF24) for used oil requirements) and exposure routes/pathways (e.g., vapor intrusion, direct contact, and ingestion). Volume of sample will be based on the analytical method and type of sample.
 3. Sufficient number of samples will be collected from appropriate locations and depth (elevations) to conduct an assessment of the site to determine areal and vertical extent of soil, surface water, ground water, and other media contamination in accordance with IDAPA 58.01.02.851 and 852 as well as IDAPA 58.01.24. These are professional judgment calls made by DEQ staff based on professional experience of the staff verifying the data and information. Various standards and guidance documents may need to be reviewed in association with the evaluation of the third-party submittal to determine if these criteria are satisfied. In addition, consultation with other DEQ staff (e.g., regional, program or technical services) may be conducted. Under certain circumstances (e.g., an environmental covenant is proposed or anticipated, or due to the complexity of the site), direct consultation with the State Office General Remediation and/or LUST Program Manager may be required.

Samples should be collected where contamination is likely to be present, under tanks, piping, joints, dispensers and where product lines exit the tanks. Samples

should also be collected to investigate potential off-site impacts. Unless site specific circumstances dictate otherwise, soil and ground water samples should be collected to determine extent of contamination at the petroleum release site. See Section 4.1 of this SOP for standards and guidance documents that may be useful references for staff.

Sampling activities may be performed in phases, with soil sampling conducted during the first phase followed by surface water and/or ground water or other media sampling if deemed necessary.

4. Sufficient number of samples will be collected from appropriate locations and depths (elevations) to confirm completion of corrective action activities, as applicable.

Warning signs for improper sample collection procedures may include:

- Composite or homogenized samples for VOC analysis.
 - Sample location in close proximity to potential sources of contaminant or interference (e.g., soil sample near asphalt when polycyclic aromatic hydrocarbon analysis is to be performed, or sample collected near running engine).
 - Biased sampling locations (e.g., collecting samples to bias the result away from contaminated areas).
 - Sample dates and times that do not match other information.
 - Inconsistencies between COC and other information.
5. Verification. Any discrepancies between type of petroleum identified and chemicals of concern, sampling requirements and analytical method requirements must be documented with an explanation provided in a verification narrative. Any discrepancies in the number and/or type of samples collected must be documented with an explanation provided in the verification narrative. Any discrepancies between sample locations on map and information presented in narrative must be documented with an explanation provided in the verification narrative. Any sample collection and handling inconsistencies, discrepancies, or missing information must be documented with an explanation provided in a verification narrative.

4.4 Data Verification of Analytical Laboratory Activities

The data verifier will conduct the following analysis, as applicable, based on the information provided by the third-party:

4.4.1 Chain of custody.

1. Chain of custody must include:

- a. Each sample must have an assigned unique number.
 - b. The date and time of sample collection.
 - c. The required testing parameters for each sample.
 - d. Sample preservation.
 - e. Sample matrix (e.g., water, soil, soil vapor, or waste).
 - f. Sample numbers assigned by the laboratory must correspond to the appropriate sample number throughout the analysis.
 - g. Chain-of-custody forms will also have applicable signatures identifying possession transfers throughout the process.
2. Verification. Any COC discrepancies must be documented with an explanation provided in a verification narrative.

4.4.2 Holding times.

1. The holding time requirements are listed in the analytical method used by the laboratory. Holding times for typical analytical methods are provided in Appendix B. Sample holding times are calculated by comparing the sample date and time on the COC form with the dates and times of analysis, including extraction dates, reported in the laboratory data sheets. For some analyses, the time from sample collection to sample preparation (e.g., extraction) must also be considered.
2. Verification. Data with holding times greater than the analytical method holding time will be documented and identified in the verification narrative. In general, data generated when holding times are exceeded will be rejected and not used in decision making. However, professional judgment may be used to flag data during verification as estimated if the data \geq MDL (i.e., elevated data may still be used under certain circumstances).

4.4.3 Sample preservation.

1. The preservation requirements are listed in the analytical method used by the laboratory. Preservation for typical analytical methods utilized are provided in Appendix B. Examine the laboratory sample receipt reports, digestion and/or distillation logs, if available, to determine if samples were preserved at the proper temperature or pH.
2. Verification. In general, data generated when improper or no preservatives are used will be rejected and not used in decision making. However, professional judgment may be used to flag data during verification as estimated if the data \geq MDL (i.e., elevated data may still be used under certain circumstances).

4.4.4 Sample Containers.

1. Typical sample container information is provided in Appendix B. Make note of any laboratory reported problems, such as sample leakage, broken containers, inadequate sample volume, inappropriate sample containers, air pockets or bubbles for VOC samples, or other information available regarding sample containers and sample condition.
2. Verification. In general, data generated when improper sample containers are used will be rejected and not used in decision making. However, professional judgment may be used to flag data during verification as estimated if the data \geq MDL (i.e., elevated data may still be used under certain circumstances).

4.4.5 Sample Analytical Methods.

1. Ensure the appropriate analytical method was requested by the third-party on the COC and utilized by the laboratory. Typical analytical method information is provided in Appendix B. Ensure the laboratory properly accounted for dilution, if utilized, in the sample analysis and reported result.
2. Verification. Any sample analytical method discrepancies must be documented with an explanation provided in a verification narrative.

4.4.6 Method Detection Limits.

- i. Ensure correct MDLs are used as indicated below for petroleum projects:
 - DEQ residential use screening levels from the Standards and Procedures for Application of Risk Based Corrective Action at Petroleum Release Sites (IDAPA 58.01.24); <http://adminrules.idaho.gov/rules/current/58/0124.pdf>, and the Petroleum Risk Evaluation Manual (2012 or more recent version); <http://www.deq.idaho.gov/waste-mgmt-remediation/remediation-activities/risk-evaluation-manuals.aspx>.
 - For used oil constituents, see DEQ Used Oil UST Closure and Release Sampling Standard Operating Procedures (TRIM 2016BAF24).
- ii. Verification. In general, data generated with MDLs greater than screening concentrations and the data is less than the screening concentration (including non-detect) will be rejected and not used in decision making.

4.4.7 Comparability

1. Comparability is satisfied by the third-party conducting sample collection and handling processes that are consistent with “standard practice” or “industry accepted practices”, and the laboratory performing sample analysis follows standard preparation and analysis procedures.

2. Verification. Any deviations from “standard practice” sample collection, handling, preparation and analysis must be documented with an explanation provided in a verification narrative.

4.4.8 Review QC Data (Precision and Accuracy).

1. Ensure precision and accuracy calculations either by third parties or by DEQ staff are valid and correct if LCS, matrix spikes, or surrogate spikes are conducted and recoveries are reported by the laboratory and submitted by the third-party for accuracy, and/or if duplicate samples are collected by the third-party or internal laboratory duplicate samples are analyzed with the samples and the information is submitted by the third-party. For most third-party data submittals, this information will likely not be available or provided to DEQ. Accuracy and precision information is considered to be supplemental and is not included as minimum acceptance criteria.
2. Verification. Document precision and accuracy calculations and information in a verification narrative.
 - a. Accuracy is to be within the ranges of acceptability for percent recovery identified by the specific laboratory conducting the analysis for each method and analyte; if LCS, matrix spikes, or surrogate spikes are conducted and recoveries are reported by the laboratory and submitted by the third-party for the analysis. Laboratories routinely conduct internal quality control analyses. Accuracy is considered to be minimum acceptance criteria.
 - b. Precision for laboratory data is to be within the ranges of acceptability, based on RPD, identified by the specific laboratory conducting the analysis for each method and analyte for the laboratory data for laboratory duplicate sample analysis, if conducted by the laboratory and reported by the third-party. Precision for laboratory data is considered to be minimum acceptance criteria.
 - c. Precision for field duplicate samples, if collected by the third-party, is to be within $\pm 50\%$ for third-party collected soil duplicate samples, and $\pm 30\%$ for third-party collected ground water duplicate samples based on RPD. Precision for field duplicate soil vapor samples, if collected by the third-party, is to be within $\pm 25\%$ based on RPD. Precision for field duplicate data is considered to be minimum acceptance criteria.

In general, data generated with accuracy and precision exceeding the criteria will be rejected and not used in decision making.

4.4.9 Review Blank Sample Results.

1. No contaminants will be present in blank samples. Examine results and identify samples where analytes were detected in blank samples at a concentration equal to or greater than the MDL. If problems with blank sample results exist, all data

associated with the sample must be carefully evaluated to determine whether or not there is an inherent variability in the data, or if the problem is an isolated occurrence not affecting other data. For most third-party data submittals, blank sample information will likely not be available or submitted to DEQ. Collection of field blank and equipment blanks during assessment and confirmation sampling activities is standard practice. Therefore, field blank and equipment blank sample data and information are considered to be minimum acceptance criteria. Trip blank sample information is considered minimum acceptance criteria when VOC analyses occur. Blank samples may consist of one or more of the following:

- a. Field blank – a field blank is a clean matrix sample that is placed into a sampling container and otherwise treated the same as other samples taken from the field to check general sampling and handling procedures, and/or
 - b. Trip blank – a trip blank is a laboratory supplied sample (typically distilled or deionized water) that accompanies each shipment of samples for VOC analysis that is analyzed to assess potential cross contamination during sample shipment, and/or
 - c. Equipment blank – equipment blanks consist of clean matrix that has passed through or over sampling equipment to check the decontamination cleaning procedure between samples. If no special equipment is used that require decontamination, such as dedicated monitoring well tubing, then equipment blanks are not necessary.
2. Verification. When blank sample results demonstrate that contamination has occurred, the Regional Project Manager will discuss the situation with the Regional Office Project QAO to consider on a case-by-case basis if the contamination is significant enough to reject, qualify, or narratively flag the data.

4.4.10 Representativeness.

1. Representativeness is satisfied by confirming that sampling locations are properly selected, sample collection procedures are appropriate and consistently followed, a sufficient number of samples are collected, MDLs are less than screening criteria, and analytical results are useable (see Section 4.3, 4.4.1-9 and 4.4.11 of this SOP).
 - a. Field data is likely Level I (e.g. PID).
 - i. Level I data will be used to evaluate representativeness of samples collected. Level I data is not used to make assessment and remediation decisions. Level I data is used to evaluate acceptability of the data and information provided (e.g., identify potential problems or issues with sample collection that may result in uncertainty of the data).

- b. Laboratory data is likely Level III/Stage 1 or Stage 2A (see Appendix A). Analytical results must be current (within the last 12 months) to be considered representative of site conditions and status. Historical, peer-reviewed published data may be used for trend analysis, but do not represent current site conditions if more than 12 months old.
2. Verification. Document representativeness in a verification narrative.

4.4.11 Completeness (90% verified data related to minimum acceptance criteria).

1. Summarize the total number of analyses requested for each analyzing laboratory, noting the number of analyses flagged by the laboratory with a data qualifier which limits the data's usability (J or R qualifier [EPA 2002]). The percent completeness (%C) is calculated using:

$$\%C = ((\text{Total Data Obtained} - \text{Flagged Data (J or R)}) / (\text{Total Data Requested})) * 100$$

2. If data completeness is less than 90%, the Regional Project QAO will discuss the situation with the Regional Project Manager to consider, on a case-by-case basis, if the data submittal is to be rejected or partially accepted.

4.5 Data Review and Verification Report

Data review identifies that the appropriate data and information was submitted to DEQ by third parties, and data verification compares the submitted data and information from third parties to the project requirements (minimum acceptance criteria) identified in the Third-Party Petroleum QAPP. The data review and verification checklist (see Appendix B of the Third-Party Petroleum QAPP [DEQ 2014]) will be the Data Review and Verification Report. The checklist will summarize the data review and verification process conducted by the Regional Office Project Manager or other staff for the project. The data review and verification checklist will also summarize data quality and data usability.

In the event that significant problems with the submitted data are discovered through the application of this review and verification procedure, additional action may be taken to ensure minimum data quality is achieved. This may include, but is not limited to, a data validation process following EPA (2002) guidance and DEQ SOP WST-2014-6 (DEQ 2014), and the development of Corrective Action Report and Corrective Action Plan per the DEQ Quality Management Plan (2012).

5 Records

The review and verification checklists (from Section 4.5 of this SOP and Appendix B of the Third-Party Petroleum QAPP), and DEQ's response to the third-party submission of data will be entered into TRIM following applicable program SOPs:

- UST documents will be entered into TRIM per the TRIM SOP TRIM 2011BAQ8.
- LUST documents will be entered into TRIM per the TRIM SOP TRIM 2012BAQ6.

- General Remediation and/or LUST documents will be entered into TRIM per the TRIM SOP 2011BAQ3.
- Emergency Response documents will be entered into TRIM per the TRIM SOP 2013AEU1.

6 References

- DEQ (Idaho Department of Environmental Quality). 2012a. Quality Management Plan. Boise, ID: DEQ. TRIM record number 2012AEC1.
- DEQ (Idaho Department of Environmental Quality). 2014a. Standard Operating Procedure for Data Validation of Third-Party Petroleum Data Submittals. Boise, ID: DEQ. TRIM record number 2016BAF21.
- DEQ (Idaho Department of Environmental Quality). 2014c. Third Party Petroleum Assessment and Corrective Action Quality Assurance Project Plan. Boise, ID: DEQ. TRIM record number 2016BAF19.
- DEQ (Idaho Department of Environmental Quality). Used Oil UST Closure and Release Sampling Standard Operating Procedures. Boise, ID: DEQ. TRIM record number 2016BAF24.
- EPA (US Environmental Protection Agency). 2002. *Guidance on Environmental Data Verification and Data Validation* (EPA QA/G-8). Washington DC: EPA, Office of Environmental Information. EPA/240/R-02/004. Available at <http://www.epa.gov/quality/qs-docs/g8-final.pdf>
- EPA (US Environmental Protection Agency). 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (OSWER No. 9200.1-85). Washington, DC: EPA, Office of Solid Waste and Emergency Response. EPA 540-R-08-005. Available at <http://www.epa.gov/superfund/policy/pdfs/EPA-540-R-08-005.pdf>.
- DEQ (Idaho Department of Environmental Quality). 2012 or more recent version. Risk Evaluation Manual. Boise, ID: DEQ. <http://www.deq.idaho.gov/waste-mgmt-remediation/remediation-activities/risk-evaluation-manuals.aspx>.
- EPA (US Environmental Protection Agency). 2014 or more recent version. Regional Screening Levels. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm.
- IDAPA 58.01.24. Standards and Procedures for Application of Risk Based Corrective Action at Petroleum Release Sites <http://adminrules.idaho.gov/rules/current/58/0124.pdf>
- IDAPA 58.01.02. Water Quality Standards. <http://adminrules.idaho.gov/rules/current/58/0102.pdf>

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Appendix A. Analytical Data Support Levels

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The concept of *analytical data support* is generally described as having five levels, where Level I is considered minimal quality assurance, quality control (QA/QC) control/documentation, and Level V is considered the highest available QA/QC control/documentation.

The appropriate type of sampling and analysis for a given project or at a given site depends on numerous factors, the foremost of which are the intended end use of the data and associated data quality requirements. The Regional Project Manager, in consultation with the appropriate Regional Quality Assurance Officer and State Office Program Manager, will determine which “level” of analytical data support is necessary for each remediation project. There is no requirement from DEQ for a specific data level package to be submitted by third parties.

Since individual laboratories frequently describe the analytical data support provided by their facility in a variety of terms other than “level,” such as “stages,” “classes,” or “packages,” the data levels described herein are intended as a general guide for project staff. Issues to consider when evaluating third-party data include the level of QC the laboratory employed when analyzing the samples; and equally important, the documentation accompanying the returned results. Though not required as minimum acceptance criteria (see Section 18), this laboratory QC information is supplemental and may be useful to DEQ in evaluating the submitted data, if provided with the third-party submittal.

The five levels of analytical support (Levels I and II, field analytical methods, and Levels III through V, laboratory analytical methods) are described below in general terms.

Included in the general description of the analytical data support level is the generally associated and/or corresponding “stage” of data verification and validation to be applied upon receipt of data and documentation by the project from the laboratory. The verification and validation “stages” are described in detail in EPA’s *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

While a given laboratory may or may not recognize various designations of analytical data support levels, the laboratory will likely be able to support the needs of the data user if the “stage” of data verification and validation is described to laboratory staff.

Level I: This refers to field screening or analyses using portable instruments, and results may or may not be compound-specific or quantitative. Generally, Level I data are related to activities such as locating sample collection points for laboratory analysis and are associated with media-specific instruments.

Generally associated verification/validation stage: Level I data may be associated, depending on data user requirements, with “Stage 1” verification and validation checks as described in Appendix A, Section 1.1, of EPA’s *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). Level I data may not be used by DEQ in decision making.

Level II: This refers to field analyses using more sophisticated portable analytical instruments or mobile laboratories onsite. Data generated can range from qualitative to quantitative (e.g., actual contaminant identification is made, but concentrations may or may not be quantified to a high

degree of accuracy). This data may or may not be acceptable for compliance purposes. Restrictions or limitations on the use of such data, if applicable, are stated below. Many types of field equipment—such as a mercury vapor analyzers and/or an XRF instrument—generate data that may (or may not) qualify as Level II data.

Generally associated verification/validation stage: Level II data may be associated, depending on data user requirements, with “Stage 1” or “Stage 2A” verification and validation checks as described in Appendix A, Sections 1.1 and 1.2, respectively, of EPA’s *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). Level II data may only be used by DEQ in decision making when supported by Level III or higher data.

Level III: This level refers to standard EPA-approved methods that may be equivalent to Level IV methods (see below), with the exception that the level of documentation supplied with analytical results is less robust than higher level data.

Generally associated verification/validation stage: Level III data may be associated, depending on data user requirements, with “Stage 1”, “Stage 2A” or “Stage 2B” verification and validation checks as described in Appendix A, Sections 1.2 and 1.3, respectively, of EPA’s *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). Level III data is typically utilized for environmental projects and may be used by DEQ in decision making.

Level IV: This refers to EPA Contract Lab Program (CLP) Routine Analytical Services (RAS) analyses, or EPA-approved methods (Level III) with additional rigorous QA/QC protocols and full documentation provided to the project by the laboratory. Documentation allows validation of results against specific contractual requirements and allows for detailed data use, restriction, and/or limitations to be identified prior to use of data. Requirements or limitations for a Level IV analysis and full validation of the analytical data, if necessary, are specified below.

Generally associated verification/validation stage: Level IV data may be associated, depending on data user requirements, with “Stage 4” verification and validation checks as described in Appendix A, Section 1.5, of EPA’s *Guidance for labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). Level IV data may be used by DEQ in decision making.

Level V: This refers to nonstandard methods that are considered to be more rigorous than Level IV methods. This analytical data level is seldom used and must be accompanied by significant evidence substantiating the validity of the nonstandard methods employed. Level V is generally used when extremely accurate/precise measurements and quality documentation, far beyond standard EPA methods, are deemed necessary for site-specific contaminant identifications and quantitation.

Generally associated verification/validation stage: Level V data may be associated, at a minimum, with the “Stage 4” verification and validation checks as described in Appendix A, Section 1.5, of EPA’s *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). Level V data may not be used by DEQ in decision making.

Field screening data, if conducted and reported by the third-party property owner or other parties conducting the field work, may include photoionization detector readings (PID), and are at data quality Level I (field parameter/screening level data).

Laboratory analytical data submitted by third parties to DEQ for review (i.e., data from samples submitted to a laboratory for analysis) are typically at data quality Level III/Stage 1 or Stage 2A (standard laboratory procedures and data reviewed by standard QA protocols). See Section 18 of the Third-Party Petroleum QAPP.

There is no requirement for third parties to provide a certain laboratory data package to DEQ. Below are the general elements of Level III Stage 1 and Level III Stage 2A data packages (note that Level III Stage 2A data package also includes the elements from Level III Stage 1):

A. Level III/Stage 1

- i. Chain of Custody documentation for all samples submitted for analysis, including name of laboratory receiving samples and conducting the analysis.
- ii. Date and time of sample collection, date and time of laboratory receipt of samples, and documentation of sample condition (e.g., preservation, pH, and temperature) upon receipt..
- iii. Analytical methods requested, analyses performed, and date of analysis.
- iv. Report of analyte results, unit values, method reporting limits, data qualifiers, and qualifier definitions.
- v. Report of sample results at/below reporting limits.
- vi. Sample results compared to sample conditions upon receipt at the laboratory (e.g., preservation checks) and sample characteristic (e.g., percent moisture) comparison to the analytical method requirements.

B. Level III/Stage 2A

- i. Dates, times, and methods for sample collection, handling, preparation, and analysis are present.
- ii. Sample related QA/QC data and QA/QC threshold criteria are provided.
- iii. If requested, report of spike analytes and results, including unit values and percent recovery.
- iv. Sample holding times compared to method requirements.
- v. Frequency of QA/QC samples checked for appropriateness (e.g., one QC sample per twenty samples in a batch).
- vi. Sample results evaluated by comparing sample-related QA/QC data to requirements and guidelines, and qualified (i.e., flagged) as appropriate.

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Appendix B. Typical Analytical Methods, Container Types, Preservation Methods and Holding Times

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Typical analytical methods, container types, preservation methods, and sampling holding times. ¹					
Compounds	Parameter	Analytical Method	Sample Container	Preservative	Holding Time
Soil Samples					
Petroleum hydrocarbons	TPH	EPA 8015D modified	4-oz glass	4 °C.	14 days
	GRO	EPA 8015D modified	4-oz glass	4 °C.	14 days
	DRO	EPA 8015D modified	4-oz glass	4 °C.	14 days (extraction), 40 days (analysis)
	BTEX	EPA method 8260B	Two 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
	MTBE	EPA method 8260B	Two 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
	EDB	EPA method 8260B	Two 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
	EDC	EPA method 8260B	Two 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
VOCs	VOCs	EPA 5035/8260B	8-oz clear glass (waste)	4° C, ±2° C	14 days
			3 x 5 grams soil to 40-ml amber glass VOA vial, PFTE septa cap	4° C, ±2° C, Methanol	
			3 x 5 grams soil to 40-ml amber glass VOA vial, PFTE septa cap	4° C, ±2° C, sodium bisulfate	
SVOCs	SVOCs	EPA 8270D SIM	4-oz amber glass, Teflon lid	4° C, ±2° C	14 days (extraction), 40 days (analysis)
PAHs	PAHs	EPA 8270D SIM	4-oz amber glass, Teflon lid	4° C, ±2° C	14 days (extraction), 40 days (analysis)
Total RCRA metals	As, Ba, Cd, Cr, Pb, Ag, Se	EPA 6010/6020	2-oz glass	4° C, ±2° C	6 months
	Hg	EPA 7470A	2-oz glass	4° C, ±2° C	28 days
TCLP RCRA metals	As, Ba, Cd, Cr, Pb, Ag, Se	EPA 1311 extraction/ EPA 6010/6020	8-oz glass	4° C, ±2° C	6 months

Typical analytical methods, container types, preservation methods, and sampling holding times. ¹					
Compounds	Parameter	Analytical Method	Sample Container	Preservative	Holding Time
	Hg	EPA 1311 extraction/ EPA 7470A			28 days
Ground Water and Surface Water					
Petroleum hydrocarbons	TPH	EPA 8015D modified	Two 1-L amber glass bottles	4 °C. pH < 2 with HCL	7 days (extraction), 40 days (analysis)
	GRO	EPA 8015D modified	Two 40-mL amber glass VOA vials	No headspace, 4 °C. pH < 2 with HCL	14 days
	DRO	EPA 8015D modified	Two 1-L amber glass bottles	4 °C. pH < 2 with HCL	7 days (extraction), 40 days (analysis)
	BTEX	EPA method 8260B	Three 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
	MTBE	EPA method 8260B	Three 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
	EDB	EPA method 8011	Three 40-ml amber glass VOA vial, PFTE septa cap	Sodium Thiosulfate	14 days
	EDC	EPA method 8260B	Three 40-mL glass VOA vials, PFTE septa cap	No headspace, 4 °C. pH < 2 with HCL	14 days
VOCs	VOCs	EPA 8260B	Three 40-ml glass VOA vial, PFTE septa cap	No headspace, 4°C, ±2° C, pH < 2 with HCL	14 days
PAHs	PAHs	EPA 3511/8270D SIM	Three 40-ml amber glass VOA vial, PFTE septa cap	4° C, ±2° C	7 days (extraction), 40 days (analysis)
SVOCs	SVOCs	EPA 8270D SIM	One 1-L, amber glass	4° C, ±2° C	7 days (extraction), 40 days (analysis)
RCRA metals	As, Ba, Cd, Cr, Pb, Ag, Se	EPA 6010 or 200.7	500 mL clear HDPE	4° C, ±2° C, pH < 2 with HNO ₃ (may be	6 months

Typical analytical methods, container types, preservation methods, and sampling holding times. ¹					
Compounds	Parameter	Analytical Method	Sample Container	Preservative	Holding Time
				added at the lab)	
	Hg	EPA 7470A	500 mL clear HDPE	4° C, ±2° C, pH < 2 with HNO ₃ (may be added at the lab)	28 days

Notes: L = liter; mL = milliliter; LDPE = low density polyethylene; HDPE = high density polyethylene; VOA = volatile organic analysis; HNO₃ = nitric acid; HCl = hydrochloric acid

¹ The analytical method, container types, preservation method, and sampling holding time requirements provided here are typical but may vary based on the laboratory and analytical methods used by third parties. Therefore, the analytical method, container types, preservation method, and sampling holding time information submitted by the third-party will be compared against the requirements identified in the third-party's 'standard of practice', or other SOPs, in case there is a reason to deviate from the requirements identified in this table.