ATTACHMENT 31

Surface Water Sampling Program - QA/QC Plan

(138 Pages)

Baffinland Iron Mines Corporation

Sampling Program – Quality Assurance and Quality Control Plan

BAF-PH1-830-P16-0001

Rev 4

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TRACK CHANGES TABLE

Index of Major Changes/Modifications in Revision 4

Item No.	Description of Change	Relevant Section
1	Updated with the current Canadian Association for Laboratory Accreditation Inc. (CALA) Certificate of Accreditation and Scope of Accreditation for ALS Environmental.	Appendix C
2	Updated with the current Quoted Parameters with Detection Limits for ALS Quote Number Q83450.	Appendix D
3	Updated with the current Quality Control Protocols for ALS Canada Limited dated January 2, 2018.	Appendix E
4	Updated references for current versions of reference documents.	12 References

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1 INTRODUCTION

As required by Baffinland Iron Mines Corporation's (Baffinland) Type 'A' Water Licence No. 2AM-MRY1325 – Amendment No. 1 (Type 'A' Water Licence), issued by the Nunavut Water Board (NWB), the Sampling Program – Quality Assurance and Quality Control Plan (QA/QC Plan) has been updated to reflect current operations at the Mary River Project (the Project). This Plan is a living document and will be revised, as required, based on changes to operations, QA/QC procedures and protocols. Updates to this Plan will be completed in accordance with the Project's water licences issued by the NWB, Commercial Lease – Q13C301 (Commercial Lease) between Baffinland and the QIA, the Project Certificate No. 005 (Project Certificate) issued by the Nunavut Impact Review Board (NIRB), applicable regulations (e.g. Metal & Diamond Mining Effluent Regulations; MDMER) and any subsequent requirements which may be issued.

In accordance with the Type 'A' Water Licence, this QA/QC Plan has been prepared following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan* (INAC, 1996).

1.1 PURPOSE AND SCOPE

The purpose of this Plan is to identify Baffinland's framework for accurate and effective QA/QC management by providing instruction for standardized field sampling and laboratory analytical procedures.

For the purposes of this report, QA/QC is defined as:

- *Quality Assurance* - System of activities used to achieve quality control.
- *Quality Control* - Set of best practice methods and procedures used to ensure quality of data in terms of precision, accuracy, and reliability.

The QA/QC best practices outlined in this management plan are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality, soil, and benthic data generated from Project Sites.

1.2 REGULATORY REQUIREMENTS

This Plan is regulated by the NWB and is subject to Baffinland's Type 'A' Water Licence 2AM-MRY1325, as amended, which provides specific terms and conditions for the management of QA/QC for the Project's water quality monitoring programs. To provide a more comprehensive QA/QC framework for the Project's aquatic ecosystem monitoring programs, other applicable requirements have been included in this Plan, such as the MDMER and sediment quality and benthic invertebrate monitoring components of the Project's Aquatic Effects Monitoring Plan (AEMP).

1.3 RELATIONSHIPS TO OTHER MANAGEMENT PLANS

This Plan is intended for use in conjunction with the following Plans:

- Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039)
- Environmental Protection Plan (BAF-PH1-830-P16-0008)
- Fresh Water Supply, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010)
- Surface Water and Aquatic Ecosystem Management Plan (BAF-PH1-830-P16-0026)
- Roads Management Plan (BAF-PH1-830-P16-0023)

2 BAFFINLAND'S CORPORATE POLICIES

Baffinland's Health, Safety and Environment Policy (BAF-PH1-800-POL-0001) is the company's commitment to achieve a safe, health and environmentally responsible workplace. The policy is provided in Appendix A.

Baffinland's Sustainable Development Policy (BAF-PH1-800-POL-0002) identifies the company's commitment internally and to the public to operate in a manner that is environmentally responsible, safe, fiscally responsible and respectful of the cultural values and legal rights of the Inuit. The Sustainable Development Policy is provided in Appendix A.

All employees and contractors are expected to comply with the contents of both policies.

3 ROLES AND RESPONSIBIITIES

3.1.1 SENIOR DIRECTOR – HEALTH, SAFETY, ENVIRONMENT, SECURITY AND TRAINING

- Reports to the Chief Executive Officer.
- Provides general operational oversight for programs related to health, safety, environment, security and training.

3.1.2 MANAGER – HEALTH, SAFETY, ENVIRONMENT AND SECURITY

- Reports to the Senior Director – Health, Safety, Environment, Security and Training.
- Provides operational oversight and leadership for health, safety, environment and security related activities and programs.

3.1.3 ENVIRONMENTAL SUPERINTENDENT

- Reports to the Manager – Health, Safety, Environment and Security.
- Serves as the onsite lead for all environmental monitoring programs.
- Responsible for ensuring this Plan is up-to-date and reflects current Project operations and regulatory requirements.

3.1.4 ENVIRONMENTAL COORDINATOR

- Reports to the Environmental Superintendent.
- Responsible for ensuring environmental monitoring programs adhere to this Plan.
- Reviewing this Plan with all environmental technicians and providing the necessary training as required.
- Conducting in-field audits of sampling methodology and QA/QC analysis on samples and data collected.
- Management of field notes, analytical results and environmental database.

3.1.5 ENVIRONMENTAL TECHNICIAN

- Reports to the Environmental Coordinator.
- Responsible for being familiar with this Plan and adhering to the relevant protocols while conducting environmental monitoring programs and managing samples.

4 WATER SAMPLE COLLECTION

4.1 GENERAL

The samples will be collected following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan* (INAC, 1996).

A summary of recommended water sample containers, sample volumes, sample preservatives and maximum sample holding times is presented in Table 9.1. Laboratory parameters such as pH, turbidity, Biochemical Oxygen Demand (BOD), nitrite, nitrate, total phosphorus, faecal coliforms, chlorophyll-a and pheophytin typically have maximum sample storage times varying from four (4) to 72 hours. Sampling programs and associated logistics will be planned ahead of time to ensure samples collected are analyzed within the appropriate holding time. Similarly, every effort will be made to prevent inadvertent freezing of water samples (due to on-site climatic conditions) which could affect analytical results for parameters. Exceptions to these protocols will be documented.

Required water sample analyses for each of the Project's water quality monitoring stations are documented in the following documents:

- NWB Type 'A' Water Licence 2AM-MRY1325, as amended
- Metal and Diamond Mining Effluent Regulations (MDMER)
- Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039)

4.2 WATER QUALITY MONITORING LOCATIONS

This Plan addresses the collection of water quality samples at the Project, including the following:

1. Surface water samples from Project area lakes, streams and rivers.
2. Groundwater samples from piezometer monitoring wells.
3. Effluent samples from Project water treatment facilities (e.g. sewage, oily water, etc.).
4. Drinking water samples from camp potable water sources.
5. Stormwater runoff samples from ore processing and stockpiling facilities.
6. Stormwater runoff samples from waste rock management facilities.
7. Stormwater runoff samples from mining areas (e.g. Deposit No. 1).
8. Stormwater samples from Project fuel and waste containment areas.
9. Stormwater from sumps at maintenance shops.
10. Surface water samples downstream of Project areas (e.g. landfills, quarries, etc.).
11. Surface water samples representative of general site drainage before, during and after construction at Project areas.
12. Snowmelt runoff samples from snow management stockpiles.

13. Surface water samples from ponded borrow pit areas.
14. Surface water samples from ponded sources for reclaimed and/or recycled water.
15. Surface water samples from water bodies affected by spills.

Locations and sampling frequency for designated water quality monitoring stations are presented in the Surface Water and Aquatic Ecosystem Management Plan (BAF-PH1-830-P16-0026), Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039), Roads Management Plan (BAF-PH1-830-P16-0023) and the Fresh Water Supply, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010).

4.3 WATER SAMPLING METHODS AND EQUIPMENT

4.3.1 GENERAL SAMPLING PROCEDURES

General water sampling procedures include the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. A new sample bottle(s) will be used at each monitoring station. Sample bottles will not be re-used.
3. Sampling will be carried out by one of the following steps:
    i) Rinsing the sample bottle with source water three (3) times before immersing the sample bottle to fill it (after which preservative is added, as required).
    ii) If the sample bottles are provided pre-charged with preservatives then it is generally convenient to transfer water sampled from the source to pre-charged sample bottles using a large transfer bottle. The transfer bottle will be provided by the lab and will be rinsed in the source water three (3) times before filling the sample bottles. Different transfer bottles will be used for different sample types (e.g. sewage effluent, hydrocarbon-impacted stormwater) and will be replaced on a regular basis.

4. Rinse water will be disposed of so that it does not contaminate the source water where the sample will be collected (e.g. downstream of the sampling location or on the shore or berm edge).
5. Bottles labeled as “certified sterile” do not need to be rinsed.
6. For samples requiring preservatives, the sample bottle will be filled to the top (or to the indicator line marked on the bottle), the preservative will be added and the bottle securely sealed. For some volatile compounds including benzene, toluene, ethylbenzene and xylenes (BTEX) the sample bottle must be filled with zero headspace.
7. Care will be taken to avoid disturbance of sediments and inclusion of disturbed suspended solids in the sample.
8. Sample details (e.g. date, time, sample ID and analyses) will be clearly marked on the bottle in permanent ink.
9. For dissolved metals analyses, the water sample will be filtered in the field while sampling using a 0.45µm disposable filter and syringe. A fresh syringe and filter must be used at each monitoring station. In the event that the sample cannot be filtered in the field, the sample will be promptly filtered at the on-site lab. Such exceptions will be documented in the field notes.

10. All samples will be sealed by ensuring the bottle caps are tightly secured before placing the bottles into a cooler that contains ice packs. Glass bottles will be protected with bubble wrap or other cushioning material.
11. All field parameters, notes, photo references and general observations will be recorded in a field notebook or log sheet to be uploaded to Baffinland's environmental database from the office.
12. All samples will be placed in an iced cooler as soon as possible after collection.

4.3.1.1 SAMPLE PRESERVATION

Sample bottles and preservatives will be stored under clean conditions on site. Sample bottles will have the appropriate volume of preservative added in the field immediately after sample collection to minimize chemical alterations. Alternatively, sample bottles will be supplied by the analytical laboratory with preservatives already added. Ensure that the preservative container does not come in contact with the sample or inside of the sample bottle/lid. If a water sample requires filtration (e.g., analysis of dissolved metals), preservative must be added following filtration.

4.3.2 LAKE SAMPLING

For water quality monitoring in lakes, a depth sampler will be used (e.g. a 'Van Dorn' or 'Kemmerer'). Generally, depth samplers consist of a clear polycarbonate sample tube with two spring mounted rubber bungs, one located at each end. The depth sampler is lowered to the correct depth attached to a cord, whereupon a metal weight is released. The weight slides down the cord and strikes a release mechanism button, which releases the two bungs and seals both ends of the tube. The water sample is then pulled back to the surface.

Depth samplers that are used will be suitable for collection of water samples for ultra-low metals analyses (e.g. have acrylic or PVC construction and silicone seals).

For depth sampling, the following considerations will be taken into account to ensure sample QA/QC:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. When sampling from a watercraft, all efforts will be made to anchor the boat to maintain its position over the sampling location. Map coordinates for lake sampling stations will be recorded using a handheld GPS unit.
2. A vertical stratification profile (if required), profiling in-situ water quality measurements (e.g. pH, temperature, dissolved oxygen, conductivity and turbidity), will be determined using a water quality multi-meter (e.g. YSI Sonde) equipped with a long cord with metre intervals marked on it.
3. Depending upon the purpose of the monitoring program, water quality samples may be collected from the different stratified layers. The depth sampler must be slowly lowered in the 'open' position until it reaches the required depth.
4. The depth sampler will be held at this depth temporarily to allow flushing of water inside the apparatus.

5. The metal weight (messenger) will be released (to activate the closing mechanism) and the depth sampler will be pulled back to the surface. Field measurements can be taken at depth.
6. When collecting samples close to the lakebed, care must be taken to ensure that the depth sampler does not disturb lakebed sediments. When possible, staff will reference the depth recorded at each sampling location from the previous sampling event in preparation to avoid disturbing the lakebed.
7. Depending upon the surface area and depth of a lake, multiple sampling stations will likely be required to characterize representative water quality for the lake.

4.3.3 RIVER SAMPLING

Depending upon the size of the water body, river sampling methods are the same as those presented in Sections 4.3.1 and 4.3.2. To avoid inclusion of floating detritus in the sample, sample bottles must be fully immersed in the water column when they are filled. Care will be taken to ensure that disturbed sediments are not included in the sample.

For river sampling, the additional following considerations will be taken into account to ensure sample QA/QC:

1. Grasp the bottle well below the neck and remove the lid, taking care not to touch the inside of the lid.
2. Facing upstream, plunge the bottle beneath the surface of the water to a depth of 20 cm (if possible) with the opening facing downward, then tilt the bottle opening upward into the current to fill.
3. Once the bottle is full, remove the bottle from the water in one motion by forcing the opening upward and into the current and seal the bottle cap securely.

When selecting water quality monitoring station locations on rivers, care will be taken where a tributary joins a river, since complete mixing of the two waters may not be occur within several hundred metres or farther downstream of the confluence. When in doubt, vertical profile monitoring across the cross-section of the river using a field parameter such as pH, temperature or conductivity will be used to assess if complete mixing has occurred.

4.3.4 GROUNDWATER SAMPLING

Groundwater at the Project will be monitored using drive-point piezometers, HDPE tubing and peristaltic pumps. Groundwater wells will be established by advancing drive-point piezometers by hand to the depth of refusal (e.g. permafrost) or other known confining layer, both in the known or assumed up-gradient (e.g. reference) and down-gradient (e.g. exposure) area of interest. Consideration must be given to the depth of the active layer, therefore groundwater samples will be collected during late August to early September, such that samples are near the depth of the active layer (approximately 1 to 2 metres). Where hydrocarbon impacts are known or suspected, samples will be collected across various depths to assess for the presence of, and capture, potential non-aqueous phase liquids (NAPL). Sampling procedures outlined in this section consider the shallow and discontinuous nature of high arctic groundwater regimes observed at the Project Sites.

General groundwater sampling procedures include the following:

1. When new piezometers/groundwater wells are installed, installation will be completed at least one day before the sampling date. This will ensure the new groundwater well has sufficient time to charge and fill with groundwater from the active layer.
2. Before sampling a well, the well will be purged for the appropriate volume, outlined in the sampling program documentation. An YSI flow cell will be used during the purge to gauge when parameters (e.g. pH, conductivity, turbidity) have stabilized.
3. Groundwater samples will be collected, preserved, stored and submitted for analysis as outlined in Section 4.3.1.
4. A field notebook will be used to document the groundwater sampling program, including any deviations from established protocols.

4.3.5 METAL AND DIAMOND MINING EFFLUENT REGULATIONS

Water samples from stations that fall under the MDMER must be taken from a designated sampling port in a location beyond which Baffinland does not have control over the quality of the effluent discharged to the environment. Samples taken from designated sampling ports can be composite samples or grab samples.

The general sampling procedures of Section 4.3.1 should be followed, and the following additional considerations will be taken into account to ensure MDMER QA/QC requirements are met:

1. MDMER sampling should be performed by trained personnel, and if possible, a second person should be present for verification purposes.
2. Notification must be given ahead of time to a certified laboratory to ensure MDMER acute lethality and sub-lethal toxicity samples can be analysed.
3. In-situ water quality monitoring will accompany all external samples taken (refer to Section 4.3.6)
4. After collecting samples and preserving as needed, a chain of custody (COC) seal shall be applied to each bottle cap.
5. All sampling activities, notes, flow volumes, photo references and general observations shall be kept in a dedicated MDMER field logbook.
6. MDMER samples shall be sent to the certified laboratory with their own COC and should not be combined with samples from other monitoring programs.

For more information and technical guidance, Environment and Climate Change Canada's 2001 *Guidance Document for the Sampling and Analysis of Metal Mining Effluents* should be consulted.

4.3.6 SAMPLING FOR TOXICITY TESTING

Sampling for lethal toxicity testing is a condition of the Type 'A' Water Licence for various monitoring programs. Sub-lethal toxicity testing is a condition of Environmental Effects Monitoring (EEM) under the Metal and Diamond Mining Effluent Regulations (MDMER). Depending upon the objectives of the toxicity testing, variables that will require confirmation prior to testing include the following:

- Type of effluent sample to be collected (e.g. instantaneous grab sample vs. composite sample).
- Type of dilution water to be used by the certified laboratory (e.g. standard synthetic laboratory dilution water, receiving water collected upstream of the discharge, etc.).
- Required test organism (e.g. *Daphnia magna* and/or Rainbow Trout).

Details concerning laboratory methods are presented in Appendix D. For further details concerning acute lethality testing, refer to Environment Canada (2002) and USEPA (2002). For further details concerning sub-lethal testing, refer to Environment Canada (2012).

4.3.7 IN-SITU WATER QUALITY

Measurement of field parameters (e.g. temperature, pH, conductivity, redox potential, or dissolved oxygen, etc.), where warranted, will be carried out for each sample at the time of sampling. The required set of field parameters will vary according to sample type and monitoring objectives. The exact methods used for monitoring field parameters will depend upon the type of monitoring probes being used. Environmental staff will read and be familiar with the instruction manual for the equipment being used on site, and follow manufacturer's instructions for specifics on proper calibration, use, storage, and maintenance.

Environmental staff will rinse the monitoring probe three (3) times with the water to be monitored before immersing the probe in the water. Environmental staff will ensure that the probe being used has had sufficient time to equilibrate in the water before the reading is taken. This is generally regarded as the point at which the reading has stabilized.

Field parameter data will be recorded in the appropriate program field form designed for this purpose and saved electronically. A copy of the data will be retained on site.

4.3.7.1 MONITORING PROBE CALIBRATION

Monitoring probes will be stored and calibrated in accordance with manufacturers' instructions. All probes will be calibrated regularly per sampling program requirements and a written record of the calibration results will be maintained on site. Environmental staff will ensure that calibration solutions are of the correct specification and that they have not passed their expiration date (if applicable). Monitoring probes will be stored as per manufacturers' recommendations.

5 SEDIMENT & SOIL SAMPLE COLLECTION

For a complete list of the required sample analyses for pre-established sediment monitoring stations, refer to the Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Sediment and soil sampling programs and associated logistics will be planned ahead of time to ensure samples collected are analyzed within the appropriate holding times. A summary of recommended sediment and soil sample containers, sample volumes, and maximum sample holding times is presented in Table 9.1. Field observations and any exceptions to established protocols (e.g. exceedance of holding time) will be documented.

5.1 SEDIMENT & SOIL MONITORING LOCATIONS

This Plan addresses the collection of sediment samples at the Project, including the following:

1. Sediment samples from Project area lakes, streams and rivers.
2. Soil samples from Project fuel and waste facilities.
3. Soil samples from Project landfarm facilities.
4. Soil samples to inform remediation and reclamation projects.
5. Soil samples to evaluate spills and releases.

5.2 SEDIMENT & SOIL SAMPLING METHODS AND EQUIPMENT

Sediment samples specified under the Project's Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039) are characterised by the following procedures.

5.2.1 GENERAL SAMPLING PROCEDURES

Generally, sampling procedures will consist of the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. A fresh sample bottle(s) will be used at each monitoring station and sample bottles will not be re-used.
3. Sample details (e.g. date, sample ID and analysis) will be clearly marked on the sample jar in permanent ink.
4. All samples will be sealed by ensuring their lids are tightly secured before placing each sample bottle into a cooler.
5. All samples will be placed in a cooler containing ice packs as soon as practicable after collection.

5.2.2 RIVER AND GRAB SAMPLING

The collection of river and grab samples will follow the general procedures stated in Section 5.2.1 and will entail the following additional QA/QC considerations:

1. Sampling station locations will be dependent upon the monitoring program objectives and the sample location.
2. A clean spatula or spoon will be utilized to obtain a representative sample of the sediment for analyses.

3. If composite samples are required by the monitoring program, a sterile container will be utilised to deposit and homogenize the subsamples, until the composite sample is fully mixed. The composite sample will then be transferred to the identified sample jars by alternating aliquots.
4. The quantity and holding time of samples obtained will depend on the prescribed analyses.

5.2.3 LAKE SAMPLING

For monitoring of sediment character and quality in lakes, a depth sampler will be used. The preferred sample apparatus for lake sediment samples are gravity percussion corers, since they allow for retrieval and analysis of sediment profiles. A *Petite Ponar* can also be used, but will not provide sediment profiles. Generally, forms of gravity percussion corers consist of a clear polycarbonate sample core tube attached to a weighted upper head assembly and a seal mechanism. The top two centimeters of sediment from the core samples will be retained for laboratory analysis unless sampling objectives state otherwise.

Sediment lake sampling procedures will follow the general procedures stated in Section 5.2.1 and the following additional QA/QC considerations for a gravity percussion corer:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. When sampling from a watercraft, all efforts will be made to anchor the boat stationary over the sampling location. Map coordinates for all lake sampling station locations will be recorded using a handheld GPS unit.
2. The corer will be positioned perpendicular to the water surface prior to release. The penetration depth of the core tube is affected by the depth of water, angle of corer deployment and substrate type.
3. Once the corer is embedded in the substrate, the stainless steel messenger will be sent down the corer rope to release the ball-type seal. This seal creates a vacuum in the core tube, retaining the sampled sediment.
4. Upon retrieval, the bottom of the core tube will be plugged using an extruding plug prior to breaking the air-water interface. This procedure will prevent sample loss.
5. An extruding apparatus will be used to force the extruding plug through the core tube moving the sediment sample to the end of tube allowing the top two centimetres (2 cm) to be scooped out and placed in a clean stainless steel bowl for sample homogenization.
6. Multiple core samples (generally three or more) are required per sample station to obtain the required sample volume. The multiple core samples are homogenized in the stainless steel bowl, removing any excess water or debris.
7. The sample containers will be filled by alternating aliquots between each of the containers.
8. After the top two centimeters (2 cm) are retained, the remaining, unused sediments within the core tube will be placed into a bucket and only released once all core sampling is complete at that particular station.
9. Depending upon the lake area and depth, multiple sampling stations will likely be required to adequately characterize lake sediment quality.

6 BENTHIC INVERTEBRATES SAMPLE COLLECTION

For a complete list of required analyses at pre-established monitoring stations, see Baffinland's Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Samples will be submitted to an analytical laboratory for processing and taxonomic identification. Laboratory methods for benthic invertebrate samples will be in accordance with guidance provided by Environment Canada (2012). Field observations and parameters if warranted should be recorded during the collection of benthic invertebrate samples.

6.1 BENTHIC INVERTEBRATE MONITORING LOCATIONS

This Plan addresses the collection of benthic invertebrate samples at the Project, including the:

- Collection of benthic invertebrate samples from the Project area and reference lakes, streams and rivers to determine potential mine related effects on benthic invertebrate communities.

6.2 BENTHIC INVERTEBRATE SAMPLING METHODS AND EQUIPMENT

Benthic invertebrate samples follow the same general procedures outlined in Section 5.2.1. Benthic invertebrates can be collected from either depositional (lake) or erosional (stream) sample locations. A *Petite Ponar* is utilised when sampling depositional environments while a *Surber sampler* is utilised when sampling erosional environments. For a complete list of depositional and erosional sample methods, refer to the Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Benthic invertebrate samples will be carefully sieved through 500-µm mesh. All materials, including invertebrates, retained by the mesh will be transferred to labeled plastic jars and fixed with 10% buffered formalin. Fixed and labeled samples will be shipped to an analytical laboratory for processing and archiving.

7 QA/QC

For monitoring of QA/QC during sample collection and shipping, a set of QA/QC samples will be routinely submitted for analysis from prescribed sampling programs. Sampling programs will each have separate QA/QC samples submitted with the regular water samples. Descriptions of the QA/QC samples that will be used are presented in Table 7.1. Ten percent (10%) of all samples will consist of QA/QC samples including field blanks, travel blanks and field duplicates. For example, a monitoring program with 30 samples would consist of 27 monitoring samples and three (3) QA/QC samples. Equipment blanks, if required, are performed on an as needed basis to ensure sampling equipment is properly cleaned and maintained and free of contaminants, and do not count towards the ten percent (10%) QA/QC samples requirement.

7.1 SAMPLING PROGRAMS WITH MULTIPLE SAMPLING STATIONS

For sampling programs with multiple sampling locations (i.e. SNP and AEMP), QA/QC samples will be performed randomly to avoid bias and care will be taken to ensure that the same stations are not sampled repeatedly for QA/QC samples.

7.2 SAMPLING PROGRAMS WITH LIMITED SAMPLING STATIONS

Sampling programs with limited sampling stations (e.g. MDMER) will require at least one QA/QC sample per sampling round. A field duplicate, field blank or travel blank must be taken during each sampling session. This may result in over sampling for QA/QC, but will ensure there is sufficient data to identify any anomalies.

7.3 QA/QC ANALYSIS

In the interest of transparency, the analytical laboratories will also be instructed to report the results of their own in-house QA/QC testing (e.g. results of random replicate analyses of submitted samples).

The results of QA/QC analyses will be routinely reviewed by Baffinland or their designate, and any anomalous results will be promptly investigated with the assistance of the analytical laboratory. Once the reason for the anomalous results is identified, Baffinland will ensure that operating procedures of field staff and/or the analytical laboratory will be altered in order to address the issue. Compliance monitoring and data management for water licence sampling will be conducted by Baffinland, with the assistance of a designate as required.

TABLE 7.1 – QA/QC SAMPLE TYPES – PURPOSE, DESCRIPTION AND FREQENCY

QA/QC Sample Type	Purpose	Description	Frequency	Prepared By
Field blank	Identification of potential contaminants arising from sample collection. The field blank bottle is filled with laboratory supplied deionized water in the field and is handled in the same way as regular sample bottles. The bottle is then submitted as a routine sample.	Bottle contains prefilled deionized water. Bottle is handled the same as one would handle the samples.	Ten percent (10%) of all samples collected will be QA/QC.	Analytical laboratory
Travel blank	Identification of potential contaminants arising from sample storage, shipping and laboratory handling. The travel blank accompanies the samples to the laboratory but is not taken out into the field, or opened.	Sealed bottle containing deionized water provided by analytical laboratory.	Ten percent (10%) of all samples collected will be QA/QC.	Analytical laboratory
Blind Field duplicate	Assesses sample variability and precision of laboratory analytical methods. Collected from a randomly selected location, split from a homogenized sample and analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory.	Duplicate sample selected at random. A large sterile bottle is used to collect the water. Water is then poured equally into two sets of pre-labeled bottles. Duplicate samples labeled with a unique ID such that the	Ten percent (10%) of all samples collected will be QA/QC.	Field Staff

		analytical laboratory cannot determine the matching sample ID.		
Equipment blank	Assesses cross contamination from field water sampling equipment (e.g. Kemmerer). Rinse deionized water through water sampling equipment and transfer to sample bottles.	Bottle contains deionized water that has been rinsed through the sampling equipment.	Collected prior to and after completion of sampling program (if required/ as needed). Not included in the ten percent (10%) calculation of other QA/QC samples.	Field Staff

8 SAMPLE MANAGEMENT

8.1 SAMPLE LABELING

Accurate sample labeling is essential for subsequent interpretation of field data. Ensure that labels are legible and written with permanent ink (pen, marker, etc.). For a complete list of the predetermined sample labels at monitoring station, please refer to the Type ‘A’ Water Licence and Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039).

A consistent format for identifying samples must be followed if a predetermined sample label does not exist in order to facilitate accurate sample tracking and to ensure sample labels are interpreted in the same manner by all personnel involved in the program.

Samples must be uniquely identified with the following information:

- Sample ID
- Sampling date and time
- Project identifier
- Company name

8.2 SAMPLE STORAGE AND HANDLING

Physical, chemical and biochemical reactions may take place in the sample container between the time of sample collection and laboratory analysis. Samples will be placed in iced coolers and shipped to the analytical laboratory as soon as possible after collection, consulting stipulated analytical holding times (Table 9.1), to minimize these changes. Samples that are not shipped offsite the same day that they are collected will be refrigerated until they are ready to be shipped offsite in coolers. Coolers and sample bottles will be kept clean and free of debris to prevent sample contamination during shipment. Care will be taken to ensure that bottles are stored upright and are packed securely within the cooler and glass bottles are wrapped in bubble wrap or similar cushioning materials. Preferably, leak-proof ice packs will be used for keeping samples at a cool temperature during shipping. If loose ice is used, ice should be securely sealed in plastic bags to prevent melt water from accumulating in the bottom of the cooler, which can cause labels to peel and become illegible.

Biological samples (e.g. benthic invertebrates) preserved using formalin or Lugol's solution can be held at room temperature until submission to the analytical laboratory.

8.3 SAMPLE SUBMISSION AND CHAIN OF CUSTODY

A chain of custody (COC) form will accompany all samples being submitted to ensure that the required analyses are completed and to confirm receipt of samples by the laboratory (see example form presented in Appendix B). Prior to shipment, samples should be carefully prepared for shipping and sample bottles listed on the COC must be reconciled with what has physically been placed in the shipping container. The collection of samples that are time sensitive needs to coincide with shipping schedules, travel time to the laboratory, and laboratory business hours. A record of all COCs submitted for laboratory analytical testing must be kept on site. Information on the COC form will include the following:

1. Project name and project assignment number.
2. Address of analytical laboratory, name of contact person and contact details.
3. Contact details and name of sampler.
4. Sampling date and time.
5. Indicate if samples are filtered (F), preserved (P) or filtered and preserved (F/P). If filtering and/or preservation at the laboratory are required leave the space provided in the COC blank.
6. List of sample I.D.'s, sample type (e.g. incinerator ash (ASH), groundwater (WG), surface water (WS), wastewater effluent (WW) or potable/drinking water (WP)), number of sample bottles per sample and analysis requested.
7. Urgency of analysis (e.g. rush or normal). For rush samples the analytical laboratory should be notified ahead of time.
8. Submission date and time.
9. Comments on any unusual conditions and other important information.

9 LABORATORY ANALYSIS

9.1 LABORATORY ACCREDITATION

Laboratory analysis of samples is performed by an on-site accredited analytical laboratory and off-site accredited analytical laboratories. The on-site laboratory is operated by ALS Canada LTD. and is located at the Mine Site. A select set of general chemistry analytical parameters (e.g. pH, conductivity, TSS, turbidity, etc.), are performed by the on-site laboratory. The off-site laboratory, ALS Environmental, located in Waterloo, ON, run by ALS Canada Ltd. performs the majority of analyses required. Toxicity testing is typically performed by Aquatox Testing & Consulting Inc., located in Guelph, ON. Details of ALS analytical laboratory licencing and accreditation are presented in Appendix C.

9.2 ANALYTICAL DETECTION LIMITS

ALS Limits of Reporting (LORs) are established using rigorous experimental and statistical procedures that begin with the determination of the Method Detection Limit (MDL) at 99% confidence. When detected at or above the MDL, ALS test results are considered qualitatively accurate, and a parameter can be reported with 99% confidence as being present in the sample.

It should be noted that on occasion, a loss of analytical sensitivity could be encountered due to excessively high concentrations of parameters within a sample or lack of provided sample matrix. If this is encountered, Baffinland or their designate will work with the analytical laboratory to try to resolve the problem and new samples will be collected if required. The detection limits on ALS analytical reports contains the LORs. The LORs may be the MDL as calculated, or a higher value. Required analytical laboratory detection limits are provided in Appendix D.

9.3 LABORATORY ANALYTICAL METHODS

Analytical methods used by the analytical laboratories for water analyses generally conform to the standard methods outlined in *Standard Methods for the Examination of Water and Wastewater* (APHA et al, 1989). Standard analytical methods for available analyses through ALS Environmental are provided in Appendix D.

9.4 ANALYTICAL LABORATORY QA/QC PROCEDURES

ALS Environmental adheres to a designated QA/QC Management System, which includes documentation and document control, staff training and internal audits. The practices exceed accreditation requirements for high confidence in data reliability utilizing but not limited to the following:

- Calibration verification standards and drift control standards.
- Surrogate standards and internal standards.
- Replicate analyses and blanks on submitted samples.
- Use of standard reference materials (SRMs) and matrix spikes.
- Data Quality Objectives (DQOs) are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal DQOs.

Additional details on the analytical laboratories in-house QA/QC protocols are presented in Appendix E.

9.5 SUMMARY OF ANALYTICAL PROCEDURES

TABLE 9.1 – ANALYTES, WATER & SOIL SAMPLE VOLUMES, PRESERVATIVES & HOLDING TIMES

Inorganics	Analysis[1]	Water Container	Water Preservation	Additional Notes	Soil Container	Water / Soil Holding Time
ROUTINE INORGANICS AND PHYSICALS	Acidity and Alkalinity	0.5-1 L Plastic			125-250 mL Jar or Bag	14 Days / NA
	Anions (Br, Cl, SO4, F) and Electrical Conductivity	0.5-1 L Plastic			125-250 mL Jar or Bag	28 Days [7]/ Unlimited
	Bromate[19], Chlorate and Chlorite	125 mL Plastic	EDA (Ethylene diamine)		NA	28 Days (Chlorite 14 Days) / NA
	BOD, Colour and Turbidity	0.5-1 L Plastic			NA	2-4 Days [8] / NA
	COD and Phenols (4AAP)	125-250 mL Glass	1:1 Sulfuric Acid (H_2SO_4)		NA	28 Days / NA
	Cyanide, Total ,Weak Acid Dissociable, Free	145 mL Plastic	6N NaOH		125-250 mL Jar or Bag	14 Days / 14 Days
	Dissolved Oxygen	300 mL BOD bottle	1 each; $MnSO_4$ & alkaline iodide azide pillows		NA	8 Hours[20] / NA
	Dissolved or Total Inorganic Carbon (DIC or TIC)	125-250 mL Glass		Field Filter for Dissolved	125-250 mL Jar or Bag	14 Days / 28 Days
	Dissolved or Total Organic Carbon (DOC or TOC)	125-250 mL Glass	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 28 Days
	Flashpoint	2 x 100-250 mL Amber Glass		Zero Headspace	125-250 mL Jar	7 Days / 7 Days
	pH	0.5-1 L Plastic			125-250 mL Jar or Bag	0.25 Hours / 30 Days [9]
	Solids (TS, TSS, TDS)	0.5-1 L Plastic			NA	7 Days / NA
	Sulfide	125 - 150 mL Plastic	Zinc Acetate & 6N NaOH		125-250 mL Jar or Bag	7 Days / 7 Days
	Sulfite	125 mL Plastic			NA	0.25 Hours / NA
NUTRIENTS	Ammonia Nitrogen	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)		125-250 mL Jar or Bag	28 Days / 72 Hours
	Nitrate or Nitrite Nitrogen (and Ammonia unpreserved)	0.5-1 L Plastic			NA	2-7 Days [10] / 72 Hours
	Nitrogen, Kjeldahl, Organic, Total or Dissolved	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	NA	28 Days / NA
	Nutrients, Available (N,P,K,S)	NA			125-250 mL Jar or Bag	NA / 3 Days [11]
	Phosphorus, Reactive (orthophosphate)	0.5-1 L Plastic			NA	2-7 Days [12] / NA
	Phosphorus, Total Dissolved	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	NA	28 Days / NA
	Phosphorus, Total	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)		NA	28 Days / NA
METALS	Chromium VI (Hexavalent)	125 mL Plastic	50% NaOH (BC MoE) or 6N NaOH + Ammonium Buffer (OMoE)		125-250 mL Jar or Bag	28 Days / 30 Days
	Mercury, Methyl	250 mL FLPE	1:1 Hydrochloric Acid (HCl)[21]	Field Filter for Dissolved	125-250 mL Jar or Bag	6 Months / 28 Days
	Mercury, Total or Dissolved	40 mL Glass Vial	1:1 Hydrochloric Acid (HCl)	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 28 Days
	Metals, Total or Dissolved	125-250 mL Plastic	1:3 Nitric Acid (HNO_3) to pH<2	Field Filter for Dissolved	125-250 mL Jar or Bag	6 Months / 6 Months
Organics						
HYDRO-CARBONS	F1, Volatile Organic Compounds (VOCs), THMs, 1,4-Dioxane, Volatile Petroleum Hydrocarbons (VPH)	2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	Field Methanol Kit [6]	14 Days / 40 Days [13]
		2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	Hermetic Sampler kit [6]	14 Days / 48 Hours
	CCME CWS F1, BTEX	2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	125 - 500 mL Jar	14 Days / 7 Days
	CCME CWS F2-F4	2 x 60 mL Amber Glass Vials [3]	Sodium Bisulfate		125 - 500 mL Jar	14 Days [14]/ 14 Days
	EPH or LEPH/HEPH	2 x 250 mL Amber Glass with Septa Cap	Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Polycyclic Aromatic Hydrocarbons (PAHs)	2 x 0.25 - 1 L Amber Glass [5]	Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Oil & Grease or Mineral Oil & Grease	2 x 0.25 - 1 L Glass	1:1 HCl or H_2SO_4		125 - 500 mL Jar	28 Days / 28 Days
TRACE ORGANICS	Alcohols	2 x 40 mL Glass Vials		Zero Headspace	125 - 500 mL Jar	7 Days / 7 Days
	Alkanolamines (MEA, DEA, DIPA)	250 mL Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	AOX	40 - 250 mL Amber Glass	1:3 Nitric Acid (HNO_3) to pH<2		125 - 500 mL Jar	6 months [15] / 28 Days
	C1 - C5 Gases	3 x 40 mL Blue Septa Vials	Sodium Bisulfate [4]	Zero Headspace	NA	14 Days / NA
	Dioxins and Furans, PBDE and PBB	2 x 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited
	Formaldehyde/Aldehydes	2 x 40 mL Amber Glass Vials [2]	Ammonium Chloride + Copper Sulfate	Zero Headspace	125 - 500 mL Jar	7 Days / 5 Days
	Glycols	2 x 40 mL Amber Glass Vials			125 - 500 mL Jar	7 Days / 14 Days
	Hormones and Steroids	1 L Plastic			NA	28 Days / NA
	Naphthenic Acids	2 x 250 mL Amber Glass			125 - 500 mL Jar	14 Days / 14 Days
	Nitroaromatics and Nitrosamines (Explosives)	1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Nonylphenol & Ethoxylates, Bisphenol A (BPA)	1 L Amber Glass			125 - 500 mL Jar	28 Days / 14 Days
	PCB	2 x 0.25 - 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited [16]
	Perfluorinated Chemicals (PFCs), PFOS, PFOA	1 L Plastic (PTFE free)			125-250 mL Jar or Bag	14 Days / 14 Days
	Phenolics, Chlorinated and Non-Chlorinated	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & Sodium Bisulfate [4]		125 - 500 mL Jar	14 Days / 14 Days
	Priority Pollutants (EPA 625 list) or SVOCs	2 x 1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days [17]

	Resin Acids & Fatty Acids	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & NaOH		125 mL Jar	14 Days / 14 Days
	Sulfolane	2 x 0.5 - 1 L Amber Glass	Sodium Bisulfate [4]		125 mL Jar	14 Days / 14 Days
PESTICIDE RESIDUES	Carbamate Pesticides	1 L Amber Glass	Use Sodium Thiosulfate if chlorinated		125 - 500 mL Jar	7 Days / 14 Days
	Glyphosate / AMPA	1 L Plastic	Use Sodium Thiosulfate if chlorinated		125 - 500 mL Jar	14 Days / 14 Days
	Herbicides, Acidic	2 x 1 L Amber Glass	Sodium Bisulfate [4]		125 - 500 mL Jar	14 Days / 14 Days
	Organochlorine or Organophosphate Pesticides	2 x 1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Soil Sterilant Scan	1 L Amber Glass			250 g Poly Bag	7 Days / 14 Days
Micro						
MICRO-BIOLOGICAL	Coliforms-Fecal, Total, E-coli & HPC	100 - 300 mL Sterilized Plastic	Sodium Thiosulfate		500 mL Sterilized Jar	24-48 Hours [18] (24 - HPC) / NA
	Microtox	1 L Amber Glass			125-250 mL Jar or Bag	3 Days / 3 Days

1. Additional analyses with the same container type and preservation may be possible - consult the lab for details.
2. The number of 40 mL glass vials required (2 or 3) for BTEX & VOC varies by lab based on instrumentation. Consult the lab for details.
3. Fill to the top of the marked line on the 60 mL Amber Glass Vials.
4. Use Sodium Thiosulfate instead of Sodium Bisulfate if sample is chlorinated.
5. OMoE has no preservation requirement for PAHs. 2 X 250 mL Amber Glass required for BC MoE and OMoE. For AB and SK and for Alkylated PAHs, ALS requires 2 x 1 L Amber Glass.
6. Soil sampling options depend on soil location and condition of soil. Field Methanol Kit consists of one 5g TerraCore® sampler or similar sampling device, two pre-weighed 40 mL glass vials with methanol preservative and a 125mL soil jar for moisture. Hermetic sampler kit consists of a T-handle, two 5g hermetic samplers and a 125mL soil jar for moisture. One additional parameter, such as metals or hydrocarbons can also be obtained from the 125mL soil jar.
7. 4-days hold time for Electrical Conductivity only as per Ontario MISA.
8. 3-days hold time for British Columbia as per BC Ministry of Environment (BC MoE); 4 Days hold time as per OMoE.
9. pH in water should be taken in the field as per BC MoE, 4 Days hold time for Ontario MISA and 28 Days hold time for OMoE. 30 Days hold time as received for pH in soil as per OMoE. One year hold time once soil is dried.
10. 3-days hold time as per BC MoE, 5 Days hold time as per Ontario MISA and 7 Days hold time as per OMoE.
11. 3-days hold time until received. Unlimited hold time once soil is dried.
12. 3-days hold time as per BC MoE and 7 Days hold time as per OMoE.
13. 4-days hold time as per BC MoE and 14 Days hold time as per OMoE. Recovered methanol extract from laboratory has a 40 Days hold time as per OMoE.
14. 40-days hold time as per OMoE.
15. 14-days hold time as per Ontario MISA.
16. 14-days hold time as per OMoE. Consult lab for container size if limited sample volume is available.
17. 14-days hold time for water and 60 Days hold time for soil as per OMoE. Ontario labs require 2 x 250 mL Amber Glass + 500 mL Amber Glass.
18. 30-hours hold time as per BC Drinking Water Regulation and 48 Hours as per OMoE.
19. Bromate alone does not require preservative.
20. 15-minutes hold time as per OMoE - Field measurement by meter is recommended.
21. Use 1:1 Sulfuric Acid (H_2SO_4) for preservation of marine or brackish samples.

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10 DATA MANAGEMENT AND REPORTING

10.1 DATA MANAGEMENT

All sample data collected by Baffinland or designate consultants from the various environmental programs required on Project sites will be stored electronically in a spreadsheet database (Microsoft Excel) or using alternative software designed specifically for environmental data management.

QA/QC measures relating to data validation will include the following**:**

1. Designation of a suitable person to act as the Database Manager (DM).
2. Upon receipt, laboratory analytical data will be reviewed by the DM to check for completeness, typos, outlying values, etc. The analytical laboratory will be immediately notified of any anomalous results.
3. At a suitable frequency (e.g. once per month) the spreadsheet database should be updated by the DM using: i) results provided in electronic format by the analytical laboratories, and ii) copies of the field parameter monitoring records forwarded from site
4. The DM will be responsible for ensuring that a third party (e.g. another staff member) carries out a QA/QC check on a minimum of ten percent of newly entered data.

11 TRAINING

Environment personnel performing environmental monitoring programs will be required to understand and be proficient in the protocols outlined in this Plan. Training will involve Environmental Coordinators conducting routine reviews of this Plan with environmental personnel and leading in-field training sessions. Environmental personnel will also be trained and proficient in the operation, calibration and maintenance of any necessary sampling equipment (e.g. YSI Sonde).

12 REFERENCES

Rice, E.W., Baird, R.B. and Eaton, A.D., editors, 2017. Standard Methods for the Examination of Water and Wastewater; 23rd Ed., American Public Health Association, American Water Works Association, Water Environment Federation.

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Environment Canada (EC), 2014. Metal mining technical guidance for Environmental Effects Monitoring. Online: https://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=AEC7C481-1&printfullpage=true.

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Nunavut Water Board (NWB), 2015. Nunavut Water Board Licence No. 2AM-MRY1325 – Amendment No. 1. Issued by the Nunavut Water Board, July 2015.

United States Environmental Protection Agency (USEPA), 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms; 5th Ed., USEPA, ref. No. EPA-821-R-02-012. Online: https://www.epa.gov/sites/production/files/2015-08/documents/acute-freshwater-and-marine-wet-manual_2002.pdf.

Appendix A – Baffinland Corporate Policies

Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 3

Approved by: **Brian Penney**

Title: **Chief Executive Officer**

Date: **May 3rd, 2019**

Signature:

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits
04/20/18	2	TS	SA/BP	Minor edits
05/03/19	3	TS	BP	Minor edits

This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance
- Meeting or exceeding the requirements of regulations and company policies
- Integrating sustainable development principles into our decision-making processes
- Maintaining an effective Health, Safety and Environmental Management System
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto “Safety First, Always” and our actions Health and Safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.

Brian Penney
Chief Executive Officer
May 2019

Baffinland Iron Mines Corporation

SUSTAINABLE DEVELOPMENT POLICY

BAF-PH1-800-POL-0002

Rev 1

Approved By: Brian Penney
Title: Chief Executive Officer
Date: March 7, 2016
Signature:

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights and ArcelorMittal's Human Rights Policy which applies to all employees and affiliates globally.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The Sustainable Development and Human Rights Policy is communicated to the public, all employees and contractors and it will be reviewed and revised as necessary on a regular basis. These four pillars form the foundation of our corporate responsibility strategy:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is "Safety First, Always".
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents.
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.
- Baffinland applies the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation.
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices.
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met.

3.0 UPHOLDING HUMAN RIGHTS OF STAKEHOLDERS

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit.
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed.
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region.
- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions.
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance.

4.0 TRANSPARENT GOVERNANCE

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.

4.1 FURTHER INFORMATION

Please refer to the following policies and documents for more information on Baffinland's commitment to operating in an environmentally and socially responsible manner:

Health, Safety and Environment Policy
Workplace Conduct Policy
Inuktitut in the Workplace Policy
Site Access Policy
Hunting and Fishing (Harvesting) Policy
Annual Report to Nunavut Impact Review Board

ArcelorMittal Canada Sustainability and Corporate Responsibility Report

If you have questions about Baffinland's commitment to upholding human rights, please direct them to contact@baffinland.com.

Brian Penney
Chief Executive Officer
March 2016

Appendix B – COC Example Forms

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report	
Company:		
Contact:		
Phone:		
	Company address below will appear on the final report	
Street:		
City/Province:		
Postal Code:		
Invoice To	Same as Report To	☐ YES ☐ NO
	Copy of Invoice with Report	☐ YES ☐ NO
Company:		
Contact:		

Report Format / Distribution

Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4-20%] ☐		**1 Business day [E - 100%]** ☐	
3 day [P3-25%] ☐		**Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]** ☐	
2 day [P2-50%] ☐			

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	**Sample Identification and/or Coordinates** (This description will appear on the report)	**Date** (dd-mmm-yy)	**Time** (hh:mm)	**Sample Type**	**NUMBER OF CONTAINERS**															**SAMPLES ON HOLD**	**SUSPECTED HAZARD (see Special Instructions)**

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐	No ☐	
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐	
Cooling Initiated ☐					

INIITIAL COOLER TEMPERATURES ºC				FINAL COOLER TEMPERATURES ºC			

SHIPMENT RELEASE (client use)			**INITIAL SHIPMENT RECEPTION (lab use only)**			**FINAL SHIPMENT RECEPTION (lab use only)**		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix C – Analytical Laboratory Certificate and Scope of Accreditation

Canadian Association for Laboratory Accreditation Inc.

CALA

Certificate of Accreditation

ALS Environmental (Waterloo)
ALS Canada Ltd.
60 Northland Rd., Unit 1
Waterloo, Ontario

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Accreditation No.: A3149
Issued On: August 18, 2020
Accreditation Date: January 3, 2005
Expiry Date: February 16, 2023

Andrew M. Adams
President & CEO

ilac-MRA CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request; reproduction must follow policy in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

CALA Directory of Laboratories

Membership Number: 3149
Laboratory Name: ALS Environmental (Waterloo)
Parent Institution: ALS Canada Ltd.
Address: 60 Northland Rd. Unit 1 Waterloo ON N2V 2B8
Contact: Mr. Cameron McIntosh
Phone: (519) 886-6910
Fax: (519) 886-9047
Email: alswt.quality@alsglobal.com; linda.neimor@alsglobal.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served: All Interested Parties
Revised On: December 11, 2020
Valid To: February 16, 2023

Scope of Accreditation

Air (Inorganic)
Fixed Gases - Air (180)
WT-TM-1703; modified from ASTM D1946-90 and EPA 3C
GC/FID & TCD - GC/FID & TCD
- Carbon dioxide (CO2)
- Carbon monoxide (CO)
- Methane
- Nitrogen
- Oxygen

Air (Organic)
Reduced Sulphur Compounds - Air (201)
WT-TM-1704; modified from ASTM 5504-12
GC/SCD-PASSIVATE CANISTER
- 2-Ethylthiophene
- 2-Methylthiophene
- 2,5-Dimethylthiophene
- 3-Methylthiophene
- Butyl mercaptan (1-Butanethiol)
- Carbon disulfide
- Carbonyl sulfide
- Diethyl disulfide
- Diethyl sulfide

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Dimethyl disulfide
Dimethyl sulfide
Ethyl mercaptan (Ethanethiol)
Ethyl methyl sulfide
Hydrogen Sulfide
Isobutyl mercaptan (2-Methyl-1-propanethiol)
Isopropyl mercaptan (2-Propanethiol)
Methyl mercaptan (Methanethiol)
Propyl mercaptan (1-Propanethiol)
sec-Butyl mercaptan (2-Butanethiol)
tert-Butyl mercaptan (2-Methyl-2-propanethiol, tert-Butylthiol, TBM)
Tetrahydrothiophene
Thiophene

Air (Organic)

Volatile Organic Compounds (VOC) - Air (202)
WT-TM-1701; modified from EPA TO-15
GC/MS-PASSIVE CANNISTER

1,1-Dichloroethane
1,1-Dichloroethene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromoethane (Ethylene dibromide)
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,2,3-Trimethylbenzene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Butadiene
1,3-Dichlorobenzene
1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
1,4-Dioxane (p-dioxane)
2-Butanone (Methyl ethyl ketone, MEK)
2-Chlorotoluene
2-Ethyltoluene
2-Hexanone (Methyl butyl ketone, MBK)
2-Methyl-1,3-butadiene (Isoprene)
2-Methylbutane (Isopentane)
2-Methylpentane
2-Propanol (Isopropyl alcohol)
2,2,4-Trimethylpentane (Isooctane)
3-Methylhexane

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3-Methylpentane
4-Ethyltoluene (1-Ethyl-4-methylbenzene)
4-isopropyltoluene (p-Cymene)
Acetone (2-Propanone)
Acetonitrile
Acrolein (Propenal)
Acrylonitrile
Aliphatic >C10-C12
Aliphatic >C12-C16
Aliphatic C6-C8
Aliphatic >C8-C10
Allyl chloride (3-chloropropene)
Aromatic >C10-C12 fraction
Aromatic >C10-C16 fraction
Aromatic C6-C8 fraction
Aromatic >C8-C10 fraction
Benzene
Benzyl chloride (a-Chlorotoluene)
Bromodichloromethane
Bromoethene (Vinyl bromide)
Bromoform
Bromomethane
Butane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodifluoromethane
Chloroethane (Ethyl Chloride)
Chloroethene (Vinyl chloride)
Chloroform
Chloromethane (Methyl chloride)
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Cyclohexane
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane
Dichloromethane (Methylene Chloride)
Ethanol
Ethyl acetate
Ethylbenzene
F1
F2
Freon 113

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Freon 114
Hexachlorobutadiene
Isopropylbenzene (Cumene)
m,p-Xylene
Methyl isobutyl ketone (MIBK)
Methyl methacrylate
Methyl tert-butyl ether (MTBE)
n-Decane
n-Heptane
n-Hexane
n-Pentane
n-Propylbenzene
Naphthalene
Nonane
o-Xylene
Octane
Propene (Propylene)
Styrene
tert-Butanol (2-Methyl-2-propanol)
Tetrachloroethylene
Tetrahydrofuran (THF)
Toluene
Total C>10-C12
Total C>12-C16
Total C>8-C10
Total C6-C8
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl acetate

Air (Organic)
Volatile Organic Compounds (VOC) - Air (203)
WT-TM-1700; modified from EPA TO-17
GC/MS-SORBENT TUBE
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromoethane (Ethylene dibromide)
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane

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1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Butadiene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
1,4-Dioxane (p-dioxane)
2-Chlorotoluene
2-Methylnaphthalene
2-Propanol (Isopropyl alcohol)
2,2-Dichloropropane
2,2,4-Trimethylpentane (Isooctane)
4-Chlorotoluene (p-Chlorotoluene)
4-Ethyltoluene (1-Ethyl-4-methylbenzene)
4-isopropyltoluene (p-Cymene)
4-Phenylcyclohexene
Acetone (2-Propanone)
Allyl chloride (3-chloropropene)
Benzene
Benzyl chloride (a-Chlorotoluene)
Bromochloromethane
Bromodichloromethane
Bromoform
Carbon tetrachloride
Chlorobenzene
Chloroethane (Ethyl Chloride)
Chloroethene (Vinyl chloride)
Chloroform
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Cyclohexane
Decamethylcyclopentasiloxane
Decamethyltetrasiloxane
Decane
Dibromochloromethane
Dichlorodifluoromethane
Dichloromethane (Methylene Chloride)
Dodecamethylcyclohexasiloxane
Dodecamethylpentasiloxane
Ethyl acetate
Ethylbenzene
Heptane

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Hexachlorobutadiene
Hexamethylcyclotrisiloxane
Hexamethyldisiloxane
Hexane
m,p-Xylene
n-Butylbenzene
n-Propylbenzene
Naphthalene
Nonane
o-Xylene
Octamethylcyclotetrasiloxane
Octamethyltrisiloxane
Octane
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Tetrahydrofuran (THF)
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethene
Trichlorofluoromethane

Biosolids (Microbiology)

Escherichia coli (E. coli) - Biosolids (087)
WT-TM-1200; modified from ON MOECC E3433
MEMBRANE FILTRATION (mFC-BCIG)
Escherichia coli (E. coli)

Biosolids (Organic)

Nonylphenol and Nonylphenol Ethoxylates - Biosolids (165)
WT-TM-1521; modified from JOURNAL OF CHROMATOGRAPHY A, 849 (1999) 467-482
LC/MS - EXTRACTION
Bisphenol A
Nonylphenol Diethoxylate (NP2EO)
Nonylphenol Ethoxylates
Nonylphenol Monoethoxylates (NP1EO)
Nonylphenols
Octylphenol Diethoxylate (OP2EO)
Octylphenol Monoethoxylate (OP1EO)
Octylphenol (OP)

Serum (Organic)

Perfluorinated Compounds (PFC) - Biomaterials [Serum] (196)
WT-TM-1565; J. ANALY. TOXICOL. 34: 400-410
LC/MS/MS
Perfluorodecanesulfonic acid (PFDS, Perfluorodecanesulfonate)

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Perfluorohexane sulfonic acid (PFHxS, Perfluorohexanesulfonate)
Perfluorononanoic acid (PFNA, Perfluorononanoate)
Perfluorooctanesulfonic acid (PFOS, Perfluorooctanesulfonate)
Perfluorooctanoic acid (PFOA, Perfluorooctanoate)
Perfluorotetradecanoic acid (PFTeDA, Perfluorotetradecanoate)
Perfluoroundecanoic acid (PFUnA, Perfluoroundecanoate)

Soil (Organic)
Pesticides - Solids [Soil] (208)
WT-TM-1589; modified from ON MOECC E3501
LC/MS/MS
Atrazine
Atrazine-2-hydroxy
Azoxystrobin
Boscalid
Bromacil
Carbaryl
Chlorantraniliprole
DCPMU
Desethyl atrazine
Desethyl atrazine + Desisopropyl atrazine
Desisopropyl atrazine
Diuron
Fludioxonil
Imidacloprid
Linuron
Metalaxyl
Myclobutanil
Propiconazole
Pyraclostrobin
Simazine
Tebuthiuron
Trifloxystrobin
Triticonazole

Soil (Organic)
Phenoxy Acid Herbicides - Solids [Soil] (210)
WT-TM-1591; modified from ON MOECC E3552
LC/MS/MS
2,4-Dichlorophenoxyacetic acid (2,4-D)
2,4-Dichlorophenoxybutyric acid (2,4-DB)
2,4-Dichlorophenoxypropionic acid (2,4-DP, Dichlorprop)
2,4,5-TP (Silvex)
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
Asulam
Brodifacoum

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Bromoxynil
Clopyralid
Dicamba
Diflufenican
Dinoseb
MCPA (2-Methyl-4-chlorophenoxyacetic acid)
MCPB (4-(4-chloro-2-methylphenoxy)butanoic acid)
MCPP (Mecoprop, Methylchlorophenoxypropionic acid)
Nicarbazin
Oryzalin
Picloram
Propanil
Terbacil
Triclopyr

Solids (Inorganic)
Acid Volatile Sulphide (AVS) - Solids (226)
WT-TM-1003; SM 4500-S2- J
COLORIMETRIC
Acid Volatile Sulphide

Solids (Inorganic)
Ammonia - Solids [Soil] (225)
WT-TM-1043; modified from JOURNAL OF ENVIRONMENTAL MONITORING (2005) SECTION 7, P. 37-42 (ANALYSIS) and SM 4500-NH3 B (PREPARATION)
FLUOROMETRIC
Ammonia

Solids (Inorganic)
Anions - Solids (136)
NA-TM-1001, NA-TM-1700; modified from EPA 1311 (PREPARATION) and EPA 300.1 (ANALYSIS)
ION CHROMATOGRAPHY (IC) - TCLP
Fluoride
Nitrate
Nitrite

Solids (Inorganic)
Anions - Solids [Sludge, Soil] (041)
NA-TM-1001, WT-TP-2013; modified from EPA 300.1
ION CHROMATOGRAPHY (IC)
Bromide
Chloride
Fluoride
Nitrate-N
Nitrite
Sulphate

Solids (Inorganic)
Conductivity - Solids [Soil] (109)
WT-TM-1010; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25˚C)

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Solids (Inorganic)
Cyanide - Solids [Soil] (079)
NA-TM-1003, WT-TP-2011; modified from ASTM D7237-15A and EPA 9013A and ISO 14403 and SM 4500-CN- I
AUTOMATED COLORIMETRIC - DIGESTION

Cyanide, Free

Cyanide (SAD)

Cyanide (WAD)

Solids (Inorganic)
Hexavalent Chromium - Solids [Soil] (158)
WT-TM-1035; modified from EPA 1636 and EPA 3060 and EPA 7199
ION CHROMATOGRAPHY (IC)

Hexavalent Chromium

Solids (Inorganic)
Hot Water Soluble Boron - Solids [Soil] (186)
NA-TP-2010, WT-TM-1026; modified from EPA 6010C and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER, 2008
ICP/OES

Boron (Hot Water Soluble)

Solids (Inorganic)
Mercury - Solids (139)
NA-TM-1005, NA-TM-1700; modified from EPA 1311 (PREPARATION) and EPA 1631E (ANALYSIS)
COLD VAPOUR ATOMIC ABSORPTION (CVAA) - TCLP

Mercury

Solids (Inorganic)
Mercury - Solids [Compost, Sludge, Soil] (050)
NA-TM-1005, NA-TP-2004; modified from EPA 1631E and EPA 200.2
COLD VAPOUR ATOMIC ABSORPTION (CVAA)

Mercury

Solids (Inorganic)
Metals - Solids (138)
NA-TM-1002, NA-TM-1700; modified from EPA 1311 (PREPARATION) and EPA 6020B (ANALYSIS)
ICP/MS - TCLP

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Iron

Lead

Lithium

Magnesium

Manganese

Potassium

Selenium
Silver
Sodium
Strontium
Sulphur (Sulfur)
Thallium
Tin
Uranium
Zinc
Zirconium

Solids (Inorganic)
Metals - Solids [Compost, Sediment, Sludge, Soil] (006)
NA-TM-1002, NA-TP-2004; modified from EPA 200.2 and EPA 6020B

ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Selenium
Silver
Sodium
Strontium
Sulphur (Sulfur)
Thallium
Tin
Titanium
Uranium
Vanadium

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Zinc

Solids (Inorganic)
Metals - Solids [Soil] (187)
WT-TM-1026, WT-TP-1012; modified from EPA 6010C and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 2ND EDITION, 2008, CHAP. 15.2.2
ICP/OES - FIXED RATIO EXTRACTION

Calcium

Magnesium

Sodium

Solids (Inorganic)
Moisture - Solids [Soil] (188)
NA-TM-1200; REFERENCE METHOD FOR THE CANADA-WIDE STANDARD FOR PERTROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD & ADDENDUM. CCME DECEMBER 2000. NO. 1310
GRAVIMETRIC

Percent Moisture

Solids (Inorganic)
Oil and Grease - Solids [Sludge, Soil] (031)
WT-TM-1100; modified from EPA 8015 and SM 5520 B and SM 5520 D and SM 5520 E and SM 5520 F
GRAVIMETRIC - EXTRACTION

Mineral Oil and Grease

Total Oil and Grease

Solids (Inorganic)
Particle Size Analysis (PSA) - Solids [Soil] (156)
WT-TM-1034; modified from SOIL SAMPLING & METHODS OF ANALYSIS CAN. SOCIETY OF SOIL SCIENCE (1993)
SEIVE

Particle Size

Solids (Inorganic)
pH - Solids [Soil] (107)
WT-TM-1001; modified from SM 4500-H+ B
pH METER

pH

Solids (Inorganic)
Phenols - Solids [Soil] (170)
WT-TM-1027; modified from EPA 9066
COLORIMETRIC

Total Phenolics

Solids (Inorganic)
Polyaromatic Hydrocarbons (PAH) - Solids (232)
NA-TM-1100, NA-TP-2107; modified from EPA 3570 (PREPARATION) and EPA 8270E (ANALYSIS)
GC/MS - TUMBLER EXTRACTION

1-Methylnaphthalene

2-Methylnaphthalene

Acenaphthene

Acenaphthylene

Acridine

Anthracene

Benzo(a)anthracene

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Benzo(e)pyrene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Naphthalene
Perylene
Phenanthrene
Pyrene
Quinoline

Solids (Inorganic)
Solids - Solids [Compost, Sediment, Sludge, Soil]   (028)
WT-TM-1011; modified from SM 2540 B and SM 2540 E and SM 2540 G
GRAVIMETRIC
Fixed Solids
Total Solids
Volatile Solids

Solids (Inorganic)
Total and Free Cyanide - Solids   (140)
NA-TM-1003, NA-TM-1700; modified from ASTM D7237-15A (ANALYSIS) and EPA 1311 (PREPARATION) and ISO 14403 (ANALYSIS) and SM 4500-CN- I (ANALYSIS)
COLORIMETRIC - TCLP
Cyanide (SAD)
Cyanide (WAD)

Solids (Inorganic)
Total Organic Carbon (TOC) - Solids [Soil]   (034)
WT-TM-1005; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER METHOD 21.3.2
TITRIMETRIC - WET OXIDATION-REDOX
Organic Carbon

Solids (Organic)
1,4-Dioxane - Solids [Soil]   (173)
WT-TM-1406; modified from EPA 5021A and EPA 8260C
GC/MS-HEADSPACE
1,4-Dioxane (p-dioxane)

Solids (Organic)
Alkanolamines - Solids [Soil]   (217)
WT-TM-1574; modified from ASTM D7599
LC/MS/MS
Diethanolamine (DEA)
Diisopropanolamine (DIPA)
Methyldiethanolamine (MDEA)
Monoethanolamine (MEA)
Monoisopropanolamine (MIPA)
Triethanolamine (TEA)

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Solids (Organic)
Aminopyralid - Solids [Soil] (223)
WT-TM-1578; IN-HOUSE
LC/MS

Aminopyralid

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Solids (141)
NA-TM-1700, WT-TM-1101, WT-TM-1300; modified from EPA 1311 (PREPARATION) and EPA 8270 (ANALYSIS)
GC/MS - TCLP

2-Methylphenol (o-Cresol)
2,3,4,6-Tetrachlorophenol
2,4-Dichlorophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
3/4-Methylphenol
Benzo(a)pyrene
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Nitrobenzene
Pentachlorophenol

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Solids [Sediment, Sludge, Soil] (016)
WT-TM-1101, WT-TM-1300; modified from EPA 3570C and EPA 8270D
GC/MS - EXTRACTION

1-Chloronaphthalene
1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylphenol (o-Cresol)
2-Nitrophenol
2,3,4-Trichlorophenol
2,3,4,5-Tetrachlorophenol
2,3,4,6-Tetrachlorophenol
2,3,5-Trichlorophenol
2,3,5,6-Tetrachlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol

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2,4,6-Trichlorophenol
2,6-Dichlorophenol
2,6-Dinitrotoluene (2,6-DNT)
3,3'-Dichlorobenzidine
4-Chloro-3-methylphenol
4-Chloroaniline (p-Chloroaniline)
4-Chloroaniline (p-Chloroaniline)
4-Chlorophenyl phenyl ether
4-Nitrophenol
4,6-Dinitro-o-cresol
5-Nitroancenphthene
Biphenyl (1,1-Biphenyl)
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate (Diethylhexyl phthalate)
Butyl benzyl phthalate
Camphene
Di-n-butyl phthalate
Di-n-octyl phthalate
Diethyl phthalate
Dimethyl phthalate
Diphenyl ether
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indole
Isophorone
m,p-Cresol
N-Nitrosodi-n-propylamine
Nitrobenzene
PBDE 3 (4-Bromophenyl phenyl ether)
Pentachlorophenol
Phenol
Total Diphenylamine

Solids (Organic)

Energetics - Solids [Soil] (195)
WT-TM-1608; modified from EPA 8330A and EPA 8330B
HPLC/UV - EXTRACTION
1,2-Dinitrobenzene (o-Dinitrobenzene)
1,3-Dinitrobenzene (1,3-DNB)
1,3,5-Trinitrobenzene (1,3,5-TNB)
2-Amino-4,6-dinitrotoluene (2-A-DNT, 2-Am-DNT)
2-Nitrotoluene (2-NT)

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2,4-Dinitrotoluene
2,4,6-Trinitrotoluene (2,4,6-TNT)
2,6-Dinitrotoluene (2,6-DNT)
3-Nitrotoluene (3-NT)
3,5-Dinitroaniline (3,5-DNA)
4-Amino-2,6-dinitrotoluene (4-A-DNT)
4-Nitrotoluene (4-NT)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
Methyl-2,4,6-trinitrophenylnitramine
Nitrobenzene
Nitroglycerin
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
Pentaerythritol tetranitrate (PETN)

Solids (Organic)
Extractable Petroleum Hydrocarbons (EPH) - Solids [Soil]   (110)
WT-TM-1406; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 5021A and EPA 8260C
GC/FID-HEADSPACE
F1: C6-C10

Solids (Organic)
Organochlorine (OC) Pesticides - Solids [Soil]   (020)
WT-TM-1102, WT-TM-1302; modified from EPA 3570C and EPA 8270D
GC/MS - EXTRACTION
2,4'-DDD (o,p'-DDD)
2,4'-DDE (o,p'-DDE)
2,4'-DDT (o,p'-DDT)
4,4'-DDD (p,p'-DDD)
4,4'-DDE (p,p'-DDE)
4,4'-DDT (p,p'-DDT)
4,4'-Methoxychlor (p,p'-Methoxychlor)
Aldrin
alpha-BHC
alpha-Chlordane
beta-BHC
Chlordane
delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
Dieldrin
Endosulfan I (a-Endosulfan)
Endosulfan II (b-Endosulfan)
Endosulfan Sulfate
Endrin
Endrin Aldehyde
gamma-Chlordane
Heptachlor
Heptachlor epoxide

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Lindane (gamma-BHC)
Mirex
Oxychlordane

Solids (Organic)
Organochlorine (OC) Pesticides - Solids [Soil] (234)
WT-TM-1120, WT-TP-2100; modified from EPA 3570 (PREPARATION) and EPA 8270E (ANALYSIS)
GC/MS - SHAKE EXTRACTION
2,4'-DDD (o,p'-DDD)
2,4'-DDE (o,p'-DDE)
2,4'-DDT (o,p'-DDT)
4,4'-DDD (p,p'-DDD)
4,4'-DDE (p,p'-DDE)
4,4'-DDT (p,p'-DDT)
4,4'-Methoxychlor (p,p'-Methoxychlor)
Aldrin
alpha-BHC
alpha-Chlordane
beta-BHC
delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
Dieldrin
Endosulfan I (a-Endosulfan)
Endosulfan II (b-Endosulfan)
Endosulfan Sulfate
Endrin
Endrin Aldehyde
gamma-Chlordane
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Lindane (gamma-BHC)
Mirex
Oxychlordane
Pentachloronitrobenzene (Quintozene)
trans-Nonachlor

Solids (Organic)
Organochlorine (OC) Pesticides - Solids [Soil] (235)
WT-TM-1120, WT-TP-2109; modified from EPA 3570 (PREPARATION) and EPA 8270E (ANALYSIS)
GC/MS/MS - SHAKE EXTRACTION
2,4'-DDD (o,p'-DDD)
2,4'-DDE (o,p'-DDE)
2,4'-DDT (o,p'-DDT)
4,4'-DDD (p,p'-DDD)
4,4'-DDE (p,p'-DDE)

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4,4'-DDT (p,p'-DDT)
4,4'-Methoxychlor (p,p'-Methoxychlor)
Aldrin
alpha-BHC
alpha-Chlordane
beta-BHC
delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
Dieldrin
Endosulfan I (a-Endosulfan)
Endosulfan II (b-Endosulfan)
Endosulfan Sulfate
Endrin
Endrin Aldehyde
gamma-Chlordane
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Lindane (gamma-BHC)
Mirex
Oxychlordane
Pentachloronitrobenzene (Quintozene)
trans-Nonachlor

Solids (Organic)
Perchlorate and Bromate - Solids [Soil] (176)
WT-TM-1503; modified from EPA 6850
LC/MS/MS
Bromate
Perchlorate

Solids (Organic)
Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) - Solids [Soil] (175)
WT-TM-1557; modified from ON MOECC E3506
LC/MS/MS
10:2 Fluorotelomer sulfonic acid (10:2 FTS)
4:2 Fluorotelomer sulfonic acid (4:2 FTS)
6:2 Fluorotelomer sulfonic acid (6:2 FTS)
8:2 Fluorotelomer sulfonic acid (8:2 FTS)
N-Ethyl perfluorooctane sulfonamide (EtFOSA)
N-Ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSSA)
N-Ethyl perfluorooctanesulfonamidoethanol (EtFOSE)
N-Methyl perfluorooctane sulfonamide (MeFOSA)
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)
Perfluorobutanesulfonic acid (PFBS, Perfluorobutanesulfonate)

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Perfluorobutanoic acid (PFBA, Perfluorobutanoate)
Perfluorodecanesulfonic acid (PFDS, Perfluorodecanesulfonate)
Perfluorodecanoic acid (PFDA, Perfluorodecanoate)
Perfluorododecanoic acid (PFDoA, Perfluorododecanoate)
Perfluoroheptanesulfonic acid (PFHpS, Perfluoroheptanesulfonate)
Perfluoroheptanoic acid (PFHpA, Perfluorohepanoate)
Perfluorohexanesulfonic acid (PFHxS, Perfluorohexanesulfonate)
Perfluorohexanoic acid (PFHxA, Perfluorohexanoate)
Perfluorononanoic acid (PFNA, Perfluorononanoate)
Perfluorooctanesulfonic acid (PFOS, Perfluorooctanesulfonate)
Perfluorooctanesulfonamide (PFOSA)
Perfluorooctanoic acid (PFOA, Perfluorooctanoate)
Perfluoropentanesulfonic acid (PFPeS, Perfluoropentanesulfonate)
Perfluoropentanoic acid (PFPeA, Perfluoropentanoate)
Perfluorotetradecanoic acid (PFTeDA, Perfluorotetradecanoate)
Perfluorotridecanoic acid (PFTrDA, Perfluorotridecanoate)
Perfluoroundecanoic acid (PFUnA, Perfluoroundecanoate)

Solids (Organic)
Pesticides - Solids [Soil] (150)
WT-TM-1107, WT-TM-1302; modified from EPA 3570C and EPA 8270
GC/MS - EXTRACTION
Alachlor
Ametryn
Atrazine
Atrazine, desethyl
Azinphos-methyl (Guthion)
Bendiocarb
Bromoxynil
Carbaryl
Carbofuran
Chlorpyrifos
Cyanazine
Diazinon
Diclofop-methyl
Dimethoate
Malathion
Metolachlor
Metribuzin
Parathion
Phorate
Prometon
Prometryne
Propazine
Simazine
Temephos (Abate)

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Terbufos
Terbutryn
Triallate
Trifluralin

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Solids [Soil] (065)
NA-TM-1100, WT-TM-1307; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Solids [Soil] (071)
NA-TM-1100; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Phenols - Solids [Soil] (204)
WT-TM-1593; modified from EPA 600/SR-97/027
LC/MS/MS
Phenol

Solids (Organic)
Polyaromatic Hydrocarbons (PAH) - Solids [Soil] (221)
WT-TM-1103, WT-TM-1304; modified from EPA 3570 and EPA 8270E
GC/MS - EXTRACTION
1-Methylnaphthalene
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Acridine
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(b,j)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3 - cd)pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene

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Quinoline

Solids (Organic)
Polychlorinated Biphenyls (PCB) - Solids (137)
NA-TM-1700, WT-TM-1105, WT-TM-1301; modified from EPA 1311 (PREPARATION) and EPA 8270 (ANALYSIS)
GC/MS - TCLP
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Solids (Organic)
Polychlorinated Biphenyls (PCB) - Solids [Soil] (018)
WT-TM-1105, WT-TM-1301; modified from EPA 3570C and EPA 8270D
GC/MS - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Solids (Organic)
Pyridine - Solids (167)
NA-TM-1700, WT-TM-1600; modified from EPA 1311 (PREPARATION) and EPA 8260B (ANALYSIS)
GC/MS
Pyridine

Solids (Organic)
Sulfolane - Solids [Soil] (206)
WT-TM-1574; modified from ASTM D7599
LC/MS/MS
Sulfolane

Solids (Organic)
Volatile Organic Compounds (VOC) - Solids (182)
WT-TM-1017, WT-TM-1406; modified from EPA 1311 (PREPARATION) and EPA 8260 (ANALYSIS)
GC/MS-HEADSPACE - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chloroform
Dichloromethane
Ethylbenzene
m,p-Xylene
Methyl ethyl ketone
o-Xylene
Tetrachloroethylene
Toluene

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Solids (Organic)

Volatile Organic Compounds (VOC) - Solids [Soil] (112)
WT-TM-1406; modified from EPA 5021A and EPA 8260C

GC/MS-HEADSPACE

1,1-Dichloroethane
1,1-Dichloroethylene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromomethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Hexanone (Methyl butyl ketone, MBK)
Acetone (2-Propanone)
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane (Ethyl Chloride)
Chloroethene (Vinyl chloride)
Chloroform
Chloromethane (Methyl chloride)
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Dichloromethane (Methylene Chloride)
Ethylbenzene
Ethylene Dibromide
Hexane
m,p-Xylene
Methyl ethyl ketone
Methyl isobutyl ketone (MIBK)
Methyl t-butyl ether

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o-Xylene
Styrene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane

Tissue (Organic)
Perfluorinated Compounds (PFC) - Tissue (198)
WT-TM-1557; modified from ANALYTICA CHIMICA ACTA (2008) 619:221-230
LC/MS/MS
2-(N-ethylperfluoro-1-Octanesulfonamide)-EtOH (N-EtFOSE)
2-(N-methylperfluoro-1-Octanesulfonamide)-Etoh (N-MeFOSE)
N-Ethylperfluoro-1-Octanesulfonamide (N-EtFOSA)
N-Methylperfluoro-1-Octanesulfonamide (N-MeFOSE)
Perfluorobutanesulfonic acid (PFBS, Perfluorobutanesulfonate)
Perfluorobutanoic acid (PFBA, Perfluorobutanoate)
Perfluorodecanesulfonic acid (PFDS, Perfluorodecanesulfonate)
Perfluorodecanoic acid (PFDA, Perfluorodecanoate)
Perfluorodecanoic acid (PFDA, Perfluorodecanoate)
Perfluorododecanoic acid (PFDoA, Perfluorododecanoate)
Perfluoroheptanesulfonic acid (PFHpS, Perfluoroheptanesulfonate)
Perfluoroheptanoic acid (PFHpA, Perfluorohepanoate)
Perfluorohexanesulfonic acid (PFHxS, Perfluorohexanesulfonate)
Perfluorohexanoic acid (PFHxA, Perfluorohexanoate)
Perfluorononanoic acid (PFNA, Perfluorononanoate)
Perfluorooctanesulfonic acid (PFOS, Perfluorooctanesulfonate)
Perfluorooctanesulfonamide (PFOSA)
Perfluorooctanoic acid (PFOA, Perfluorooctanoate)
Perfluoropentanoic acid (PFPeA, Perfluoropentanoate)
Perfluorotetradecanoic acid (PFTeDA, Perfluorotetradecanoate)
Perfluorotridecanoic acid (PFTrDA, Perfluorotridecanoate)

Water (Inorganic) OSDWA †
Acidity - Water (227)
WT-TM-1028; modified from SM 2310 B
ION SELECTIVE ELECTRODE (ISE)
Acidity

Water (Inorganic) OSDWA †
Alkalinity - Water (070)
WT-TM-1028; modified from SM 2320 B
AUTOMATED TITRIMETRIC
Alkalinity (pH 4.5)

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Water (Inorganic) OSDWA †
Alkalinity - Water (094)
WT-TM-1032; modified from EPA 310.2
COLORIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic) OSDWA †
Ammonia - Water (212)
WT-TM-1043; JOURNAL OF ENVIRONMENTAL MONITORING (2005) SECTION 7, P. 37-42
FLUOROMETRIC
Ammonia

Water (Inorganic) OSDWA †
Anions - Water [Wastewater] (003)
NA-TM-1001; modified from EPA 300.1
ION CHROMATOGRAPHY (IC)
Bromide
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (001)
WT-TM-1002; modified from SM 5210 B
DISSOLVED OXYGEN METER (DO)
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Carbon - Water (047)
WT-TM-1024; modified from SM 5310 B
INFRARED SPECTROSCOPY (IR) - COMBUSTION
Organic Carbon

Water (Inorganic) OSDWA †
Chemical Oxygen Demand (COD) - Water (035)
WT-TM-1006; modified from SM 5220 D
COLORIMETRIC - REFLUX
COD

Water (Inorganic) OSDWA †
Chlorate and Chlorite - Water (211)
WT-TM-1044; EPA 300.1
ION CHROMATOGRAPHY (IC)
Chlorate
Chlorite

Water (Inorganic) OSDWA †
Chlorine - Water (074)
WT-TM-1021; modified from SM 4500-CL G
COLORIMETRIC
Free Chlorine
Total Chlorine

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Water (Inorganic) OSDWA †
Colour - Water (097)
WT-TM-1014; modified from SM 2120 C
COLORIMETRIC
Apparent Colour
True Colour

Water (Inorganic) OSDWA †
Conductivity - Water (048)
WT-TM-1010; modified from EPA 9050A and SM 2510 B
CONDUCTIVITY METER
Conductivity (25˚C)

Water (Inorganic) OSDWA †
Conductivity - Water (108)
WT-TM-1028; modified from SM 2510 B
ION SELECTIVE ELECTRODE (ISE)
Conductivity (25˚C)

Water (Inorganic) OSDWA †
Cyanate - Water (161)
WT-TM-1036; modified from SM 4500-CN- L and SM 4500-NH3 D
ION SELECTIVE ELECTRODE (ISE)
Cyanate

Water (Inorganic) OSDWA †
Cyanide - Water [Wastewater] (004)
NA-TM-1003; modified from ASTM D7237-10 and ISO 14403 and SM 4500-CN- I
COLORIMETRIC - DISTILLATION
Cyanide, Free
Cyanide (SAD)
Cyanide (WAD)

Water (Inorganic) OSDWA †
Dissolved Metals - Water (005)
NA-TM-1002, NA-TP-2002; modified from EPA 3030B and EPA 6020B
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead

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Lithium
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Silicon
Silver
Sodium
Strontium
Sulphur (Sulfur)
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic) OSDWA †
Hexavalent Chromium - Water (157)
WT-TM-1035; modified from EPA 3060A and EPA 7199
ION CHROMATOGRAPHY (IC)

Hexavalent Chromium

Water (Inorganic) OSDWA †
Hydrogen Sulphide - Water (012)
WT-TM-1003; modified from SM 4500-S2- D and SM 4500-S2- E and SM 4500-S2- F
COLORIMETRIC

Sulphide

Water (Inorganic) OSDWA †
Mercury - Water [Wastewater] (049)
NA-TM-1005; modified from EPA 1631E
COLD VAPOUR ATOMIC ABSORPTION (CVAA)

Mercury

Water (Inorganic) OSDWA †
Oil and Grease - Water (033)
WT-TM-1100; modified from EPA 1664 and SM 5520 B and SM 5520 D and SM 5520 E and SM 5520 F
GRAVIMETRIC - EXTRACTION

Mineral Oil and Grease
Total Oil and Grease

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Water (Inorganic) OSDWA †
Perchlorate and Bromate - Water (114)
WT-TM-1503; modified from EPA 6850
LC/MS/MS - EXTRACTION

Bromate

Perchlorate

Water (Inorganic) OSDWA †
pH - Water (026)
WT-TM-1001; modified from SM 4500-H+ B
PH METER

pH

Water (Inorganic) OSDWA †
pH - Water (106)
WT-TM-1028; modified from SM 4500-H+ B
ION SELECTIVE ELECTRODE (ISE)

pH

Water (Inorganic) OSDWA †
Phenols - Water (009)
WT-TM-1027; modified from EPA 9066
COLORIMETRIC

Total Phenolics

Water (Inorganic) OSDWA †
Phosphorus - Water (098)
WT-TM-1025; modified from SM 4500-P B and SM 4500-P F
COLORIMETRIC

Phosphate

Water (Inorganic) OSDWA †
Solids - Water (010)
WT-TM-1011; modified from SM 2540 D and SM 2540 E
GRAVIMETRIC

Total Suspended Solids

Volatile Suspended Solids

Water (Inorganic) OSDWA †
Solids - Water (056)
NA-TM-1004, WT-TM-1011; modified from SM 2540 B and SM 2540 C and SM 2540 E
GRAVIMETRIC

Total Dissolved Solids

Total Solids (TS)

Volatile Solids (VS)

Water (Inorganic) OSDWA †
Tannin and LIgnin - Water (181)
WT-TM-1015; modified from SM 5550 B
COLORIMETRIC

Tannin and Lignin

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Water (Inorganic)
Total Kjeldahl Nitrogen (TKN) - Water (231)
WT-TM-1046; modified from JOURNAL OF ENVIRONMENTAL MONITORING (2005) SECTION 7, P. 37-42
FLUOROMETRIC

Total Kjeldahl Nitrogen

Water (Inorganic) OSDWA †
Total Metals - Water [Wastewater] (032)
NA-TM-1002, NA-TP-2001; modified from EPA 200.2 and EPA 6020B
ICP/MS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Rubidium
Selenium
Silicon
Silver
Sodium
Strontium
Sulphur (Sulfur)
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Uranium

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Vanadium
Zinc
Zirconium

Water (Inorganic) OSDWA †
Total Phosphorus - Water (011)
WT-TM-1025; modified from SM 4500-P E and SM 4500-P F
AUTOMATED COLORIMETRIC - DIGESTION

Total Phosphorus

Water (Inorganic) OSDWA †
Turbidity - Water (024)
WT-TM-1004; modified from SM 2130 B
TURBIDIMETRIC

Turbidity

Water (Inorganic) OSDWA †
UV Transmittance - Water (190)
WT-TM-1033; modified from SM 5910
COLORIMETRIC

Transmittance, UV (254nm)

Water (Inorganic)
Volatile Organic Acids - Water (191)
WT-TM-1031; modified from SM 5560 C
TITRIMETRIC - DISTILLATION

Volatile Organic Acids (As Acetic)

Water (Microbiology) OSDWA †
Coliforms - Water (183)
NA-TM-1300; modified from SM 9215 E and SM 9223 B
QUANTI-TRAY (COLILERT)

Escherichia coli

Total Coliforms

Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (052)
WT-TM-1200; modified from ON MOECC COMPARISON EVALUATION and SM 9222D
MEMBRANE FILTRATION (mFC-BCIG)

Escherichia coli

Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (051)
WT-TM-1200; modified from SM 9222 D
MEMBRANE FILTRATION (M-FC)

Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (030)
WT-TM-1200; modified from SM 9215 D
MEMBRANE FILTRATION

Heterotrophic Plate Count (HPC)

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Water (Microbiology) OSDWA †
Pseudomonas aeruginosa - Water (091)
WT-TM-1200; modified from SM 9213 E
MEMBRANE FILTRATION (MPAC)

Pseudomonas aeruginosa

Water (Microbiology) OSDWA †
Total Coliforms - Water (002)
WT-TM-1200; modified from SM 9222 B
MEMBRANE FILTRATION (M-ENDO)

Background Counts

Total Coliforms

Water (Organic) OSDWA †
1,4-Dioxane - Water (172)
WT-TM-1406; modified from EPA 5021A and EPA 8260C
GC/MS-HEADSPACE

1,4-Dioxane (p-dioxane)

Water (Organic) OSDWA †
Aldicarb and Diuron - Water (135)
WT-TM-1502; modified from ON MOECC E3501
LC/MS/MS - EXTRACTION

Aldicarb

Diuron

Water (Organic) OSDWA †
Alkanolamines - Water (216)
WT-TM-1574; modified from ASTM D7599
LC/MS/MS

Diethanolamine (DEA)

Diisopropanolamine (DIPA)

Methyldiethanolamine (MDEA)

Monoethanolamine (MEA)

Monoisopropanolamine (MIPA)

Triethanolamine (TEA)

Water (Organic) OSDWA †
Base Neutral Acid Extractables (BNA) - Water [Wastewater] (015)
WT-TM-1101, WT-TM-1300; modified from EPA 3510C and EPA 8270
GC/MS - EXTRACTION

1-Chloronaphthalene

1,2,3-Trichlorobenzene

1,2,4-Trichlorobenzene

1,3-Dichlorobenzene

2-Chloronaphthalene

2-Chlorophenol

2-Methylphenol (o-Cresol)

2-Nitrophenol

2,3,4-Trichlorophenol

2,3,4,5-Tetrachlorophenol

2,3,4,6-tetrachlorophenol

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2,3,5-Trichlorophenol
2,3,5,6-Tetrachlorophenol
2,4-dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-trichlorophenol
2,6-Dichlorophenol
2,6-Dinitrotoluene (2,6-DNT)
3,3'-Dichlorobenzidine
4-Chloro-3-methylphenol
4-Chloroaniline (p-Chloroaniline)
4-Chlorophenyl phenyl ether
4-Nitrophenol
4,6-Dinitro-o-cresol
5-Nitroancenphthene
Biphenyl (1,1-Biphenyl)
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate (Diethylhexyl phthalate)
Butyl benzyl phthalate
Camphene
Di-n-butyl phthalate
Di-n-octyl phthalate
Diethyl phthalate
Dimethyl phthalate
Diphenyl ether
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indole
Isophorone
m,p-Cresol
N-Nitrosodi-n-propylamine
Nitrobenzene
PBDE 3 (4-Bromophenyl phenyl ether)
Pentachlorophenol
Phenol
Total Diphenylamine

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Water (Organic)
Caffeine - Water (228)
WT-TM-1581; modified from EPA 1694
LC/MS/MS

Caffeine

Water (Organic) OSDWA †
Diquat and Paraquat - Water (134)
WT-TM-1506; modified from ON MOECC E3503
LC/MS/MS - EXTRACTION

Diquat

Paraquat

Water (Organic)
Energetics - Water (194)
WT-TM-1608; modified from EPA 8330A and EPA 8330B
HPLC/UV - EXTRACTION

1,2-Dinitrobenzene (o-Dinitrobenzene)

1,3-Dinitrobenzene (1,3-DNB)

1,3,5-Trinitrobenzene (1,3,5-TNB)

2-Amino-4,6-dinitrotoluene (2-A-DNT, 2-Am-DNT)

2-Nitrotoluene (2-NT)

2,4-Dinitrotoluene

2,4,6-Trinitrotoluene (2,4,6-TNT)

2,6-Dinitrotoluene (2,6-DNT)

3-Nitrotoluene (3-NT)

3,5-Dinitroaniline (3,5-DNA)

4-Amino-2,6-dinitrotoluene (4-A-DNT)

4-Nitrotoluene (4-NT)

Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

Methyl-2,4,6-trinitrophenylnitramine

Nitrobenzene

Nitroglycerin

Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)

Pentaerythritol tetranitrate (PETN)

Water (Organic) OSDWA †
Formaldehyde - Water (162)
WT-TM-1603; modified from EPA 556.1
GC/ECD

Formaldehyde

Water (Organic) OSDWA †
Glyphosate and Aminomethylphosphonic acid (AMPA) - Water (133)
WT-TM-1504; modified from ON MOECC E3500
LC/MS/MS - EXTRACTION

Aminomethylphosphonic acid (AMPA)

Glyphosate

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Water (Organic) OSDWA †

Haloacetic Acids (HAA) - Water (230)
WT-TM-1596; modified from ON MOECC E3478

LC/MS/MS

- Bromochloroacetic acid
- Bromodichloroacetic acid
- Chlorodibromoacetic acid (CDBAA)
- Dalapon (2,2-Dichloropropionic Acid)
- Dibromoacetic acid
- Dichloroacetic acid
- Iodoacetic acid
- Monobromoacetic acid
- Monochloroacetic acid
- Tribromoacetic acid
- Trichloroacetic acid

Water (Organic) OSDWA †

Hydrocarbons - Water (062)
WT-TM-1602; modified from EPA REGION 1, 2002

GC/FID-HEADSPACE

- Ethane
- Ethene (Ethylene)
- Methane

Water (Organic)

N-Nitrosodimethylamine (NDMA) - Water (233)
WT-TM-1533; modified from EPA 521 and NANNAN, YANBO, WENHAI. LC-MS/MS SOLUTION FOR DETERMINATION OF NITROSAAAMINE DISINFECTION BYPROOOODUCTS IN DRINKING WATER and TOPUZ AND AYDIN. A PRACTICAL LC-MS/MS METHOD FOR THE DETECTION OF NDMA PER LITER

LC/MS/MS - SOLID PHASE EXTRACTION (SPE)

- N-Nitrosodimethylamine (NDMA)

Water (Organic) OSDWA †

Neonicotinoids - Water (200)
WT-TM-1569; modified from ON MOECC E3544

LC/MS/MS

- 6-Chloronicotinic acid
- Acetamiprid
- Clothianidin
- Flonicamid
- Imidacloprid
- Nitenpyram
- Sulfoxaflor
- Thiacloprid
- Thiamethoxam

Water (Organic) OSDWA †

Nitrilotriacetic Acid (NTA) - Water (036)
WT-TM-1007; modified from EPA 430.1

COLORIMETRIC

- Nitrilotriacetic acid (NTA)

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Water (Organic) OSDWA †
Nonylphenol and Nonylphenol Ethoxylates - Water (116)
WT-TM-1521; modified from JOURNAL OF CHROMATOGRAPHY A, 849 (1999) 467-482
LC/MS/MS - EXTRACTION

Bisphenol A
Nonylphenol Diethoxylate (NP2EO)
Nonylphenol Ethoxylates
Nonylphenol Monoethoxylates (NP1EO)
Nonylphenols
Octylphenol Diethoxylate (OP2EO)
Octylphenol Monoethoxylate (OP1EO)
Octylphenol (OP)

Water (Organic) OSDWA †
Organochlorine (OC) Pesticides - Water (222)
WT-TM-1118, WT-TP-2100; modified from EPA 8081B and EPA 8270E
GC/MS

2,4'-DDD (o,p'-DDD)
4,4'-DDD (p,p'-DDD)
4,4'-DDE (p,p'-DDE)
A -BHC
a - Chlordane
Aldrin
beta-HCH (beta-Hexachlorocyclohexane (b-HCH, b-BHC, beta-BHC, beta-Hexachlorocyclohexane)
delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Endrin
Endrin Aldehyde
g - Chlordane
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Lindane (gamma-BHC)
Mirex
o,p- DDE
o,p' - DDT
Oxychlordane
p,p' - DDT
p,p' Methoxychlor

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Water (Organic) OSDWA †

Organochlorine (OC) Pesticides - Water (229)

WT-TM-1118, WT-TP-2109; modified from EPA 8270

GC/MS/MS

- 2,4'-DDD (o,p'-DDD)
- 2,4'-DDE (o,p'-DDE)
- 4,4'-DDD (p,p'-DDD)
- 4,4'-DDE (p,p'-DDE)
- A -BHC
- a - Chlordane
- Aldrin
- beta-HCH (beta-Hexachlorocyclohexane (b-HCH, b-BHC, beta-BHC, beta-Hexachlorocyclohexane)
- Chloroneb
- delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan Sulfate
- Endrin
- Endrin Aldehyde
- Endrin Ketone
- Ethalfluralin
- g - Chlordane
- Heptachlor
- Heptachlor epoxide
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachloroethane
- Lindane (gamma-BHC)
- Mirex
- o,p' - DDT
- Oxychlordane
- p,p' - DDT
- p,p' Methoxychlor
- Trifluralin

Water (Organic) OSDWA †

Organochlorine (OC) Pesticides - Water [Wastewater] (019)

WT-TM-1102, WT-TM-1302; modified from EPA 3510C and EPA 8270

GC/MS - EXTRACTION

- 2,4'-DDD (o,p'-DDD)
- 2,4'-DDE (o,p'-DDE)
- 4,4'-DDD (p,p'-DDD)
- 4,4'-DDE (p,p'-DDE)
- A -BHC
- a - Chlordane

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Aldrin
beta-HCH (beta-Hexachlorocyclohexane (b-HCH, b-BHC, beta-BHC, beta-Hexachlorocyclohexane)
delta-HCH (d-HCH, d-BHC, delta-BHC, delta-Hexachlorocyclohexane)
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Endrin
Endrin Aldehyde
g - Chlordane
Heptachlor
Heptachlor epoxide
Lindane (gamma-BHC)
Mirex
o,p' - DDT
Oxychlordane
p,p' - DDT
p,p' Methoxychlor

Water (Organic) OSDWA †
Perfluorinated Compounds (PFC) - Water (174)
WT-TM-1557; ON MOECC E3457
LC/MS/MS
10:2 Fluorotelomer sulfonic acid (10:2 FTS)
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)
4:2 Fluorotelomer sulfonic acid (4:2 FTS)
6:2 Fluorotelomer sulfonic acid (6:2 FTS)
8:2 Fluorotelomer sulfonic acid (8:2 FTS)
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)
Dodecafluoro-3H-4,8-dioxanonoic acid (DONA)
N-Ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSSA)
N-Ethylperfluorooctane sulfonamide (EtFOSA)
N-Ethylperfluorooctane sulfonamidoethanol (EtFOSE)
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)
N-Methylperfluorooctane sulfonamide (MeFOSA)
N-Methylperfluorooctane sulfonamidoethanol (MeFOSE)
Perfluorobutanesulfonic acid (PFBS, Perfluorobutanesulfonate)
Perfluorobutanoic acid (PFBA, Perfluorobutanoate)
Perfluorodecanesulfonic acid (PFDS, Perfluorodecanesulfonate)
Perfluorodecanoic acid (PFDA, Perfluorodecanoate)
Perfluorododecanoic acid (PFDoA, Perfluorododecanoate)
Perfluoroheptanesulfonic acid (PFHpS, Perfluoroheptanesulfonate)
Perfluoroheptanoic acid (PFHpA, Perfluorohepanoate)
Perfluorohexanesulfonic acid (PFHxS, Perfluorohexanesulfonate)
Perfluorohexanoic acid (PFHxA, Perfluorohexanoate)
Perfluorononanesulfonic acid (PFNS, Perfluorononanesulfonate)

Perfluorononanoic acid (PFNA, Perfluorononanoate)
Perfluorooctanesulfonic acid (PFOS, Perfluorooctanesulfonate)
Perfluorooctanesulfonamide (PFOSA)
Perfluorooctanoic acid (PFOA, Perfluorooctanoate)
Perfluoropentanesulfonic acid (PFPeS, Perfluoropentanesulfonate)
Perfluoropentanoic acid (PFPeA, Perfluoropentanoate)
Perfluorotetradecanoic acid (PFTeDA, Perfluorotetradecanoate)
Perfluorotridecanoic acid (PFTrDA, Perfluorotridecanoate)
Perfluoroundecanoic acid (PFUnA, Perfluoroundecanoate)

Water (Organic) OSDWA †
Pesticides - Water (023)
WT-TM-1107, WT-TM-1109, WT-TM-1302; modified from EPA 3510C and EPA 8270
GC/MS - EXTRACTION
2,4-Dichlorophenoxypropionic acid (2,4-DP, Dichlorprop)
2,4-TP
Alachlor
Ametryn
Atrazine
Azinphos-methyl
Bendiocarb
Carbaryl
Carbofuran
Chlorpyrifos ethyl
Cyanazine
De-ethylated atrazine
Diazinon
Diclofop-methyl (as free acid)
Dimethoate
Ethalfluralin
Fluazifop-p-butyl
Malathion
MCPA (2-Methyl-4-chlorophenoxyacetic acid)
MCPP (Mecoprop, Methylchlorophenoxypropionic acid)
Metolachlor
Metribuzin
Parathion (ethyl)
Parathion-methyl
Phorate
Prometon
Prometryne
Propazine
Simazine
Temephos (Abate)
Terbufos
Terbutryn

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Triallate
Trifluralin

Water (Organic) OSDWA †
Pesticides - Water (207)
WT-TM-1589; modified from ON MOECC E3501
LC/MS/MS
Atrazine
Atrazine-2-hydroxy
Azoxystrobin
Boscalid
Bromacil
Carbaryl
Chlorantraniliprole
Clothianidin
DCPMU
Desethyl atrazine
Desethyl atrazine + Desisopropyl atrazine
Desisopropyl atrazine
Diuron
Fludioxonil
Imidacloprid
Iprodione
Linuron
Metalaxyl
Myclobutanil
Propiconazole
Pyraclostrobin
Simazine
Tebuthiuron
Trifloxystrobin
Triticonazole

Water (Organic) OSDWA †
Pesticides - Water (213)
WT-TM-1575; IN-HOUSE
LC/MS/MS
Chlorothalonil (Daconil)
Chlorothalonil-4-Hydroxy

Water (Organic)
Pesticides - Water (218)
WT-TM-1526; ON MOECC E3501
LC/MS/MS
Benomyl
Carboxin (Carbathiin)
Deltamethrin
Diuron

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Ethalfluralin
Fenoxaprop
Imazamethabenz-methyl
Metsulfuron-methyl
Propachlor
Propanil
Propoxur (Baygon)
Quizalofop
Sethoxydim
Thifensulfuron-methyl
Tralkoxydim
Tribenuron-methyl
Trifluralin

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (068)
NA-TM-1112; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 3511
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (069)
WT-TM-1112; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and ON MOECC E3421
GRAVIMETRIC
F4: Gravimetric

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (111)
WT-TM-1406; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 5021A and EPA 8260
GC/FID-HEADSPACE
F1: C6-C10

Water (Organic)
Phenoxy Acid Herbicides - Water (209)
WT-TM-1591; modified from ON MOECC E3552
LC/MS/MS
2,4-Dichlorophenoxyacetic acid
2,4-Dichlorophenoxybutyric acid (2,4-DB)
2,4-Dichlorophenoxypropionic acid (2,4-DP, Dichlorprop)
2,4,5-TP (Silvex)
2,4,5-Trichlorophenoxyacetic acid
Asulam

Brodifacoum

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Bromoxynil
Clopyralid
Dicamba
Diflufenican

Dinoseb
MCPA (2-Methyl-4-chlorophenoxyacetic acid)
MCPB (4-(4-chloro-2-methylphenoxy)butanoic acid)
MCPP (Mecoprop, Methylchlorophenoxypropionic acid)
Nicarbazin

Oryzalin

Picloram
Propanil
Terbacil
Triclopyr

Water (Organic) OSDWA †

Polyaromatic Hydrocarbons (PAH) - Water (220)
NA-TM-1112, NA-TP-2109; modified from EPA 3511 and EPA 8270D

GC/MS - EXTRACTION
1-Methylnaphthalene
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Acridine
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(b,j)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3 - cd)pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene
Quinoline

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Water (Organic) OSDWA †

Polychlorinated Biphenyls (PCB) - Water (224)
WT-TM-1118, WT-TP-2100; EPA 3511 (PREPARATION) and EPA 8081B (ANALYSIS)
GC/MS - EXTRACTION

- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260
- Total PCB

Water (Organic) OSDWA †

Polychlorinated Biphenyls (PCB) - Water [Wastewater] (017)
WT-TM-1105, WT-TM-1301; modified from EPA 3510C and EPA 8270
GC/MS - EXTRACTION

- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260
- Total PCB

Water (Organic) OSDWA †

Polycyclic Aromatic Hydrocarbons (PAH) - Water (214)
WT-TM-1103, WT-TM-1311; modified from EPA 3510 and EPA 3570 and EPA 8270
GC/MS - EXTRACTION

- 1,3-Dinitropyrene
- 1,6-Dinitropyrene
- 1,8-Dinitropyrene
- 3-Methylcholanthrene
- 7H-Dibenzo(c,g)carbazole
- Benzo(e)pyrene
- Dibenz(a,h)acridine
- Dibenzo(a,e)pyrene
- Dibenzo(a,h)pyrene
- Dibenzo(a,i)pyrene
- Dibenzo(a,j)acridine

Water (Organic)

Steroids and Hormones - Water (166)
WT-TM-1555; modified from JOURNAL OF CHROMATOGRAPHY B, 879 (2011) 2998-3004
LC/MS/MS - EXTRACTION

- 17a-Dihydroequilin
- 17a-Estradiol
- 17a-Ethinylestradiol
- 17b-Estradiol
- Androstendione
- Androsterone
- beta-Sitosterol
- beta-Stigmastanol
- Betamethasone

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Campesterol
Cholestanol
Cholesterol
Coprostanol
Desmosterol
Desogestrel
Epicoprostanol
Equilenin
Equilin
Ergosterol
Estradiol-3-benzoate
Estriol
Estrone
Mestranol
Norethindrone
Norgestrel
Progesterone
Stigmasterol
Testosterone

Water (Organic)
Sulfolane - Water (205)
WT-TM-1572; IN-HOUSE
LC/MS/MS
Sulfolane

Water (Organic) OSDWA †
Volatile Organic Compounds (VOC) - Water (113)
WT-TM-1406; modified from EPA 5021A and EPA 8260C
GC/MS-HEADSPACE
1,1-Dichloroethane
1,1-Dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane

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1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
2-Chlorotoluene
2-Hexanone (Methyl butyl ketone, MBK)
2,2-Dichloropropane
4-Chlorotoluene (p-Chlorotoluene)
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane (Ethyl Chloride)
Chloroform
Chloromethane (Methyl chloride)
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene (Cumene)
Isopropyltoluene
m,p-Xylene
Methyl ethyl ketone
Methyl isobutyl ketone (MIBK)
Methyl t-butyl ether
n-Butylbenzene
n-Propylbenzene
Naphthalene
o-Xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene

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trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl chloride

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Appendix D – Laboratory Analytical Methods

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Water-Field Tests			
Temperature, Client	Result supplied by Client	-50	Deg. C
Misc.-Field Tests			
Air volume	HYGIENE METHOD	0	
Waste-Sample Preparation			
Final pH	EPA 1311	0.10	pH units
Initial pH	EPA 1311	0.10	pH units
Tissue-Physical Tests			
% Moisture	Puget Sound WQ Authority, Apr 1997	2.0	%
Water-Physical Tests			
Colour, Apparent	APHA 2120	2.0	CU
Colour, True	APHA 2120C	2.0	CU
Conductivity	APHA 2510 Auto. Conduc.	2.0	uS/cm
Conductivity	APHA 2510 B	3.0	umhos/cm
Hardness (as CaCO3)	APHA 2340 B	0.50	mg/L
Hardness (as CaCO3)	APHA 2340B	0.50	mg/L
pH	APHA 4500 H-Electrode	0.10	pH units
pH	APHA 4500-H pH Value	0.10	pH
Total Dissolved Solids	APHA 2540 C - GRAVIMETRIC	10	mg/L
Total Dissolved Solids	APHA 2540C	10	mg/L
Total Suspended Solids	APHA 2540 D - GRAVIMETRIC	3.0	mg/L
Total Suspended Solids	APHA 2540 D-Gravimetric	2.0	mg/L
Total Suspended Solids	APHA 2540 D-Gravimetric	3.0	mg/L
Total Suspended Solids	APHA 2540D	1.0	mg/L
Turbidity	APHA 2130 B	0.10	NTU
Turbidity	APHA 2130 Turbidity	0.10	NTU
Soil-Physical Tests			
% Moisture	CCME PHC in Soil - Tier 1 (mod)	0.25	%
Conductivity	MOEE E3138	0.0040	mS/cm
pH	MOEE E3137A	0.10	pH units
Soil-Particle Size			
% Clay (<2um)	SSIR-51 Method 3.2.1	1.0	%
% Sand (2.0mm - 0.05mm)	SSIR-51 Method 3.2.1	1.0	%
% Silt (0.05mm - 2um)	SSIR-51 Method 3.2.1	1.0	%
Texture	SSIR-51 Method 3.2.1		
Dustfall-Particulates			

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Fixed Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/dm2.day
Total Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/dm2.day
Volatile Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/dm2.day
Air-Asbestos/Quartz/Other Fibres			
Cristobalite	NIOSH 7500		
Water-Anions and Nutrients			
Acidity (as CaCO3)	APHA 2310 Acidity	2.0	mg/L
Alkalinity, Bicarbonate (as CaCO3)	APHA 2320B	2.0	mg/L
Alkalinity, Carbonate (as CaCO3)	APHA 2320B	2.0	mg/L
Alkalinity, Hydroxide (as CaCO3)	APHA 2320B	2.0	mg/L
Alkalinity, Total (as CaCO3)	APHA 2320 Alkalinity	1	mg/L
Alkalinity, Total (as CaCO3)	APHA 2320B	2.0	mg/L
Alkalinity, Total (as CaCO3)	APHA 2320B	10	mg/L
Unionized ammonia	CALCULATION	0.050	mg/L
Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC	0.0050	mg/L
Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC	0.010	mg/L
Bromate	EPA 6850	0.30	ug/L
Bromide (Br)	EPA 300.1 (mod)	0.050	mg/L
Bromide (Br)	EPA 300.1 (mod)	0.10	mg/L
Chlorate	EPA 300.1 (mod)	0.010	mg/L
Chloride (Cl)	EPA 300.1 (mod)	0.50	mg/L
Chlorite	EPA 300.1 (mod)	0.010	mg/L
Fluoride (F)	EPA 300.1 (mod)	0.020	mg/L
Fluoride (F)	EPA 300.1 (mod)	0.10	mg/L
Nitrate and Nitrite as N	APHA 4110 B	0.10	mg/L
Nitrate (as N)	EPA 300.1 (mod)	0.0050	mg/L
Nitrate (as N)	EPA 300.1 (mod)	0.020	mg/L
Nitrite (as N)	EPA 300.1 (mod)	0.0010	mg/L
Nitrite (as N)	EPA 300.1 (mod)	0.0050	mg/L
Nitrite (as N)	EPA 300.1 (mod)	0.010	mg/L
Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS	0.0030	mg/L
Phosphorus (P)-Total	APHA 4500-P Phosphorus	0.0020	mg/L
Phosphorus, Total	APHA 4500-P PHOSPHORUS	0.0030	mg/L
Sulfate (SO4)	EPA 300.1 (mod)	0.30	mg/L
Sulphide (as S)	APHA 4500S2D	0.018	mg/L
Sulphide (as H2S)	Calculation	0.020	mg/L
Total Kjeldahl Nitrogen	APHA 4500-NORG D.	0.050	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Total Kjeldahl Nitrogen	J. ENVIRON. MONIT., 2005,7,37-42,RSC	0.050	mg/L
Seawater-Anions and Nutrients			
Phosphorus (P)-Total	APHA 4500-P Phosphorus	0.0040	mg/L
Dustfall-Anions and Nutrients			
Interval	BC LAB MAN. - PART. - SOLUBLE - ANIONS	1	days
Nitrate (as N)	BC LAB MAN. - PART. - SOLUBLE - ANIONS	0.040	mg/dm2.day
Sulfate (SO4)	BC LAB MAN. - PART. - SOLUBLE - ANIONS	0.50	mg/dm2.day
Water-Cyanides			
Cyanide, Total	ISO 14403-2	0.0020	mg/L
Water-Organic / Inorganic Carbon			
Dissolved Carbon Filtration Location	APHA 5310B		
Dissolved Organic Carbon	APHA 5310B	0.50	mg/L
Total Organic Carbon	APHA 5310B	0.50	mg/L
Total Organic Carbon	APHA 5310B TOTAL ORGANIC CARBON (TOC)	0.50	mg/L
Soil-Organic / Inorganic Carbon			
Fraction Organic Carbon	CARTER 21.3.2	0.0010	g/g
Total Organic Carbon	CARTER 21.3.2	0.10	%
Water-Inorganic Parameters			
Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration	2.0	mg/L
Chloramines	APHA 4500-Cl B	0.070	mg/L
Chlorine, Free	SM 4500-CL G, EPA 330.5	0.050	mg/L
Chlorine, Total	APHA 4500-CL G	0.050	mg/L
Silicon (as SiO2)-Total	Calculation	0.10	mg/L
Water-Bacteriological Tests			
Escherichia Coli	APHA 9223B	0	MPN/100 mL
Fecal Coliforms	SM 9222D	0	CFU/100 mL
Fecal Coliforms	SM9222D	1	CFU/100 mL
Heterotrophic Plate Count	SM 9215D	0	CFU/mL
Total Coliforms	APHA 9223B	0	MPN/100 mL
Soil-Bacteriological Tests			
E. Coli	E3433	10	CFU/g dwt
Water-Bioassays			

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Daphnia Magna - LC50 48hr	EPS 1/RM/14	0.10	% v/v
Trout Bioassay LC50 96hr	EPS 1/RM/13	0.10	% v/v
Tissue-Metals			
Arsenic (As)-Total	EPA 200.3/6020B	0.03	mg/kg
Mercury (Hg)-Total	EPA 200.3, EPA 245.7	0.0050	mg/kg
Silver (Ag)-Total	EPA 200.3/6020B	0.0050	mg/kg
Titanium (Ti)-Total	EPA 200.3/6020B	0.50	mg/kg
Soil-Metals			
Arsenic (As)	EPA 200.2/6020B (mod)	1	mg/kg
Copper (Cu)	EPA 200.2/6020B (mod)	1	mg/kg
Lead (Pb)	EPA 200.2/6020B (mod)	0.5	mg/kg
Lead (Pb)	EPA 200.2/6020B (mod)	1	mg/kg
Mercury (Hg)	EPA 200.2/1631E (mod)	0.0050	mg/kg
Nickel (Ni)	EPA 200.2/6020B (mod)	1	mg/kg
Zinc (Zn)	EPA 200.2/6020B (mod)	5	mg/kg
Dustfall-Metals			
Aluminum (Al)-Total	EPA 6020A	0.0050	mg/dm2.day
Antimony (Sb)-Total	EPA 6020A	0.00010	mg/dm2.day
Arsenic (As)-Total	EPA 6020A	0.0050	mg/dm2.day
Barium (Ba)-Total	EPA 6020A	0.00080	mg/dm2.day
Beryllium (Be)-Total	EPA 6020A	0.00050	mg/dm2.day
Bismuth (Bi)-Total	EPA 6020A	0.00050	mg/dm2.day
Boron (B)-Total	EPA 6020A	0.010	mg/dm2.day
Cadmium (Cd)-Total	EPA 6020A	0.00050	mg/dm2.day
Calcium (Ca)-Total	EPA 6020A	0.080	mg/dm2.day
Cesium (Cs)-Total	EPA 6020A	0.000050	mg/dm2.day
Chromium (Cr)-Total	EPA 6020A	0.00050	mg/dm2.day
Cobalt (Co)-Total	EPA 6020A	0.00010	mg/dm2.day
Copper (Cu)-Total	EPA 6020A	0.0010	mg/dm2.day
Interval	EPA 6020A	1	days
Interval	EPA SW846 7470A	1	days

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Iron (Fe)-Total	EPA 6020A	0.0080	mg/dm2.day
Lead (Pb)-Total	EPA 6020A	0.000080	mg/dm2.day
Lithium (Li)-Total	EPA 6020A	0.0050	mg/dm2.day
Magnesium (Mg)-Total	EPA 6020A	0.0050	mg/dm2.day
Manganese (Mn)-Total	EPA 6020A	0.00030	mg/dm2.day
Mercury (Hg)-Total	EPA SW846 7470A	0.000050	mg/dm2.day
Molybdenum (Mo)-Total	EPA 6020A	0.000050	mg/dm2.day
Nickel (Ni)-Total	EPA 6020A	0.00050	mg/dm2.day
Phosphorus (P)-Total	EPA 6020A	0.050	mg/dm2.day
Potassium (K)-Total	EPA 6020A	0.050	mg/dm2.day
Rubidium (Rb)-Total	EPA 6020A	0.00010	mg/dm2.day
Selenium (Se)-Total	EPA 6020A	0.0010	mg/dm2.day
Silicon (Si)-Total	EPA 6020A	0.050	mg/dm2.day
Silver (Ag)-Total	EPA 6020A	0.000010	mg/dm2.day
Sodium (Na)-Total	EPA 6020A	0.050	mg/dm2.day
Strontium (Sr)-Total	EPA 6020A	0.00010	mg/dm2.day
Sulfur (S)-Total	EPA 6020A	0.50	mg/dm2.day
Tellurium (Te)-Total	EPA 6020A	0.00010	mg/dm2.day
Thallium (Tl)-Total	EPA 6020A	0.00010	mg/dm2.day
Thorium (Th)-Total	EPA 6020A	0.000050	mg/dm2.day
Tin (Sn)-Total	EPA 6020A	0.00010	mg/dm2.day
Titanium (Ti)-Total	EPA 6020A	0.010	mg/dm2.day
Tungsten (W)-Total	EPA 6020A	0.00010	mg/dm2.day
Uranium (U)-Total	EPA 6020A	0.000010	mg/dm2.day
Vanadium (V)-Total	EPA 6020A	0.0010	mg/dm2.day
Zinc (Zn)-Total	EPA 6020A	0.0030	mg/dm2.day

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Zirconium (Zr)-Total	EPA 6020A	0.00050	mg/dm2. day
Water-Total Metals			
Aluminum (Al)-Total	EPA 200.2/6020A (mod)	0.005	mg/L
Antimony (Sb)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Arsenic (As)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Arsenic (As)-Total	EPA 6020A	1	ug/L
Barium (Ba)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Beryllium (Be)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Bismuth (Bi)-Total	EPA 200.2/6020A (mod)	0.00005	mg/L
Boron (B)-Total	EPA 200.2/6020A (mod)	0.01	mg/L
Cadmium (Cd)-Total	EPA 200.2/6020A (mod)	0.000005	mg/L
Calcium (Ca)-Total	EPA 200.2/6020A (mod)	0.05	mg/L
Chromium (Cr)-Total	EPA 200.2/6020A (mod)	0.0005	mg/L
Cobalt (Co)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Copper (Cu)-Total	EPA 200.2/6020A (mod)	0.0005	mg/L
Copper (Cu)-Total	EPA 200.2/6020A (mod)	0.001	mg/L
Copper (Cu)-Total	EPA 6020A	1	ug/L
Iron (Fe)-Total	EPA 200.2/6020A (mod)	0.01	mg/L
Lead (Pb)-Total	EPA 200.2/6020A (mod)	0.00005	mg/L
Lead (Pb)-Total	EPA 6020A	1	ug/L
Lithium (Li)-Total	EPA 200.2/6020A (mod)	0.001	mg/L
Magnesium (Mg)-Total	EPA 200.2/6020A (mod)	0.005	mg/L
Manganese (Mn)-Total	EPA 200.2/6020A (mod)	0.0005	mg/L
Mercury	EPA 1631E (mod)	0.10	ug/L
Mercury (Hg)-Total	EPA 1631E (mod)	0.0000050	mg/L
Molybdenum (Mo)-Total	EPA 200.2/6020A (mod)	0.00005	mg/L
Nickel (Ni)-Total	EPA 200.2/6020A (mod)	0.0005	mg/L
Nickel (Ni)-Total	EPA 6020A	1	ug/L
Potassium (K)-Total	EPA 200.2/6020A (mod)	0.05	mg/L
Selenium (Se)-Total	EPA 200.2/6020A (mod)	0.00005	mg/L
Silicon (Si)-Total	EPA 200.2/6020A (mod)	0.1	mg/L
Silver (Ag)-Total	EPA 200.2/6020A (mod)	0.00005	mg/L
Sodium (Na)-Total	EPA 200.2/6020A (mod)	0.05	mg/L
Strontium (Sr)-Total	EPA 200.2/6020A (mod)	0.001	mg/L
Thallium (Tl)-Total	EPA 200.2/6020A (mod)	0.00001	mg/L
Tin (Sn)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L
Titanium (Ti)-Total	EPA 200.2/6020A (mod)	0.0003	mg/L
Tungsten (W)-Total	EPA 200.2/6020A (mod)	0.0001	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Uranium (U)-Total	EPA 200.2/6020A (mod)	0.00001	mg/L
Vanadium (V)-Total	EPA 200.2/6020A (mod)	0.0005	mg/L
Zinc (Zn)-Total	EPA 200.2/6020A (mod)	0.003	mg/L
Zinc (Zn)-Total	EPA 6020A	3	ug/L
Zirconium (Zr)-Total	EPA 200.2/6020A (mod)	0.0003	mg/L
Water-Total Metals (Undigested)			
Aluminum (Al)-Total	EPA 6020B (mod)	0.001	mg/L
Aluminum (Al)-Total	EPA SW-846 6020A	0.003	mg/L
Antimony (Sb)-Total	EPA 6020B (mod)	0.00002	mg/L
Antimony (Sb)-Total	EPA SW-846 6020A	0.0001	mg/L
Arsenic (As)-Total	EPA 6020B (mod)	0.00002	mg/L
Arsenic (As)-Total	EPA SW-846 6020A	0.00003	mg/L
Arsenic (As)-Total	EPA SW-846 6020A	0.0001	mg/L
Barium (Ba)-Total	EPA 6020B (mod)	0.00002	mg/L
Barium (Ba)-Total	EPA SW-846 6020A	0.00005	mg/L
Beryllium (Be)-Total	EPA 6020B (mod)	0.000005	mg/L
Beryllium (Be)-Total	EPA SW-846 6020A	0.0005	mg/L
Bismuth (Bi)-Total	EPA 6020B (mod)	0.000005	mg/L
Bismuth (Bi)-Total	EPA SW-846 6020A	0.0005	mg/L
Boron (B)-Total	EPA 6020B (mod)	0.005	mg/L
Boron (B)-Total	EPA SW-846 6020A	0.01	mg/L
Cadmium (Cd)-Total	EPA 6020B (mod)	0.000005	mg/L
Cadmium (Cd)-Total	EPA SW-846 6020A	0.00001	mg/L
Calcium (Ca)-Total	EPA 6020B (mod)	0.01	mg/L
Calcium (Ca)-Total	EPA SW-846 6020A	0.05	mg/L
Chromium (Cr)-Total	EPA 6020B (mod)	0.0001	mg/L
Chromium (Cr)-Total	EPA SW-846 6020A	0.0005	mg/L
Cobalt (Co)-Total	EPA 6020B (mod)	0.000005	mg/L
Cobalt (Co)-Total	EPA SW-846 6020A	0.0001	mg/L
Copper (Cu)-Total	EPA 6020B (mod)	0.00005	mg/L
Copper (Cu)-Total	EPA SW-846 6020A	0.0002	mg/L
Copper (Cu)-Total	EPA SW-846 6020A	0.0005	mg/L
Iron (Fe)-Total	EPA 6020B (mod)	0.001	mg/L
Iron (Fe)-Total	EPA SW-846 6020A	0.03	mg/L
Lead (Pb)-Total	EPA 6020B (mod)	0.00001	mg/L
Lead (Pb)-Total	EPA SW-846 6020A	0.00003	mg/L
Lead (Pb)-Total	EPA SW-846 6020A	0.00005	mg/L
Lithium (Li)-Total	EPA 6020B (mod)	0.0005	mg/L
Lithium (Li)-Total	EPA SW-846 6020A	0.001	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Magnesium (Mg)-Total	EPA 6020B (mod)	0.004	mg/L
Magnesium (Mg)-Total	EPA SW-846 6020A	0.05	mg/L
Manganese (Mn)-Total	EPA 6020B (mod)	0.00005	mg/L
Manganese (Mn)-Total	EPA SW-846 6020A	0.00007	mg/L
Molybdenum (Mo)-Total	EPA 6020B (mod)	0.00005	mg/L
Molybdenum (Mo)-Total	EPA SW-846 6020A	0.00005	mg/L
Nickel (Ni)-Total	EPA 6020B (mod)	0.00005	mg/L
Nickel (Ni)-Total	EPA SW-846 6020A	0.0001	mg/L
Nickel (Ni)-Total	EPA SW-846 6020A	0.0005	mg/L
Potassium (K)-Total	EPA 6020B (mod)	0.02	mg/L
Potassium (K)-Total	EPA SW-846 6020A	0.2	mg/L
Selenium (Se)-Total	EPA 6020B (mod)	0.00004	mg/L
Selenium (Se)-Total	EPA SW-846 6020A	0.001	mg/L
Silicon (Si)-Total	EPA 6020B (mod)	0.05	mg/L
Silicon (Si)-Total	EPA SW-846 6020A	0.1	mg/L
Silver (Ag)-Total	EPA 6020B (mod)	0.000005	mg/L
Silver (Ag)-Total	EPA SW-846 6020A	0.00001	mg/L
Sodium (Na)-Total	EPA 6020B (mod)	0.02	mg/L
Sodium (Na)-Total	EPA SW-846 6020A	0.05	mg/L
Strontium (Sr)-Total	EPA 6020B (mod)	0.00002	mg/L
Strontium (Sr)-Total	EPA SW-846 6020A	0.0001	mg/L
Thallium (Tl)-Total	EPA 6020B (mod)	0.000005	mg/L
Thallium (Tl)-Total	EPA SW-846 6020A	0.0001	mg/L
Tin (Sn)-Total	EPA 6020B (mod)	0.00002	mg/L
Tin (Sn)-Total	EPA SW-846 6020A	0.0001	mg/L
Titanium (Ti)-Total	EPA 6020B (mod)	0.00005	mg/L
Titanium (Ti)-Total	EPA SW-846 6020A	0.01	mg/L
Uranium (U)-Total	EPA 6020B (mod)	0.000001	mg/L
Uranium (U)-Total	EPA SW-846 6020A	0.00001	mg/L
Vanadium (V)-Total	EPA 6020B (mod)	0.00005	mg/L
Vanadium (V)-Total	EPA SW-846 6020A	0.001	mg/L
Zinc (Zn)-Total	EPA 6020B (mod)	0.0005	mg/L
Zinc (Zn)-Total	EPA SW-846 6020A	0.001	mg/L
Zinc (Zn)-Total	EPA SW-846 6020A	0.003	mg/L

Water-Dissolved Metals

Aluminum (Al)-Dissolved	APHA 3030B/6020A (mod)	0.0010	mg/L
Aluminum (Al)-Dissolved	APHA 3030B/6020A (mod)	0.0050	mg/L
Aluminum (Al)-Dissolved	EPA 6020B (mod)	0.001	mg/L
Aluminum (Al)-Dissolved	EPA SW-846 6020A	0.003	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Antimony (Sb)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Antimony (Sb)-Dissolved	EPA 6020B (mod)	0.00002	mg/L
Antimony (Sb)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Arsenic (As)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Arsenic (As)-Dissolved	EPA 6020B (mod)	0.00002	mg/L
Arsenic (As)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Barium (Ba)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Barium (Ba)-Dissolved	EPA 6020B (mod)	0.00002	mg/L
Barium (Ba)-Dissolved	EPA SW-846 6020A	0.00005	mg/L
Beryllium (Be)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Beryllium (Be)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Beryllium (Be)-Dissolved	EPA SW-846 6020A	0.0005	mg/L
Bismuth (Bi)-Dissolved	APHA 3030B/6020A (mod)	0.000050	mg/L
Bismuth (Bi)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Bismuth (Bi)-Dissolved	EPA SW-846 6020A	0.0005	mg/L
Boron (B)-Dissolved	APHA 3030B/6020A (mod)	0.010	mg/L
Boron (B)-Dissolved	EPA 6020B (mod)	0.005	mg/L
Boron (B)-Dissolved	EPA SW-846 6020A	0.01	mg/L
Cadmium (Cd)-Dissolved	APHA 3030B/6020A (mod)	0.0000050	mg/L
Cadmium (Cd)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Cadmium (Cd)-Dissolved	EPA SW-846 6020A	0.00001	mg/L
Calcium (Ca)-Dissolved	APHA 3030B/6020A (mod)	0.050	mg/L
Calcium (Ca)-Dissolved	EPA 6020B (mod)	0.01	mg/L
Calcium (Ca)-Dissolved	EPA SW-846 6020A	0.05	mg/L
Cesium (Cs)-Dissolved	APHA 3030B/6020A (mod)	0.000010	mg/L
Chromium (Cr)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Chromium (Cr)-Dissolved	APHA 3030B/6020A (mod)	0.00050	mg/L
Chromium (Cr)-Dissolved	EPA 6020B (mod)	0.0001	mg/L
Chromium (Cr)-Dissolved	EPA SW-846 6020A	0.0005	mg/L
Cobalt (Co)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Cobalt (Co)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Cobalt (Co)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Copper (Cu)-Dissolved	APHA 3030B/6020A (mod)	0.00020	mg/L
Copper (Cu)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Copper (Cu)-Dissolved	EPA SW-846 6020A	0.0005	mg/L
Dissolved Mercury Filtration Location	APHA 3030B/EPA 1631E (mod)		
Dissolved Mercury Filtration Location	EPA 1631E (mod)		
Dissolved Metals Filtration Location	APHA 3030B/6020A (mod)		
Iron (Fe)-Dissolved	APHA 3030B/6020A (mod)	0.010	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Iron (Fe)-Dissolved	EPA 6020B (mod)	0.001	mg/L
Iron (Fe)-Dissolved	EPA SW-846 6020A	0.03	mg/L
Lead (Pb)-Dissolved	APHA 3030B/6020A (mod)	0.000050	mg/L
Lead (Pb)-Dissolved	EPA 6020B (mod)	0.00001	mg/L
Lead (Pb)-Dissolved	EPA SW-846 6020A	0.00005	mg/L
Lithium (Li)-Dissolved	APHA 3030B/6020A (mod)	0.0010	mg/L
Lithium (Li)-Dissolved	EPA 6020B (mod)	0.0005	mg/L
Lithium (Li)-Dissolved	EPA SW-846 6020A	0.001	mg/L
Magnesium (Mg)-Dissolved	APHA 3030B/6020A (mod)	0.0050	mg/L
Magnesium (Mg)-Dissolved	EPA 6020B (mod)	0.004	mg/L
Magnesium (Mg)-Dissolved	EPA SW-846 6020A	0.05	mg/L
Manganese (Mn)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Manganese (Mn)-Dissolved	APHA 3030B/6020A (mod)	0.00050	mg/L
Manganese (Mn)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Manganese (Mn)-Dissolved	EPA SW-846 6020A	0.00007	mg/L
Mercury (Hg)-Dissolved	APHA 3030B/EPA 1631E (mod)	0.0000050	mg/L
Mercury (Hg)-Dissolved	EPA 1631E (mod)	0.0000050	mg/L
Molybdenum (Mo)-Dissolved	APHA 3030B/6020A (mod)	0.000050	mg/L
Molybdenum (Mo)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Molybdenum (Mo)-Dissolved	EPA SW-846 6020A	0.00005	mg/L
Nickel (Ni)-Dissolved	APHA 3030B/6020A (mod)	0.00050	mg/L
Nickel (Ni)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Nickel (Ni)-Dissolved	EPA SW-846 6020A	0.0005	mg/L
Phosphorus (P)-Dissolved	APHA 3030B/6020A (mod)	0.050	mg/L
Potassium (K)-Dissolved	APHA 3030B/6020A (mod)	0.050	mg/L
Potassium (K)-Dissolved	EPA 6020B (mod)	0.02	mg/L
Potassium (K)-Dissolved	EPA SW-846 6020A	0.2	mg/L
Rubidium (Rb)-Dissolved	APHA 3030B/6020A (mod)	0.00020	mg/L
Selenium (Se)-Dissolved	APHA 3030B/6020A (mod)	0.000050	mg/L
Selenium (Se)-Dissolved	EPA 6020B (mod)	0.00004	mg/L
Selenium (Se)-Dissolved	EPA SW-846 6020A	0.001	mg/L
Silicon (Si)-Dissolved	APHA 3030B/6020A (mod)	0.050	mg/L
Silicon (Si)-Dissolved	EPA 6020B (mod)	0.05	mg/L
Silicon (Si)-Dissolved	EPA SW-846 6020A	0.1	mg/L
Silver (Ag)-Dissolved	APHA 3030B/6020A (mod)	0.000010	mg/L
Silver (Ag)-Dissolved	APHA 3030B/6020A (mod)	0.000050	mg/L
Silver (Ag)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Silver (Ag)-Dissolved	EPA SW-846 6020A	0.00001	mg/L
Sodium (Na)-Dissolved	APHA 3030B/6020A (mod)	0.050	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Sodium (Na)-Dissolved	EPA 6020B (mod)	0.02	mg/L
Sodium (Na)-Dissolved	EPA SW-846 6020A	0.05	mg/L
Strontium (Sr)-Dissolved	APHA 3030B/6020A (mod)	0.00020	mg/L
Strontium (Sr)-Dissolved	APHA 3030B/6020A (mod)	0.0010	mg/L
Strontium (Sr)-Dissolved	EPA 6020B (mod)	0.00002	mg/L
Strontium (Sr)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Sulfur (S)-Dissolved	APHA 3030B/6020A (mod)	0.50	mg/L
Tellurium (Te)-Dissolved	APHA 3030B/6020A (mod)	0.00020	mg/L
Thallium (Tl)-Dissolved	APHA 3030B/6020A (mod)	0.000010	mg/L
Thallium (Tl)-Dissolved	EPA 6020B (mod)	0.000005	mg/L
Thallium (Tl)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Thorium (Th)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Tin (Sn)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Tin (Sn)-Dissolved	EPA 6020B (mod)	0.00002	mg/L
Tin (Sn)-Dissolved	EPA SW-846 6020A	0.0001	mg/L
Titanium (Ti)-Dissolved	APHA 3030B/6020A (mod)	0.00030	mg/L
Titanium (Ti)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Titanium (Ti)-Dissolved	EPA SW-846 6020A	0.01	mg/L
Tungsten (W)-Dissolved	APHA 3030B/6020A (mod)	0.00010	mg/L
Uranium (U)-Dissolved	APHA 3030B/6020A (mod)	0.000010	mg/L
Uranium (U)-Dissolved	EPA SW-846 6020A	0.00001	mg/L
Vanadium (V)-Dissolved	APHA 3030B/6020A (mod)	0.00050	mg/L
Vanadium (V)-Dissolved	EPA 6020B (mod)	0.00005	mg/L
Vanadium (V)-Dissolved	EPA SW-846 6020A	0.001	mg/L
Zinc (Zn)-Dissolved	APHA 3030B/6020A (mod)	0.0010	mg/L
Zinc (Zn)-Dissolved	EPA 6020B (mod)	0.0005	mg/L
Zinc (Zn)-Dissolved	EPA SW-846 6020A	0.003	mg/L
Zirconium (Zr)-Dissolved	APHA 3030B/6020A (mod)	0.00020	mg/L

Waste-TCLP Metals

Arsenic (As)	EPA 6020B	0.05	mg/L
Copper (Cu)-Total	EPA 200.8	0.5	mg/L
Lead (Pb)	EPA 6020B	0.03	mg/L
Lead (Pb)	EPA 6020B	0.05	mg/L
Mercury (Hg)	EPA 1631E	0.00010	mg/L
Nickel (Ni)-Total	EPA 200.8	0.1	mg/L
Zinc (Zn)-Total	EPA 200.8	1	mg/L

Waste-Waste Characterizations

Flash Point	ASTM D-93	30.0	Deg. C

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Water-Aggregate Organics			
BOD	APHA 5210 B	2.0	mg/L
Biochemical Oxygen Demand	SM5210B	2.0	mg/L
COD	APHA 5220 D	10	mg/L
COD	APHA 5220 D. CHEMICAL OXYGEN DEMAND	20	mg/L
Oil and Grease	BCMOE (2010), EPA1664A	5.0	mg/L
Oil and Grease, Total	APHA 5520 B	5.0	mg/L
Mineral Oil and Grease	APHA 5520 B	2.5	mg/L
Phenols (4AAP)	EPA 9066	0.0010	mg/L
Soil-Aggregate Organics			
Oil and Grease, Total	APHA 5520 B	500	mg/kg
Water-Volatile Organic Compounds			
1,1-dichloroethylene (vinylidene chlorid	SW846 8260	0.50	ug/L
1,2-Dichlorobenzene	SW846 8260	0.50	ug/L
1,2-Dichloroethane	SW846 8260	0.50	ug/L
1,4-Dichlorobenzene	SW846 8260	0.50	ug/L
1,4-Difluorobenzene	SW846 8260	1	%
1,4-Difluorobenzene	SW846 8260	1	
1,4-Difluorobenzene	SW846 8260 (511)	1	%
1,4-Difluorobenzene	SW846 8260 (HEADSPACE)	1	
1,4-Difluorobenzene (SS)	EPA 5035A/5021A/8260C	1	%
4-Bromofluorobenzene	SW846 8260	1	%
4-Bromofluorobenzene	SW846 8260	1	
4-Bromofluorobenzene	SW846 8260 (511)	1	%
4-Bromofluorobenzene	SW846 8260 (HEADSPACE)	1	
4-Bromofluorobenzene (SS)	EPA 5035A/5021A/8260C	1	%
Benzene	EPA 5021A/8260C	0.00050	mg/L
Benzene	SW846 8260	0.50	ug/L
Benzene	SW846 8260 (511)	0.50	ug/L
Benzene	SW846 8260 (HEADSPACE)	0.50	ug/L
Carbon tetrachloride	SW846 8260	0.20	ug/L
Monochlorobenzene	SW846 8260	0.50	ug/L
Ethylbenzene	EPA 5021A/8260C	0.00050	mg/L
Ethylbenzene	SW846 8260	0.50	ug/L
Ethylbenzene	SW846 8260 (511)	0.50	ug/L
Ethylbenzene	SW846 8260 (HEADSPACE)	0.50	ug/L
m+p-Xylenes	SW846 8260 (511)	0.40	ug/L
m+p-Xylenes	SW846 8260 (HEADSPACE)	1.0	ug/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
m/p-xylene	SW846 8260	1.0	ug/L
meta- & para-Xylene	EPA 5021A/8260C	0.00050	mg/L
MTBE	SW846 8260	0.5	ug/L
Methyl t-butyl ether (MTBE)	EPA 5021A/8260C	0.00050	mg/L
Dichloromethane	SW846 8260	5.0	ug/L
o-Xylene	SW846 8260 (511)	0.30	ug/L
o-Xylene	SW846 8260 (HEADSPACE)	0.50	ug/L
o-xylene	SW846 8260	0.50	ug/L
ortho-Xylene	EPA 5021A/8260C	0.00050	mg/L
Styrene	EPA 5021A/8260C	0.00050	mg/L
Tetrachloroethylene (perchloroethylene)	SW846 8260	0.50	ug/L
Toluene	EPA 5021A/8260C	0.00045	mg/L
Toluene	SW846 8260	0.50	ug/L
Toluene	SW846 8260 (511)	0.50	ug/L
Toluene	SW846 8260 (HEADSPACE)	0.50	ug/L
Trichloroethylene	SW846 8260	0.50	ug/L
F1 (C6-C10)	EPA 5021A/CCME CWS PHC (Pub# 1310)	0.10	mg/L
Vinyl chloride	SW846 8260	0.20	ug/L
Xylenes	CALCULATION	0.00075	mg/L
Xylenes (Total)	CALCULATION	0.50	ug/L
Xylenes (Total)	SW846 8260	0.50	ug/L

Soil-Volatile Organic Compounds

1,3-Dichloropropene (cis & trans)	SW8260B/SW8270C	0.0020	mg/kg
1,4-Difluorobenzene	SW846 8260	1	
4-Bromofluorobenzene	SW846 8260	1	
Benzene	SW846 8260	0.0068	ug/g
Ethylbenzene	SW846 8260	0.018	ug/g
m+p-Xylenes	SW846 8260	0.030	ug/g
o-Xylene	SW846 8260	0.020	ug/g
Toluene	SW846 8260	0.080	ug/g
Xylenes (Total)	CALCULATION	0.050	ug/g

Water-Hydrocarbons

2-Bromobenzotrifluoride	EPA 3511/CCME Tier 1	1	
2-Bromobenzotrifluoride	MOE DECPH-E3421/CCME TIER 1	1	
2-Bromobenzotrifluoride, F2-F4	CCME CWS-PHC, Pub #1310, Dec 2001	1.0	%
3,4-Dichlorotoluene	E3398/CCME TIER 1-HS	1	
3,4-Dichlorotoluene	E3421/CCME (HS)	1	
3,4-Dichlorotoluene	MOE DECPH-E3421/CCME TIER 1	1	

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
3,4-Dichlorotoluene (SS)	BC Env. Lab Manual (VH in Solids)	1	%
Chrom. to baseline at nC50	EPA 3511/CCME Tier 1		
Chrom. to baseline at nC50	MOE DECPH-E3421/CCME TIER 1		
F2-Naphth	CCME CWS-PHC, Pub #1310, Dec 2001-L	100	ug/L
F3-PAH	CCME CWS-PHC, Pub #1310, Dec 2001-L	250	ug/L
F2 (C10-C16)	CCME CWS-PHC, Pub #1310, Dec 2001	0.30	mg/L
F2 (C10-C16)	EPA 3511/CCME Tier 1	100	ug/L
F2 (C10-C16)	MOE DECPH-E3421/CCME TIER 1	100	ug/L
F3 (C16-C34)	CCME CWS-PHC, Pub #1310, Dec 2001	0.30	mg/L
F3 (C16-C34)	EPA 3511/CCME Tier 1	250	ug/L
F3 (C16-C34)	MOE DECPH-E3421/CCME TIER 1	250	ug/L
F4 (C34-C50)	CCME CWS-PHC, Pub #1310, Dec 2001	0.30	mg/L
F4 (C34-C50)	EPA 3511/CCME Tier 1	250	ug/L
F4 (C34-C50)	MOE DECPH-E3421/CCME TIER 1	250	ug/L
Total Hydrocarbons (C6-C50)	CCME CWS-PHC, Pub #1310, Dec 2001-L	250	ug/L
F1 (C6-C10)	E3398/CCME TIER 1-HS	25	ug/L
F1 (C6-C10)	E3421/CCME (HS)	100	ug/L
F1 (C6-C10)	MOE DECPH-E3421/CCME TIER 1	25	ug/L
F1-BTEX	CCME CWS PHC TIER 1 (2001)	0.10	mg/L
F1-BTEX	CCME CWS-PHC, Pub #1310, Dec 2001-L	100	ug/L

Soil-Hydrocarbons

Parameter	Method Reference	Report D.L.	Units
2-Bromobenzotrifluoride	CCME Tier 1	1	
3,4-Dichlorotoluene	E3398/CCME TIER 1-HS	1	
Chrom. to baseline at nC50	CCME Tier 1		
F2-Naphth	CCME CWS-PHC, Pub #1310, Dec 2001-S	10	ug/g
F3-PAH	CCME CWS-PHC, Pub #1310, Dec 2001-S	50	ug/g
F2 (C10-C16)	CCME Tier 1	10	ug/g
F3 (C16-C34)	CCME Tier 1	50	ug/g
F4 (C34-C50)	CCME Tier 1	50	ug/g
Total Hydrocarbons (C6-C50)	CCME CWS-PHC, Pub #1310, Dec 2001-S	50	ug/g
F1 (C6-C10)	E3398/CCME TIER 1-HS	5.0	ug/g
F1-BTEX	CCME CWS-PHC, Pub #1310, Dec 2001-S	10	ug/g

Water-Trihalomethanes

Parameter	Method Reference	Report D.L.	Units
1,4-Difluorobenzene	SW846 8260	1	
Bromodichloromethane	SW846 8260	2.0	ug/L
Bromoform	SW846 8260	2.0	ug/L
Dibromochloromethane	SW846 8260	2.0	ug/L
Chloroform	SW846 8260	2.0	ug/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Total THMs	CALCULATION	0.0040	mg/L
Total THMs	CALCULATION	1.0	ug/L
Water-Haloacetic Acids			
Bromochloroacetic Acid	MOECC E3478	0.25	ug/L
Bromodichloroacetic Acid	MOECC E3478	0.25	ug/L
Chlorodibromoacetic Acid	MOECC E3478	0.25	ug/L
Dalapon	MOECC E3478	0.10	ug/L
Dibromoacetic Acid	MOECC E3478	0.50	ug/L
Dichloroacetic Acid	MOECC E3478	0.50	ug/L
Total Haloacetic Acids 5	CALCULATION	2.2	ug/L
Iodoacetic Acid	MOECC E3478	0.25	ug/L
Bromoacetic Acid	MOECC E3478	0.10	ug/L
Chloroacetic acid	MOECC E3478	0.50	ug/L
Tribromoacetic Acid	MOECC E3478	0.25	ug/L
Trichloroacetic Acid	MOECC E3478	0.50	ug/L
Water-Semi-Volatile Organics			
1,2,3-Trichlorobenzene	SW846 8270	0.40	ug/L
1,2,4-Trichlorobenzene	SW846 8270	0.40	ug/L
1,2-Dichlorobenzene	SW846 8270	0.40	ug/L
1,3-Dichlorobenzene	SW846 8270	0.40	ug/L
1,4-Dichlorobenzene	SW846 8270	0.40	ug/L
1-Chloronaphthalene	SW846 8270	0.40	ug/L
1-Methylnaphthalene	SW846 8270	0.40	ug/L
2,3,4,5-Tetrachlorophenol	SW846 8270	0.50	ug/L
2,3,4,6-Tetrachlorophenol	SW846 8270	0.50	ug/L
2,3,4-Trichlorophenol	SW846 8270	0.50	ug/L
2,3,5,6-Tetrachlorophenol	SW846 8270	0.50	ug/L
2,3,5-Trichlorophenol	SW846 8270	0.50	ug/L
2,4,5-Trichlorophenol	SW846 8270	0.50	ug/L
2,4,6-Tribromophenol	SW846 8270	1	ug/L
2,4,6-Trichlorophenol	SW846 8270	0.50	ug/L
2,4-Dichlorophenol	SW846 8270	0.30	ug/L
2,4-Dimethylphenol	SW846 8270	0.50	ug/L
2,4-Dinitrophenol	SW846 8270	1.0	ug/L
2,4-Dinitrotoluene	SW846 8270	0.40	ug/L
2,6-Dichlorophenol	SW846 8270	0.50	ug/L
2,6-Dinitrotoluene	SW846 8270	0.40	ug/L
2-Chloronaphthalene	SW846 8270	0.40	ug/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
2-Chlorophenol	SW846 8270	0.30	ug/L
2-Fluorobiphenyl	SW846 8270	1	ug/L
4,6-Dinitro-2-methylphenol	SW846 8270	2.0	ug/L
2-Methylnaphthalene	SW846 8270	0.40	ug/L
2-Methylphenol	SW846 8270	0.50	ug/L
2-Nitrophenol	SW846 8270	0.50	ug/L
3,3'-Dichlorobenzidine	SW846 8270	0.40	ug/L
4-Bromophenyl phenyl ether	SW846 8270	0.40	ug/L
4-Chloro-3-methylphenol	SW846 8270	0.50	ug/L
4-Chloroaniline	SW846 8270	0.40	ug/L
4-Chlorophenyl phenyl ether	SW846 8270	0.40	ug/L
4-Nitrophenol	SW846 8270	0.50	ug/L
5-Nitroacenaphthene	SW846 8270	0.40	ug/L
Acenaphthene	SW846 8270	0.20	ug/L
Acenaphthylene	SW846 8270	0.20	ug/L
Anthracene	SW846 8270	0.20	ug/L
Benzo(a)anthracene	SW846 8270	0.20	ug/L
Benzo(a)pyrene	SW846 8270	0.050	ug/L
Benzo(b)fluoranthene	SW846 8270	0.20	ug/L
Benzo(ghi)perylene	SW846 8270	0.20	ug/L
Benzo(k)fluoranthene	SW846 8270	0.20	ug/L
Biphenyl	SW846 8270	0.20	ug/L
Bis(2-chloroethoxy)methane	SW846 8270	0.40	ug/L
Bis(2-chloroethyl)ether	SW846 8270	0.40	ug/L
Bis(2-chloroisopropyl)ether	SW846 8270	0.40	ug/L
Bis(2-ethylhexyl)phthalate	SW846 8270	1.0	ug/L
Butylbenzyl phthalate	SW846 8270	0.40	ug/L
Camphene	SW846 8270	0.40	ug/L
Chrysene	SW846 8270	0.20	ug/L
Cresols (total)	CALCULATION	0.75	ug/L
Di-n-butylphthalate	SW846 8270	1.0	ug/L
Di-n-octylphthalate	SW846 8270	0.40	ug/L
Dibenzo(a,h)anthracene	SW846 8270	0.20	ug/L
Dibenzofuran	SW846 8270	0.20	ug/L
Diethylphthalate	SW846 8270	0.20	ug/L
Dimethylphthalate	SW846 8270	0.20	ug/L
Diphenyl ether	SW846 8270	0.40	ug/L
Diphenylamine	SW846 8270	0.40	ug/L
Fluoranthene	SW846 8270	0.20	ug/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Fluorene	SW846 8270	0.20	ug/L
Hexachlorobenzene	SW846 8270	0.040	ug/L
Hexachlorobutadiene	SW846 8270	0.20	ug/L
Hexachlorocyclopentadiene	SW846 8270	0.40	ug/L
Hexachloroethane	SW846 8270	0.40	ug/L
Indeno(1,2,3-cd)pyrene	SW846 8270	0.20	ug/L
Indole	SW846 8270	0.40	ug/L
Isophorone	SW846 8270	0.40	ug/L
3&4-Methylphenol	SW846 8270	0.50	ug/L
N-Nitroso-di-n-propylamine	SW846 8270	0.40	ug/L
N-Nitrosodimethylamine	MOE E3388	0	ng/L
N-Nitrosodimethylamine-d6	MOE E3388	1	%
Naphthalene	SW846 8270	0.20	ug/L
Nitrobenzene	SW846 8270	0.40	ug/L
Nitrobenzene d5	SW846 8270	1	ug/L
p-Terphenyl d14	SW846 8270	1	ug/L
Pentachlorophenol	SW846 8270	0.50	ug/L
Perylene	SW846 8270	0.20	ug/L
Phenanthrene	SW846 8270	0.20	ug/L
Phenol	SW846 8270	0.50	ug/L
Pyrene	SW846 8270	0.20	ug/L

Water-Herbicides

2,4,5-T	MOE E3552	0.00010	mg/L
2,4,5-TP	MOE E3552	0.00010	mg/L
2,4,5-TP	MOE E3552	0.20	ug/L
2,4-D	MOE E3552	0.00010	mg/L
2,4-D	MOE E3552	0.20	ug/L
2,4-Dichlorophenylacetic Acid	MOE E3552	1	
AMPA	MOE E3500	0.50	ug/L
Bromoxynil	MOE E3552	0.00010	mg/L
Bromoxynil	MOE E3552	0.20	ug/L
Dicamba	MOE E3552	0.00010	mg/L
Dicamba	MOE E3552	0.20	ug/L
Dinoseb	MOE E3552	0.00010	mg/L
Dinoseb	MOE E3552	0.20	ug/L
Glyphosate	MOE E3500	5.0	ug/L
MCPA	MOE E3552	0.00010	mg/L
MCPA	MOE E3552	0.20	ug/L
Mecoprop	MOE E3552	0.00010	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Picloram	MOE E3552	0.00010	mg/L
Picloram	MOE E3552	0.20	ug/L
Water-Pesticides			
2,3,4,6-Tetrachlorophenol	SW846 8270	0.50	ug/L
2,4,6-Tribromophenol	SW846 8270	1	ug/L
2,4,6-Trichlorophenol	SW846 8270	0.50	ug/L
2,4-Dichlorophenol	SW846 8270	0.30	ug/L
2-Fluorobiphenyl	SW846 8270	1	ug/L
Alachlor	SW846 8270	0.10	ug/L
Atrazine	SW846 8270	0.10	ug/L
Atrazine Desethyl	SW846 8270	0.10	ug/L
Atrazine & Metabolites	SW846 8270	0.20	ug/L
Azinphos-methyl	SW846 8270	0.10	ug/L
Carbaryl	SW846 8270	0.20	ug/L
Carbofuran	SW846 8270	0.20	ug/L
Chlorpyrifos	SW846 8270	0.10	ug/L
Diazinon	SW846 8270	0.10	ug/L
Diclofop-methyl	SW846 8270	0.20	ug/L
Dimethoate	SW846 8270	0.10	ug/L
Diquat	E3503	1.0	ug/L
Diuron	E3501	1.0	ug/L
Malathion	SW846 8270	0.10	ug/L
Metolachlor	SW846 8270	0.10	ug/L
Metribuzin	SW846 8270	0.10	ug/L
Paraquat	E3503	1.0	ug/L
Pentachlorophenol	SW846 8270	0.50	ug/L
Phorate	SW846 8270	0.10	ug/L
Prometryne	SW846 8270	0.10	ug/L
Simazine	SW846 8270	0.10	ug/L
Terbufos	SW846 8270	0.20	ug/L
Triallate	SW846 8270	0.10	ug/L
Trifluralin	SW846 8270	0.10	ug/L
Water-Dioxins and Furans			
OCDD	USEPA 1613B	0	pg/L
OCDF	USEPA 1613B	0	pg/L
1,2,3,4,6,7,8-HpCDD	USEPA 1613B	0	pg/L
1,2,3,4,6,7,8-HpCDF	USEPA 1613B	0	pg/L
1,2,3,4,7,8,9-HpCDF	USEPA 1613B	0	pg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
1,2,3,4,7,8-HxCDD	USEPA 1613B	0	pg/L
1,2,3,4,7,8-HxCDF	USEPA 1613B	0	pg/L
1,2,3,6,7,8-HxCDD	USEPA 1613B	0	pg/L
1,2,3,6,7,8-HxCDF	USEPA 1613B	0	pg/L
1,2,3,7,8,9-HxCDD	USEPA 1613B	0	pg/L
1,2,3,7,8,9-HxCDF	USEPA 1613B	0	pg/L
1,2,3,7,8-PeCDD	USEPA 1613B	0	pg/L
1,2,3,7,8-PeCDF	USEPA 1613B	0	pg/L
13C12-1,2,3,4,6,7,8-HpCDD	USEPA 1613B	1.00	%
13C12-1,2,3,4,6,7,8-HpCDF	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8-HxCDD	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8,9-HpCDF	USEPA 1613B	1.00	%
13C12-1,2,3,6,7,8-HxCDD	USEPA 1613B	1.00	%
13C12-1,2,3,6,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-1,2,3,7,8-PeCDD	USEPA 1613B	1.00	%
13C12-1,2,3,7,8-PeCDF	USEPA 1613B	1.00	%
13C12-1,2,3,7,8,9-HxCDF	USEPA 1613B	1.00	%
13C12-2,3,4,6,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-2,3,4,7,8-PeCDF	USEPA 1613B	1.00	%
13C12-2,3,7,8-TCDD	USEPA 1613B	1.00	%
13C12-2,3,7,8-TCDF	USEPA 1613B	1.00	%
13C12-OCDD	USEPA 1613B	1.00	%
2,3,4,6,7,8-HxCDF	USEPA 1613B	0	pg/L
2,3,4,7,8-PeCDF	USEPA 1613B	0	pg/L
2,3,7,8-TCDD	USEPA 1613B	0	pg/L
2,3,7,8-TCDF	USEPA 1613B	0	pg/L
37Cl4-2,3,7,8-TCDD (Cleanup)	USEPA 1613B	1.0	%
Lower Bound PCDD/F TEQ (NATO)	USEPA 1613B		pg/L
Lower Bound PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/L
Lower Bound PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/L
Mid Point PCDD/F TEQ (NATO)	USEPA 1613B		pg/L
Mid Point PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/L
Mid Point PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/L
Total-TCDD	USEPA 1613B	0	pg/L
Total-HpCDD	USEPA 1613B	0	pg/L
Total-HpCDF	USEPA 1613B	0	pg/L
Total-HxCDD	USEPA 1613B	0	pg/L
Total-HxCDF	USEPA 1613B	0	pg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Total HpCDD # Homologues	USEPA 1613B		
Total HpCDF # Homologues	USEPA 1613B		
Total HxCDD # Homologues	USEPA 1613B		
Total HxCDF # Homologues	USEPA 1613B		
Total PeCDD # Homologues	USEPA 1613B		
Total PeCDF # Homologues	USEPA 1613B		
Total-PeCDD	USEPA 1613B	0	pg/L
Total-PeCDF	USEPA 1613B	0	pg/L
Total TCDD # Homologues	USEPA 1613B		
Total TCDF # Homologues	USEPA 1613B		
Total-TCDF	USEPA 1613B	0	pg/L
Upper Bound PCDD/F TEQ (NATO)	USEPA 1613B		pg/L
Upper Bound PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/L
Upper Bound PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/L

Soil-Dioxins and Furans

% Moisture	USEPA 1613B	0.010	%
OCDD	USEPA 1613B	1.0	pg/g
OCDF	USEPA 1613B	1.0	pg/g
1,2,3,4,6,7,8-HpCDD	USEPA 1613B	0.40	pg/g
1,2,3,4,6,7,8-HpCDF	USEPA 1613B	0.40	pg/g
1,2,3,4,7,8,9-HpCDF	USEPA 1613B	0.40	pg/g
1,2,3,4,7,8-HxCDD	USEPA 1613B	0.40	pg/g
1,2,3,4,7,8-HxCDF	USEPA 1613B	0.40	pg/g
1,2,3,6,7,8-HxCDD	USEPA 1613B	0.40	pg/g
1,2,3,6,7,8-HxCDF	USEPA 1613B	0.40	pg/g
1,2,3,7,8,9-HxCDD	USEPA 1613B	0.40	pg/g
1,2,3,7,8,9-HxCDF	USEPA 1613B	0.40	pg/g
1,2,3,7,8-PeCDD	USEPA 1613B	0.40	pg/g
1,2,3,7,8-PeCDF	USEPA 1613B	0.40	pg/g
13C12-1,2,3,4,6,7,8-HpCDD	USEPA 1613B	1.00	%
13C12-1,2,3,4,6,7,8-HpCDF	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8-HxCDD	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-1,2,3,4,7,8,9-HpCDF	USEPA 1613B	1.00	%
13C12-1,2,3,6,7,8-HxCDD	USEPA 1613B	1.00	%
13C12-1,2,3,6,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-1,2,3,7,8-PeCDD	USEPA 1613B	1.00	%
13C12-1,2,3,7,8-PeCDF	USEPA 1613B	1.00	%
13C12-1,2,3,7,8,9-HxCDF	USEPA 1613B	1.00	%

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
13C12-2,3,4,6,7,8-HxCDF	USEPA 1613B	1.00	%
13C12-2,3,4,7,8-PeCDF	USEPA 1613B	1.00	%
13C12-2,3,7,8-TCDD	USEPA 1613B	1.00	%
13C12-2,3,7,8-TCDF	USEPA 1613B	1.00	%
13C12-OCDD	USEPA 1613B	1.00	%
2,3,4,6,7,8-HxCDF	USEPA 1613B	0.40	pg/g
2,3,4,7,8-PeCDF	USEPA 1613B	0.40	pg/g
2,3,7,8-TCDD	USEPA 1613B	0.40	pg/g
2,3,7,8-TCDF	USEPA 1613B	0.40	pg/g
37Cl4-2,3,7,8-TCDD (Cleanup)	USEPA 1613B	1.0	%
Lower Bound PCDD/F TEQ (NATO)	USEPA 1613B		pg/g
Lower Bound PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/g
Lower Bound PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/g
Mid Point PCDD/F TEQ (NATO)	USEPA 1613B		pg/g
Mid Point PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/g
Mid Point PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/g
Percent Solids	USEPA 1613B	0.010	%
Total-TCDD	USEPA 1613B	0.40	pg/g
Total-HpCDD	USEPA 1613B	0.40	pg/g
Total-HpCDF	USEPA 1613B	0.40	pg/g
Total-HxCDD	USEPA 1613B	0.40	pg/g
Total-HxCDF	USEPA 1613B	0.40	pg/g
Total HpCDD # Homologues	USEPA 1613B		
Total HpCDF # Homologues	USEPA 1613B		
Total HxCDD # Homologues	USEPA 1613B		
Total HxCDF # Homologues	USEPA 1613B		
Total PeCDD # Homologues	USEPA 1613B		
Total PeCDF # Homologues	USEPA 1613B		
Total-PeCDD	USEPA 1613B	0.40	pg/g
Total-PeCDF	USEPA 1613B	0.40	pg/g
Total TCDD # Homologues	USEPA 1613B		
Total TCDF # Homologues	USEPA 1613B		
Total-TCDF	USEPA 1613B	0.40	pg/g
Upper Bound PCDD/F TEQ (NATO)	USEPA 1613B		pg/g
Upper Bound PCDD/F TEQ (WHO 1998)	USEPA 1613B		pg/g
Upper Bound PCDD/F TEQ (WHO 2005)	USEPA 1613B		pg/g

Water-Plant Pigments

Chlorophyll a	EPA 445.0 ACET	0.10	ug/L
Phaeophytin a	EPA 445.0 ACET	0.10	ug/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Water-Organic Parameters			
Microcystin	ENVIROLOGIX QUANTIPLATE KIT CAT. EP022HS	0.20	ug/L
Nitrilotriacetic Acid (NTA)	EPA 430.1	0.20	mg/L
Water-Radiological Parameters			
Ra-226	EPA 903.1	0.010	Bq/L
Misc.-Miscellaneous			
Special Request	SEE SUBLET LAB RESULTS		
Special Request	SPECIAL REQUEST		

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>625-WT</td><td>Water</td><td>EPA 8270 Extractables</td><td>SW846 8270</td></tr>
<tr><td colspan="4">Aqueous samples are extracted and extracts are analyzed on GC/MSD. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.
N-nitrosodiphenylamine is reported as diphenylamine. N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. (EPA 8270D)</td></tr>
<tr><td>ACIDITY-WT</td><td>Water</td><td>Acidity (as CaCO3)</td><td>APHA 2310 B - Potentiometric Titration</td></tr>
<tr><td>ACIDS-ONT-DW-WT</td><td>Water</td><td>O.Reg 170/03 Acids</td><td>SW846 8270</td></tr>
<tr><td colspan="4">Pesticides are extracted from an aqueous sample using separate aliquots of solvent, extracts are concentrated down to a certain volume and analyzed on the GC/MSD.</td></tr>
<tr><td>ACY-PCT-VA</td><td>Water</td><td>Acidity by Automatic Titration</td><td>APHA 2310 Acidity</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.
Samples of industrial wastes, acid mine drainage, or other solutions that contain appreciable amounts of hydrolyzable metal ions such as aluminum, iron, and manganese may require hot peroxide treatment to ensure oxidation and hydrolysis of reduced forms of polyvalent cations. Acidity results may be highly variable if this procedure is not followed. Results in this report for 'Acidity (as CaCO3)' have not been peroxide treated.</td></tr>
<tr><td>AG-DRY-MICR-CCMS-VA</td><td>Tissue</td><td>Silver in Tissue by CRC ICPMS (DRY)</td><td>EPA 200.3/6020B</td></tr>
<tr><td colspan="4">This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020B).
Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.</td></tr>
<tr><td>AIR VOLUME-ED</td><td>Misc.</td><td>Air volume (L)</td><td>HYGIENE METHOD</td></tr>
<tr><td colspan="4">NOTE: When air concentrations of analytes are reported, they are based on air sampling information (air volume, sampling time, sampling flow rate) supplied by the client.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>ALK-SPEC-PCT-WT</td><td>Water</td><td>Automated Speciated Alkalinity</td><td>APHA 2320B</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.</td></tr>
<tr><td>ALK-TITR-VA</td><td>Water</td><td>Alkalinity Species by Titration</td><td>APHA 2320 Alkalinity</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.</td></tr>
<tr><td>ALK-WT</td><td>Water</td><td>Alkalinity, Total (as CaCO3)</td><td>APHA 2320B</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint.</td></tr>
<tr><td>BIM-NO2-IC-L-WT</td><td>Water</td><td>Low Level Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">This analysis is carried out procedures adapted from EPA 300.1 "Anions". Nitrite is determined by Ion Chromatography with conductivity and/or UV detection on a water sample.</td></tr>
<tr><td>BOD-WT</td><td>Water</td><td>BOD</td><td>APHA 5210 B</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.</td></tr>
<tr><td>BOD5-TG</td><td>Water</td><td>Biochemical Oxygen Demand- 5 day (TAIGA)</td><td>SM5210B</td></tr>
<tr><td>BR-IC-N-WT</td><td>Water</td><td>Bromide in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>BR-L-IC-N-VA</td><td>Water</td><td>Bromide in Water by IC (Low Level)</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>BROMATE-ONT-DW-WT</td><td>Water</td><td>Bromate in Water by LC/MS-MS</td><td>EPA 6850</td></tr>
<tr><td colspan="4">An aliquot of sample is spiked with 18O-BrO3 internal standard and analyzed by LC/MS/MS.
This test procedure does not incorporate EDA preservation for bromate. Unpreserved bromate in water is stable for at least the 28 day recommended hold time, but samples that contain free chlorine or ozone could form additional bromate after the time of sampling (EPA 300.0 and 300.1).</td></tr>
<tr><td>BTX-511-HS-WT</td><td>Soil</td><td>BTEX-O.Reg 153/04 (July 2011)</td><td>SW846 8260</td></tr>
<tr><td colspan="4">BTX is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/MS.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>BTX-511-HS-WT</td><td>Water</td><td>BTEX by Headspace</td><td>SW846 8260 (511)</td></tr>
<tr><td colspan="4">BTX is determined by analyzing by headspace-GC/MS.</td></tr>
<tr><td>BTX-HS-WT</td><td>Water</td><td>BTEX by Headspace</td><td>SW846 8260 (HEADSPACE)</td></tr>
<tr><td colspan="4">BTX is determined by analyzing by headspace-GC/MS.</td></tr>
<tr><td>CARBONS-DOC-VA</td><td>Water</td><td>Dissolved organic carbon by combustion</td><td>APHA 5310B</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.</td></tr>
<tr><td>CARBONS-TOC-VA</td><td>Water</td><td>Total organic carbon by combustion</td><td>APHA 5310B TOTAL ORGANIC CARBON (TOC)</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".</td></tr>
<tr><td>CHL/A-ACET-FLUORO-WP</td><td>Water</td><td>Chlorophyll a by fluorometry</td><td>EPA 445.0 ACET</td></tr>
<tr><td colspan="4">This analysis is done using procedures modified from EPA method 445.0. Chlorophyll a is determined by a 90 % acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.</td></tr>
<tr><td>CHLORATE-IC-WT</td><td>Water</td><td>Chlorate by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CHLORITE-IC-WT</td><td>Water</td><td>Chlorite by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CL-IC-N-VA</td><td>Water</td><td>Chloride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CL-IC-N-WT</td><td>Water</td><td>Chloride by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>CL2-FREE-WT</td><td>Water</td><td>Free Chlorine</td><td>SM 4500-CL G, EPA 330.5</td></tr>
<tr><td colspan="4">Chlorine (residual), as free or total, is analyzed using the DPD colourimetric method. The recommended hold time for these tests is 15 minutes; field testing is recommended for best results. Chlorine can be rapidly consumed by organic matter, if present, and dissipates rapidly into headspace.</td></tr>
<tr><td>CL2-TOTAL-WT</td><td>Water</td><td>Total Residual Chlorine</td><td>APHA 4500-CL G</td></tr>
<tr><td colspan="4">Chlorine (residual), as free or total, is analyzed using the DPD colourimetric method. The recommended hold time for these tests is 15 minutes; field testing is recommended for best results. Chlorine can be rapidly consumed by organic matter, if present, and dissipates rapidly into headspace.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>CN-TOT-WT</td><td>Water</td><td>Cyanide, Total</td><td>ISO 14403-2</td></tr>
<tr><td colspan="4">Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference</td></tr>
<tr><td>COD-COL-VA</td><td>Water</td><td>Chemical Oxygen Demand by Colorimetric</td><td>APHA 5220 D. CHEMICAL OXYGEN DEMAND</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.</td></tr>
<tr><td>COD-T-WT</td><td>Water</td><td>Chemical Oxygen Demand</td><td>APHA 5220 D</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.</td></tr>
<tr><td>COLOUR-APPARENT-WT</td><td>Water</td><td>Colour</td><td>APHA 2120</td></tr>
<tr><td colspan="4">Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</td></tr>
<tr><td>COLOUR-TRUE-WT</td><td>Water</td><td>Colour, True</td><td>APHA 2120C</td></tr>
<tr><td colspan="4">True Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</td></tr>
<tr><td>CRESOL-SUM-CALC-WT</td><td>Water</td><td>Total Cresols</td><td>CALCULATION</td></tr>
<tr><td colspan="4">Total cresols represents the sum of o-cresol and m&p-cresol.</td></tr>
<tr><td>DAPHNIA-LC50-48HR-NL</td><td>Water</td><td>Daphnia Magna LC50 (48 Hour) - Nautilus</td><td>EPS 1/RM/14</td></tr>
<tr><td>DIQUAT-ONT-DW-WT</td><td>Water</td><td>Diquat in Water by LC/MS-MS</td><td>E3503</td></tr>
<tr><td colspan="4">An aliquot of the sample is taken and internal standard is added. The sample is analyzed by LC/MS/MS.</td></tr>
<tr><td>DIURON-ONT-DW-WT</td><td>Water</td><td>Diuron in Drinking Water</td><td>E3501</td></tr>
<tr><td colspan="4">An aliquot of water sample is diluted 1:1 using acetonitrile and analyzed using LC/MS/MS</td></tr>
<tr><td>DOC-WT</td><td>Water</td><td>Dissolved Organic Carbon</td><td>APHA 5310B</td></tr>
<tr><td colspan="4">Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.</td></tr>
<tr><td>DUSTFALLS-INS.DM2-WT</td><td>Dustfall</td><td>Dustfalls Insoluble (mg/dm2.day)</td><td>BCMOE DUSTFALLS</td></tr>
<tr><td colspan="4">Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.</td></tr>
<tr><td>DX-1613B-HRMS-BU</td><td>Soil</td><td>Dioxins and Furans HR 1613B</td><td>USEPA 1613B</td></tr>
<tr><td colspan="4">Samples are extracted by Soxhlet. The extracts are prepared using column chromatography, reduced in volume and analyzed by isotope-dilution GC/HRMS</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>DX-R511-HRMS-BU</td><td>Water</td><td>Dioxins and Furans</td><td>USEPA 1613B</td></tr>
<tr><td>EC-PCT-VA</td><td>Water</td><td>Conductivity (Automated)</td><td>APHA 2510 Auto. Conduc.</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.</td></tr>
<tr><td>EC-SCREEN-VA</td><td>Water</td><td>Conductivity Screen (Internal Use Only)</td><td>APHA 2510</td></tr>
<tr><td colspan="4">Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.</td></tr>
<tr><td>EC-SCREEN-WT</td><td>Water</td><td>Conductivity Screen (Internal Use Only)</td><td>APHA 2510</td></tr>
<tr><td colspan="4">Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.</td></tr>
<tr><td>EC-SOLID-MF-WT</td><td>Soil</td><td>E. coli on sludge or solid</td><td>E3433</td></tr>
<tr><td colspan="4">A biosolid sub-sample is transferred into buffered dilution water blank. The sample is manually shaken and an aliquot of the sample is then filtered through the membrane filter. The filter is then placed on mFC-BCIG agar and incubated at 44.5 ± 0.2 ºC for 24 ± 2 hours. Method ID: WT-TM-1200. Results are reported on a dry weight basis. Moisture is required.</td></tr>
<tr><td>EC-WT</td><td>Soil</td><td>Conductivity (EC)</td><td>MOEE E3138</td></tr>
<tr><td colspan="4">A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>EC-WT</td><td>Water</td><td>Conductivity</td><td>APHA 2510 B</td></tr>
<tr><td colspan="4">Water samples can be measured directly by immersing the conductivity cell into the sample.</td></tr>
<tr><td>ETL-CHLORAMINES-WT</td><td>Water</td><td>Chloramines</td><td>APHA 4500-Cl B</td></tr>
<tr><td>ETL-N2N3-WT</td><td>Water</td><td>Calculate from NO2 + NO3</td><td>APHA 4110 B</td></tr>
<tr><td>ETL-NH3-UNION-WT</td><td>Water</td><td>Un-ionized ammonia</td><td>CALCULATION</td></tr>
<tr><td>F-DW-IC-WT</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>F-IC-N-VA</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>F-IC-N-WT</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>F1-511-WT</td><td>Water</td><td>F1-O.Reg 153/04 (July 2011)</td><td>MOE DECPH-E3421/CCME TIER 1</td></tr>
<tr><td colspan="4">Fraction F1 is determined by purging a volume of a ground water sample followed by GC/FID analysis.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
</table>

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

Product	Matrix	Product Description	Analytical Method Reference
F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-F4-CALC-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F1-HS-WT	Water	F1 (O.Reg.153/04)	E3421/CCME (HS)

Fraction F1 is determined by analyzing by headspace-GC/FID.

F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-511-WT	Soil	F2-F4-O.Reg 153/04 (July 2011)	CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F2-F4-511-WT	Water	F2-F4-O.Reg 153/04 (July 2011)	EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the “Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil –Tier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the “Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil – Tier 1 Method, CCME, Dec 2001.”

F2-F4-WT	Water	F2-F4 (O.Reg.153/04)	MOE DECPH-E3421/CCME TIER 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the “Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil –Tier 1 Method, CCME, 2001.

FC-MF-WT	Water	Fecal Coliforms	SM 9222D

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mFC agar and incubated at 24±2h@44.5±0.2°C. Method ID: WT-TM-1200

FLASH-PMCC-AUTO-CL	Waste	Pensky-Martens Closed Cup Flashpoint	ASTM D-93

A brass cup of specified dimensions, filled to the inner mark with test sample and fitted with a cover, is heated and the sample stirred at specified rates, using one of 3 defined procedures. An ignition source is directed into the cup at regular intervals until a flash is detected. The flash point is the lowest temperature corrected for barometric pressure, at which the vapour of the sample ignites.

GLYPHOSATE-ONT-DW-WT	Water	Glyphosate in Drinking Water	MOE E3500

This analysis is carried out using procedures adapted from ON MOE E3500 "Glyphosate". Glyphosate is determined by direct injection by LC-MS/MS on a sample that bas been derivatized.

HAA+DAL-LCMS-WT	Water	Haloacetic Acids by LC/MS-MS	MOECC E3478

An aliquot of filtered sample is fortified with formic acid and analyzed by direct inject via Electro Spray Ionization MS/MS detection using Triple Quadrupole MS/MS detector.

HAA5-SUM-CALC-WT	Water		CALCULATION

Total Haloacetic Acids 5 (HAA5) represents the sum of monobromoacetic acid, monochloroacetic acid, dibromoacetic acid, dichloroacetic acid and trichloroacetic acid. For the purpose of calculation, results less than the detection limit (DL) are treated as zero.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>HG-200.2-CVAA-WT</td><td>Soil</td><td>Mercury in Soil by CVAAS</td><td>EPA 200.2/1631E (mod)</td></tr>
<tr><td colspan="4">Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>HG-D-CVAA-VA</td><td>Water</td><td>Diss. Mercury in Water by CVAAS or CVAFS</td><td>APHA 3030B/EPA 1631E (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</td></tr>
<tr><td>HG-D-CVAA-WT</td><td>Water</td><td>Dissolved Mercury in Water by CVAAS</td><td>EPA 1631E (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>HG-DRY-MICR-CVAA-VA</td><td>Tissue</td><td>Mercury in Tissue by CVAAS (DRY)</td><td>EPA 200.3, EPA 245.7</td></tr>
<tr><td colspan="4">This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by atomic absorption spectrophotometry, adapted from US EPA Method 245.7.</td></tr>
<tr><td>HG-DUST(DM2)-CVAA-WT</td><td>Dustfall</td><td>Total Mercury in Dustfalls by CVAA</td><td>EPA SW846 7470A</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic absorption spectrophotometry.</td></tr>
<tr><td>HG-T-CVAA-VA</td><td>Water</td><td>Total Mercury in Water by CVAAS or CVAFS</td><td>EPA 1631E (mod)</td></tr>
<tr><td colspan="4">Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</td></tr>
<tr><td>HG-T-CVAA-WT</td><td>Water</td><td>Total Mercury in Water by CVAAS</td><td>EPA 1631E (mod)</td></tr>
<tr><td colspan="4">Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.</td></tr>
<tr><td>HG-T-ONT-DW-WT</td><td>Water</td><td>Mercury (Hg)</td><td>EPA 1631E (mod)</td></tr>
<tr><td>HG-TCLP-WT</td><td>Waste</td><td>Mercury (CVAA) for O.Reg 347</td><td>EPA 1631E</td></tr>
<tr><td colspan="4">This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter and analysed using atomic absorption spectrophotometry (EPA 1631E).</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>HPC-DW-MF-WT</td><td>Water</td><td>Heterotrophic Plate Count</td><td>SM 9215D</td></tr>
<tr><td colspan="4">A 1mL volume of sample is filtered through a membrane, the membrane is placed on mHPC agar and incubated for 48±2h@35±0.5°C. Method ID: WT-TM-1200</td></tr>
<tr><td>LEACH-TCLP-WT</td><td>Waste</td><td>Leachate Procedure for Reg 347</td><td>EPA 1311</td></tr>
<tr><td colspan="4">Inorganic and Semi-Volatile Organic contaminants are leached from waste samples in strict accordance with US EPA Method 1311, "Toxicity Characteristic Leaching Procedure" (TCLP). Test results are reported in leachate concentration units (normally mg/L).</td></tr>
<tr><td>MEOH-TERRACORE-WT</td><td>Misc.</td><td>Terracore MeOH Kit - Vials, corer, jar</td><td></td></tr>
<tr><td>MET-200.2-CCMS-WT</td><td>Soil</td><td>Metals in Soil by CRC ICPMS</td><td>EPA 200.2/6020B (mod)</td></tr>
<tr><td colspan="4">Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).</td></tr>
<tr><td>MET-D-CCMS-VA</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>APHA 3030B/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</td></tr>
<tr><td>MET-D-CCMS-WT</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>APHA 3030B/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>MET-D-NP-CCMS-VA</td><td>Water</td><td>Dissolved Metals in Water CRC ICPMS</td><td>EPA 6020B (mod)</td></tr>
<tr><td colspan="4">Ultra trace metals in water are analyzed by CRC ICPMS, based on US EPA Method 6020B (July 2014). This procedure is intended for pristine field-filtered acid-preserved water samples. The detection limits (LOR) for this test are based on lab instrumental analysis only, not including filtration. Due to the high probability of false positives due to filtration, it is strongly recommended that a filtration blank be analysed to aid in data interpretation.</td></tr>
<tr><td>MET-D-NP-U-CCMS-WT</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>EPA SW-846 6020A</td></tr>
<tr><td colspan="4">Ultra trace metals in water are analyzed by CRC ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. The detection limits (LOR) for this test are based on lab instrumental analysis only, not including filtration. ALS-supplied field filtration equipment does not support these LOR. Therefore, because of the high probability of false positives due to filtration, it is strongly recommended that a filtration blank be analysed to aid in data interpretation. Special bottles, preservatives and sampling procedures apply.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>MET-DRY-MICR-CCMS-VA</td><td>Tissue</td><td>Metals in Tissue by CRC ICPMS (DRY)</td><td>EPA 200.3/6020B</td></tr>
<tr><td colspan="4">This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020B).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.</td></tr>
<tr><td>MET-DUST(DM2)-MS-WT</td><td>Dustfall</td><td>Total Metals in Dustfalls by ICPMS</td><td>EPA 6020A</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by ICP-MS (EPA Method 6020A)</td></tr>
<tr><td>MET-ONT-DW-WT</td><td>Water</td><td>Drinking Water Metals</td><td>EPA 6020A</td></tr>
<tr><td>MET-T-CCMS-VA</td><td>Water</td><td>Total Metals in Water by CRC ICPMS</td><td>EPA 200.2/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</td></tr>
<tr><td>MET-T-CCMS-WT</td><td>Water</td><td>Total Metals in Water by CRC ICPMS</td><td>EPA 200.2/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>MET-T-NP-CCMS-VA</td><td>Water</td><td>Total Metals by CRC ICPMS (Undigested)</td><td>EPA 6020B (mod)</td></tr>
<tr><td colspan="4">Ultra trace metals in water are analyzed by CRC ICPMS, based on US EPA Method 6020B (July 2014). The detection limits provided can only be met for undigested samples. This procedure is intended for colorless, non-turbid, acid-preserved water samples (i.e. pristine water samples), having turbidity < 1 NTU and no odor. Where turbidity exceeds 1 NTU, and/or the sample is colored and has an odor, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.
Where turbidity is <1NTU, undigested metals are equivalent to total metals concentrations.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>MET-T-NP-U-CCMS-WT</td><td>Water</td><td>Total Metals by CRC ICPMS (Undigested)</td><td>EPA SW-846 6020A</td></tr>
<tr><td colspan="4">Ultra trace metals in water are analyzed by CRC ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for colorless, non-turbid, acid-preserved water samples (i.e. pristine water samples), having turbidity < 1 NTU and no odor. Where turbidity exceeds 1 NTU, and/or the sample is colored and has an odor, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results. Special bottles, preservatives and sampling procedures apply.</td></tr>
<tr><td>MET-TCLP-EXTRA-WT</td><td>Waste</td><td>O. Reg 347 Extra Metals on TCLP Leachate</td><td>EPA 200.8</td></tr>
<tr><td>MET-TCLP-WT</td><td>Waste</td><td>O.Reg 347 TCLP Leachable Metals</td><td>EPA 6020B</td></tr>
<tr><td colspan="4">This analysis is carried out in accordance with the extraction procedure outlined in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods Volume 1C" SW-846 EPA Method 1311, published by the United States Environmental Protection Agency (EPA). In summary, the sample is extracted at a 20:1 liquid to solids ratio for 16 to 20 hours using either extraction fluid #1 (glacial acetic acid, water and sodium hydroxide) or extraction fluid #2 (glacial acetic acid), depending on the pH of the original sample. The extract is then filtered through a 0.6 to 0.8 micron glass fibre filter. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020B).</td></tr>
<tr><td>MICROCYSTIN-WP</td><td>Water</td><td>Microcystin</td><td>ENVIROLOGIX QUANTIPLATE KIT CAT. EP022HS</td></tr>
<tr><td colspan="4">Total Microcystins (intraceller and extraceller) in aqueous matrices is determined by the Enzyme-Linked ImmunoSorbent Assay (ELISA) method.</td></tr>
<tr><td>MISC-ONT-DW-WT</td><td>Water</td><td>O.Reg 170/03 Miscellaneous Pesticides</td><td>SW846 8270</td></tr>
<tr><td colspan="4">Pesticides are extracted from an aqueous sample using separate aliquots of solvent, extracts are concentrated down to a certain volume and analyzed on the GC/MSD.</td></tr>
<tr><td>MOISTURE-MICR-VA</td><td>Tissue</td><td>Moisture in Tissue</td><td>Puget Sound WQ Authority, Apr 1997</td></tr>
<tr><td colspan="4">This analysis is carried out gravimetrically by drying the sample at <60 deg. C.</td></tr>
<tr><td>MOISTURE-WT</td><td>Soil</td><td>% Moisture</td><td>CCME PHC in Soil - Tier 1 (mod)</td></tr>
<tr><td>NDMA-ONTDW-HRMS-BU</td><td>Water</td><td>NDMA to meet Ont Reg 170/03</td><td>MOE E3388</td></tr>
<tr><td colspan="4">NDMA by modified Ont. MOE method E3388 GC/HRMS</td></tr>
<tr><td>NH3-F-VA</td><td>Water</td><td>Ammonia in Water by Fluorescence</td><td>J. ENVIRON. MONIT., 2005, 7, 37-42, RSC</td></tr>
<tr><td colspan="4">This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</td></tr>
<tr><td>NH3-F-WT</td><td>Water</td><td>Ammonia in Water by Fluorescence</td><td>J. ENVIRON. MONIT., 2005, 7, 37-42, RSC</td></tr>
<tr><td colspan="4">This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</td></tr>
<tr><td>NO2-DW-IC-WT</td><td>Water</td><td>Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>NO2-IC-WT</td><td>Water</td><td>Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO2-L-IC-N-VA</td><td>Water</td><td>Nitrite in Water by IC (Low Level)</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-DW-IC-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-IC-N-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-IC-VA</td><td>Dustfall</td><td>Dustfall Nitrate by Ion Chromatography</td><td>BC LAB MAN. - PART. - SOLUBLE - ANIONS</td></tr>
<tr><td colspan="4">The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The nitrate analysis is specifcially carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

Results are reported in units of nitrogen weight. To convert to units by weight of nitrate, multiply by 4.43.</td></tr>
<tr><td>NO3-IC-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-L-IC-N-VA</td><td>Water</td><td>Nitrate in Water by IC (Low Level)</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NTA-ONT-DW-WT</td><td>Water</td><td>NTA in Drinking Water</td><td>EPA 430.1</td></tr>
<tr><td colspan="4">NTA refers to the tri-sodium salt of nitrilotriacetic acid, N(CH2COONa)3. Zinc forms a blue-coloured complex with 2 carboxy-2-hydroxy-5-sulfoformazylbenzene (Zincon) in a solution buffered to pH 9.2. When NTA is added to the sample, the Zinc-Zincon complex is broken which reduces the absorbance in proportion to the amount of NTA present.</td></tr>
<tr><td>OGG-SF-VA</td><td>Water</td><td>Oil & Grease by Gravimetric</td><td>BCMOE (2010), EPA1664A</td></tr>
<tr><td colspan="4">The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.</td></tr>
<tr><td>OGG-SPEC-CALC-WT</td><td>Water</td><td>Speciated Oil and Grease A/V Calc</td><td>CALCULATION</td></tr>
<tr><td colspan="4">Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.</td></tr>
<tr><td>OGG-SPEC-WT</td><td>Water</td><td>Speciated Oil and Grease-Gravimetric</td><td>APHA 5520 B</td></tr>
<tr><td colspan="4">The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.</td></tr>
<tr><td>OGG-TOT-WT</td><td>Soil</td><td>Oil and Grease, Total</td><td>APHA 5520 B</td></tr>
<tr><td colspan="4">Sample is extracted with an acetone:hexane mixture and then evaporated and the resulting residue is weighed to determine the total oil and grease.</td></tr>
</table>

Met

Pro	Matrix	Product Description	Analytical Method Reference
OG	Water	Oil and Grease, Total	APHA 5520 B
	The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.		
P-T-	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
	This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.		
P-T-	Seawater	Total P in Seawater by Colour	APHA 4500-P Phosphorus
	This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.		
P-T-	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
	This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.		
PAH	Water	Phenoxyacid Herbicides by LC-MS/MS	MOE E3552
	Water samples are subjected to 0.2 µM RC filtration and analyzed by direct injection without sample preparation using liquid chromatography tandem mass spectrometry (LC-MS/MS).		
PAH	Water	O.Reg 170/03 PA Herbicides	MOE E3552
	Water samples are analyzed by direct injection without sample preparation using liquid chromatography tandem mass spectrometry (LC-MS/MS).		
PAR	Water	Paraquat in Water by LC/MS-MS	E3503
	An aliquot of the sample is taken and internal standard is added. The sample is analyzed by LC/MS/MS.		
PAR	Filter	Respirable Dust N0600	NIOSH 0600 Mod., MW MCE Filter
PH-	Water	pH	APHA 4500 H-Electrode
	Water samples are analyzed directly by a calibrated pH meter.		
PH-	Water	pH by Meter (Automated)	APHA 4500-H pH Value
	This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field.		
PH-	Soil	pH	MOEE E3137A
	A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).		

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>PH-WT</td><td>Water</td><td>pH</td><td>APHA 4500 H-Electrode</td></tr>
<tr><td colspan="4">Water samples are analyzed directly by a calibrated pH meter.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days</td></tr>
<tr><td>PHENOLS-4AAP-WT</td><td>Water</td><td>Phenol (4AAP)</td><td>EPA 9066</td></tr>
<tr><td colspan="4">An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.</td></tr>
<tr><td>PHEOA-ACET-FLUORO-WP</td><td>Water</td><td>Pheophytin a by fluorometry</td><td>EPA 445.0 ACET</td></tr>
<tr><td colspan="4">This analysis is done using procedures modified from EPA method 445.0. Pheopigments present in the sample are determined collectively as Pheophytin a by a 90% (v/v) acetone extraction followed with analysis by fluorometry using the acidification procedure.</td></tr>
<tr><td>PO4-DO-COL-WT</td><td>Water</td><td>Diss. Orthophosphate in Water by Colour</td><td>APHA 4500-P PHOSPHORUS</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</td></tr>
<tr><td>PREP-DRY/GRIND-SK</td><td>Soil</td><td>Dry and Grind</td><td></td></tr>
<tr><td>PREP-MET-DIGEST-WT</td><td>Water</td><td>Sample Prep (Digestion for Metals)</td><td></td></tr>
<tr><td>PREP-MET-FILT-WT</td><td>Water</td><td>Sample Prep (Filtration for Metals)</td><td></td></tr>
<tr><td>PREP-MICR-DIGEST-VA</td><td>Tissue</td><td>Tissue/Vegetation Micro Preparation</td><td></td></tr>
<tr><td>PSA-1-SK</td><td>Soil</td><td>Particle Size Analysis:Mini-Pipet Method</td><td>SSIR-51 Method 3.2.1</td></tr>
<tr><td colspan="4">Dry, < 2 mm soil is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. After treatment, sub-samples of the homogenized soil suspension are taken at specific times and sampling depths as determined by Stoke's Law. The dry weight of soil found in each sub-sample is used determine the silt and clay content. The sand fraction is determined by difference.
The soil texture is determined according to the CSSC soil texture triangle.</td></tr>
<tr><td>RA226-MMER-FC</td><td>Water</td><td>Ra226 by Alpha Scint, MDC=0.01 Bq/L</td><td>EPA 903.1</td></tr>
<tr><td>S2-T>H2S-CALC-WT</td><td>Water</td><td>Total Sulphide Calculated as H2S</td><td>Calculation</td></tr>
<tr><td colspan="4">This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".</td></tr>
<tr><td>SAMPLE-DISPOSAL-VA</td><td>Misc.</td><td>Sample Handling and Disposal Fee</td><td></td></tr>
<tr><td>SAMPLE-DISPOSAL-WT</td><td>Misc.</td><td>Sample Handling and Disposal Fee</td><td></td></tr>
<tr><td>SAMPLE-DISPOSAL-YL</td><td>Misc.</td><td>Sample Handling and Disposal Fee</td><td></td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>SHIPPING-LG-YL</td><td>Misc.</td><td>Subsidized shipping charge (per cooler)</td><td></td></tr>
<tr><td>SHIPPING-WT</td><td>Misc.</td><td>Shipping Charge</td><td></td></tr>
<tr><td>SIO2-T-CALC-WT</td><td>Water</td><td>Total Silicon (reported as Silica)</td><td>Calculation</td></tr>
<tr><td>SO4-IC-N-VA</td><td>Water</td><td>Sulfate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>SO4-IC-N-WT</td><td>Water</td><td>Sulfate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>SO4-IC-VA</td><td>Dustfall</td><td>Dustfall Sulfate by Ion Chromatography</td><td>BC LAB MAN. - PART. - SOLUBLE - ANIONS</td></tr>
<tr><td colspan="4">The Dustfall analysis is carried out in accordance with the B.C. Laboratory Manual method 'Particulate - Total' and 'Particulate - Soluble - Anions and Cations by Ion Chromatography'. The sulfate analysis is specifcially carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</td></tr>
<tr><td>SOLIDS-TDS-BF</td><td>Water</td><td>Total Dissolved Solids</td><td>APHA 2540C</td></tr>
<tr><td colspan="4">A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 180 +/- 2C for 1hr.</td></tr>
<tr><td>SOLIDS-TDS-WT</td><td>Water</td><td>Total Dissolved Solids</td><td>APHA 2540C</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.</td></tr>
<tr><td>SOLIDS-TSS-BF</td><td>Water</td><td>Suspended solids</td><td>APHA 2540 D-Gravimetric</td></tr>
<tr><td colspan="4">A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104 +/- 1C for a minimum of four hours or until a constant weight is achieved.</td></tr>
<tr><td>SOLIDS-TSS-WT</td><td>Water</td><td>Suspended solids</td><td>APHA 2540 D-Gravimetric</td></tr>
<tr><td colspan="4">A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104±1°C for a minimum of four hours or until a constant weight is achieved.</td></tr>
<tr><td>SPECIAL REQ-61-WP</td><td>Misc.</td><td>Special Request Inorganics Winnipeg</td><td>SPECIAL REQUEST</td></tr>
<tr><td>SPECIAL-REQ-PSA-AV</td><td>Misc.</td><td>Special Req. Activation Lab PSA in Water</td><td>SEE SUBLET LAB RESULTS</td></tr>
<tr><td>SULPHIDE-WT</td><td>Water</td><td>Sulphide (as S)</td><td>APHA 4500S2D</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.</td></tr>
<tr><td>SYRINGE-FTR-KIT-WT</td><td>Misc.</td><td>60mL syringe + 2 X 0.45 syringe filters</td><td></td></tr>
<tr><td colspan="4">In-Line filter is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringment. ALS assumes no responsibility for errors or omissions in the operation of the equipment.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>TC,EC-QT51-DW-WT</td><td>Water</td><td>Total Coliform and E. Coli</td><td>APHA 9223B</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture of hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.</td></tr>
<tr><td>TDS-VA</td><td>Water</td><td>Total Dissolved Solids by Gravimetric</td><td>APHA 2540 C - GRAVIMETRIC</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.</td></tr>
<tr><td>THM-ONT-DW-WT</td><td>Water</td><td>Trihalomethanes</td><td>SW846 8260</td></tr>
<tr><td colspan="4">Liquid samples are analyzed by headspace GC/MSD.</td></tr>
<tr><td>THM-SUM-CALC-WT</td><td>Water</td><td>Total Trihalomethanes (THMs)</td><td>CALCULATION</td></tr>
<tr><td colspan="4">Total Trihalomethanes (THMs) represents the sum of bromodichloromethane, bromoform, chlorodibromomethane and chloroform. For the purpose of calculation, results less than the detection limit (DL) are treated as zero.</td></tr>
<tr><td>THM-SUM-DW-CALC-WT</td><td>Water</td><td>Total Trihalomethanes (THMs)</td><td>CALCULATION</td></tr>
<tr><td colspan="4">Total Trihalomethanes (THMs) represents the sum of bromodichloromethane, bromoform, chlorodibromomethane and chloroform. For the purpose of calculation, results less than the detection limit (DL) are treated as zero.</td></tr>
<tr><td>THM-SUM-PPB-CALC-WT</td><td>Water</td><td>Total Trihalomethanes (THMs)</td><td>CALCULATION</td></tr>
<tr><td colspan="4">Total Trihalomethanes (THMs) represents the sum of bromodichloromethane, bromoform, chlorodibromomethane and chloroform. For the purpose of calculation, results less than the detection limit (DL) are treated as zero.</td></tr>
<tr><td>TI-DRY-MICR-CCMS-VA</td><td>Tissue</td><td>Titanium in Tissue by CRC ICPMS (DRY)</td><td>EPA 200.3/6020B</td></tr>
<tr><td colspan="4">This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020B).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.</td></tr>
<tr><td>TKN-F-VA</td><td>Water</td><td>TKN in Water by Fluorescence</td><td>APHA 4500-NORG D.</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.</td></tr>
<tr><td>TKN-F-WT</td><td>Water</td><td>TKN in Water by Fluorescence</td><td>J. ENVIRON. MONIT., 2005,7,37-42,RSC</td></tr>
<tr><td colspan="4">Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection</td></tr>
<tr><td>TOC-WT</td><td>Soil</td><td>TOC & FOC in Solids</td><td>CARTER 21.3.2</td></tr>
<tr><td colspan="4">Soil is treated with excess acidic dichromate, which reacts with the organic carbon, oxidizing it to CO2. The residual dichromate is titrated with ferrous ammonium sulphate and TOC calculated by difference.</td></tr>
</table>

Methodology

<table>
<tr><th>Product</th><th>Matrix</th><th>Product Description</th><th>Analytical Method Reference</th></tr>
<tr><td>TOC-WT</td><td>Water</td><td>Total Organic Carbon</td><td>APHA 5310B</td></tr>
<tr><td colspan="4">Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.</td></tr>
<tr><td>TROUT-LC50-96HR-NL</td><td>Water</td><td>Trout Bioassay LC50 (96 Hour) - Nautilus</td><td>EPS 1/RM/13</td></tr>
<tr><td>TSS-LOW-VA</td><td>Water</td><td>Total Suspended Solids by Grav. (1 mg/L)</td><td>APHA 2540D</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.</td></tr>
<tr><td>TSS-VA</td><td>Water</td><td>Total Suspended Solids by Gravimetric</td><td>APHA 2540 D - GRAVIMETRIC</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.</td></tr>
<tr><td>TURB-MET-WT</td><td>Water</td><td>Turbidity on preserved metals sample</td><td>APHA 2130 B</td></tr>
<tr><td colspan="4">Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.</td></tr>
<tr><td>TURBIDITY-BF</td><td>Water</td><td>Turbidity</td><td>APHA 2130 B</td></tr>
<tr><td colspan="4">Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.</td></tr>
<tr><td>TURBIDITY-ONT-DW-WT</td><td>Water</td><td>Turbidity</td><td>APHA 2130 B</td></tr>
<tr><td colspan="4">Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.</td></tr>
<tr><td>TURBIDITY-VA</td><td>Water</td><td>Turbidity by Meter</td><td>APHA 2130 Turbidity</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.</td></tr>
<tr><td>TURBIDITY-WT</td><td>Water</td><td>Turbidity</td><td>APHA 2130 B</td></tr>
<tr><td colspan="4">Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.</td></tr>
<tr><td>VH-SURR-FID-VA</td><td>Water</td><td>VH Surrogates for Waters</td><td>BC Env. Lab Manual (VH in Solids)</td></tr>
<tr><td>VOC-1,3-DCP-CALC-WT</td><td>Soil</td><td>Regulation 153 VOCs</td><td>SW8260B/SW8270C</td></tr>
</table>

Methodology

Product	Matrix	Product Description	Analytical Method Reference
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

Product	Matrix	Product Description	Analytical Method Reference
VOC-ONT-DW-WT	Water	Volatile Organics (O.Reg 170/03)	SW846 8260

Liquid samples are analyzed by headspace GC/MSD.

Product	Matrix	Product Description	Analytical Method Reference
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260

Aqueous samples are analyzed by headspace-GC/MS.

Product	Matrix	Product Description	Analytical Method Reference
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

Product	Matrix	Product Description	Analytical Method Reference
VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

Product	Matrix	Product Description	Analytical Method Reference
XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

Product	Matrix	Product Description	Analytical Method Reference
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

Appendix E – Analytical Laboratory Quality Control Protocols

Quality Control Protocols

02 January 2018

Quality control (QC) samples are introduced into batches of client samples at critical points of sample handling, preparation and analysis to demonstrate the processes are performing as expected. In general, quality control samples are considered either Instrument QC or Method QC. The following identifies the standard requirements for Quality Control at ALS, which are applicable to most tests. Many test methods use additional QC elements to monitor control over specific steps in testing processes.

Instrument QC:

Instrument QC samples demonstrate control for the instrumental portion of a method. Instrument QC requirements must be successfully met before the analysis of Method QC or samples may proceed.

- Verification of initial calibration - criteria varies with each test.
- 2nd source Calibration Verification Standard (CVS) – at minimum, with each initial calibration.
- Continuing Calibration Verification (CCV) – frequency varies by test.
- Instrument Blanks – usage and frequency varies by test.

Method QC:

Method QC samples encompass the entire method and are initiated at the earliest point of the method where appropriate. Refer to the QC Definitions below. One set of Method QC is included for each batch of up to 20 client samples. Each set includes:

- 1 Method Blank.
- 1 Sample Duplicate. *
- 1 Lab Control Sample.
- 1 Reference Material or Matrix Spike. **
- Surrogate Compounds.

* Duplicate analyses are not performed where sub-sampling is not possible – e.g. most tests for organics in water.

** Spikes and Reference Materials are unavailable for Microbiology tests. Microbiology tests utilize positive and negative controls daily in each incubator. The controls are specific to the tests performed.

Method QC must be successfully analyzed before sample results are approved. Method QC results are normally reported to ALS clients with data reports.

Data Quality Objectives (DQOs):

DQOs are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods or regulatory requirements take precedence over internal DQOs. Current DQOs are available upon request.

Detailed descriptions of how DQOs are evaluated for different types of Quality Control are described on the following pages.

Types of Quality Control – Definitions and Evaluation Protocols

Method Blank (MB) - A blank sample prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of Method Blanks provide an estimate of the within batch variability of the blank response and an indication of bias introduced by the analytical procedure.

Except in special cases (as outlined in ALS DQO summary documents) the ALS DQO for Method Blanks is for all results to lie below the Limit of Reporting (LOR).

Laboratory Sample Duplicate (DUP) - A second portion of sample taken from the same container as the sub-sample used for the primary analysis, that is analyzed independently through all steps of the laboratory's sampling and analytical procedures. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Duplicate precision is normally measured as Relative Percent Difference (RPD), where RPD = |(Result2 - Result1) / Mean| * 100. Duplicate samples should normally agree to within the ALS Precision DQO for the test and parameter (expressed as RPD), or within ± 2 x the LOR (for low level results). Refer to the ALS DQOs for Precision for specific limits for any given test.

ALS does not establish DQOs for Field Sample Duplicates. However, it is generally understood and accepted that the variability of Field Sample Duplicates is significantly more than what is observed with Laboratory Sample Duplicates.[1]

Laboratory Control Sample (LCS) - A known matrix spiked with compound(s) representative of the target analytes. An LCS is used to verify the accuracy of the laboratory's performance of the test.

LCS accuracy is calculated as the measured amount divided by the target concentration, and is normally expressed as percent recovery. LCS recoveries should normally lie within the ALS Accuracy DQOs for the test and parameter. For a low level LCS, the result should normally lie within ± 1 x the LOR of the target concentration. Refer to the ALS Accuracy DQOs for specific limits for any given test.

Reference Material (RM) – A material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. An RM is similar to an LCS, but encompasses a representative sample matrix. Similar to an LCS, an RM is used to verify the accuracy of the laboratory's performance of the test, but including the challenges of a complex sample matrix.

RM accuracy is calculated, expressed, and evaluated similarly to LCS accuracy. Refer to ALS Accuracy DQOs for specific limits for any given test.

Matrix Spike (MS) - A sample prepared by adding a known amount of a target analyte to a specified amount of a sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the sample matrix on a method's recovery efficiency.

Matrix Spike results are calculated and expressed as percent recovery, by dividing the measured result (minus any analyte contribution from the unspiked sample) by the target analyte concentration. Matrix Spike results should normally lie within the ALS Accuracy DQOs for Matrix Spikes. Matrix Spike results cannot be accurately

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[1] Depending on the type of Field Sample Duplicates being evaluated (e.g. Co-located versus Split Sample Duplicates), ALS recommends DQOs for Field Sample Duplicates that are between 1.5 – 2.0 times higher than our Laboratory Sample Duplicate DQOs. Co-located Sample Duplicates generally require higher DQOs than Split Sample Duplicates.

calculated or reported in cases where the background concentration of the test parameter in the sample is higher than the spike level.

Surrogate Compounds (SURR) – Surrogate Compounds are added to every sample where applicable (organics tests only). They are substances with properties that mimic the analyte of interest, and which are unlikely to be found in environmental samples. They are added at known concentrations to samples to establish that the analytical method has been properly performed.

Surrogate results are calculated and expressed as percent recovery, by dividing the measured result against the expected target concentration. Refer to ALS Accuracy DQOs for specific limits for any given test.

Automated Relational Checks

In addition to all our standard Quality Control checks, ALS also employs dozens of "Relational Checks", which are programmed into our Laboratory Information Systems (LIMS) to automatically highlight any situations where the expected relationships between different test parameters are violated, which can often point to errors. Such errors may originate with field sampling, or from laboratory processes, but should always be identified and pro-actively investigated.

Total versus Dissolved Metals ("D > T" Check) – One of the most important and common relational checks we do is a check for situations where Dissolved Metal concentrations significantly exceed Total Metal concentrations. By definition, this situation should not occur. However, there are a few reasons why this can occur:

i) Circumstances where Dissolved Metals slightly exceed Total Metals are expected in a small percentage of samples, simply due to normal random variability associated with sampling and testing protocols. In fact, when all metals in a test sample exist in the dissolved form, we expect that Dissolved Metals measurements will numerically exceed Total Metals measurements exactly half the time (by a small margin), simply due to random chance.

ii) Samples to be analyzed for Dissolved Metals must be filtered, which should be conducted in the field to ensure valid results. Unvalidated and uncontrolled filtration processes are a common source of low level metals contaminants. Contamination of a sample during field filtration is the most common source of significant D > T issues (ALS recommends syringe filtration in the field, using filters proven by ALS to be suitable for this task. If in-line filters are used, ALS recommends pre-rinsing with 1L of sample prior to use; smaller rinse volumes may be suitable but should be demonstrated in advance).

iii) ALS recommends the use of Field Filtration Blanks to monitor and control the filtration process, and to assist with the interpretation of any D > T issues.

iv) Field samples for Dissolved and Total Metals are normally collected independently, therefore field sampling variability is another common cause of D > T issues.

If none of the above causes can explain a situation where Dissolved Metals exceed Total Metals, then another type of error may be indicated, either with the collection of the sample in the field, or with sample containers or preservatives, or with the laboratory testing process.

ALS automatically highlights and investigates all circumstances where a Dissolved Metal result exceeds the Total Metal result by 30% RPD or more, but only if the absolute difference between the two results is greater than the sum of the Limits of Reporting (Detection Limits) of the two results.

In the case of field filtered samples where D > T, the following qualifier will be applied where no lab errors are identified upon review: *DTMF: Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants were likely introduced to dissolved sample during field filtration.* The mechanism of this relational check is derived from the ALS Duplicate DQOs for Metals in Water (20% RPD), multiplied by 1.5 to account for variability attributed to field sampling, because the dissolved and total metals tests are conducted on independent samples.

All D > T relational checks that violate the rule above are flagged internally, and are investigated by ALS before sample results will be released to our clients. Anomalous results (except those consistent with low level contamination caused by field filtration) will be re-analyzed to confirm or correct the anomaly. If results are confirmed by re-analysis, the following data qualifier is applied: *DTC: Dissolved concentration exceeds total. Results were confirmed by re-analysis.*

Other Important Relational Checks Conducted by ALS

ALS employs dozens of other relational checks to highlight anomalous relationships between test parameters. Some of more common checks include the following:

- *Total Ammonia should not exceed Total Kjeldahl Nitrogen*
- *Weak Acid Dissociable Cyanide should not exceed Total Cyanide*
- *E. coli should not exceed Fecal Coliforms*
- *Nitrate + Nitrite should not exceed Total Nitrogen*
- *Hexavalent Chromium should not exceed Total Chromium*
- *True Colour should not exceed Apparent Colour*
- *Mineral Oil and Grease should not exceed Total Oil and Grease*
- *Reactive Phosphorus should not exceed Total Phosphorus*

Quality System Protocols

19 January 2018

ALS is a global diversified testing services organization with a presence on every continent, offering a broad range of services to leading global companies.

The following summarizes standard practices routinely employed by the ALS Environmental Division in Canada. Our practices exceed accreditation requirements and have been designed to meet or exceed the needs of our customers and to give them confidence in the reliability of our test data.

ALS Canada locations hold accreditations and certifications relevant to their work and area of operation. Participation in CALA, USA DOD, NELAP, various USA state and other regional and regulatory programs is location-specific. Refer to Accreditations in the Environmental Testing Downloads section at www.alsglobal.com for information relevant to each ALS location. Alternatively, current scopes and certificates are available from your Account Manager or by contacting our Quality Department.

Additional information is available on request. Customers are invited to audit or tour ALS facilities at their convenience.

Services to Customers:

ALS cooperates closely with our customers to ensure their testing needs are understood, and allows them reasonable access to relevant work areas of the laboratories to audit our management system or to witness test work undertaken on their behalf.

All client issues are logged into our tracking system to ensure each issue is addressed completely and appropriately. Local and national oversight and initiatives ensure that identified improvements are incorporated throughout our Canadian laboratory network so that customers receive the same level of service regardless of which location performs the testing.

Documentation and Document Control:

Test methods and support procedures are documented in detail to ensure consistency of application, repeatability of test results and traceability of analyses.

Test method requirements include but are not limited to sample handling, sample storage, minimizing interference, sample preparation, reagent and standard specifications, equipment, supplies, calibration requirements, instrumental measurement procedures, quality control requirements, data quality objectives and corrective actions, calculations, reporting requirements, reference information, and hazards and their preventive measures.

Administrative support procedures are also documented where needed to ensure quality system procedures and customer services are provided in a controlled, approved manner consistent with ALS policies and client needs.

All documents are authorized prior to use, ensuring adequate technical and quality oversight.

Distribution of documents is controlled to ensure only the most recent version is available for use. Authorized documents are reviewed periodically by the ALS signing authority to ensure they continue to meet both internal ALS requirements and our customers’ needs.

Test methods and support procedures are available for client viewing on-site.

Internal Audits:

ALS Canada operates an extensive internal audit program. Audits are performed by qualified Quality Assurance and Technical staff for analytical procedures and Quality System elements. The ALS audit program ensures that procedures are implemented as intended, that test methods are scientifically defensible and technically sound, and that policies, procedures and records continue to meet the objectives of our Quality System.

Quality staff may periodically initiate unscheduled audits in response to proficiency testing program results, client feedback, requests from managers, or any other circumstance that warrants investigation.

Quality Control (QC):

ALS has established QC procedures for monitoring the validity of tests performed by our laboratories. Individual test methods specify quality control requirements, frequency of use, and Data Quality Objectives (DQOs).

The type of quality control elements used for process monitoring is dependent on the test performed, but typically includes (as appropriate): Calibration Verification Standards, Continuing Calibration Verifications, Instrument Blanks, Method Blanks, Laboratory Control Samples, Reference Materials, Matrix Spikes, Surrogate Spikes, and Internal Standards.

DQOs are established for each QC type, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal DQOs.

Test results for selected QC samples are available on test reports. Please contact your Account Manager for more information.

Refer to the ALS Quality Control Protocol handout for details on ALS QC practices.

Control Charts:

Control charts are used to provide a graphical representation of QC results and test method performance over time. Control charts graphically display DQOs as well as the statistically derived mean and ± 2 and 3 standard deviations (“sigma”) around the mean, calculated from recent historical QC results. ALS applies advanced trend monitoring algorithms to identify outliers and non-random data distributions (trends) that may indicate undesirable changes in test method performance, so the causes can be investigated and corrected.

Continuous Improvement:

ALS is committed to continuously improving our processes and services. The Quality System feeds into a continuous cycle of review, implementation, and monitoring so that improvements are actively sought and adopted where needed.

Test Data Validation and Record Retention:

ALS analytical data proceeds through several reviews prior to the release of final reports. The ALS data validation process includes test result validation, inter-parameter validation, and report validation. Test result validation involves a thorough analyst review followed by an independent peer review. Inter-parameter validation occurs when all department specific parameters for a sample are completed, and involves an overall review of test results within each sample for consistency among any related test parameters. Report validation occurs when all the requested test results for a work order are completed, and involves a review of the final report before it is sent to the customer.

ALS maintains laboratory records in a traceable manner for a minimum of five years.

Method Validation:

Customers rely on ALS to select test methods that are appropriate to meet their needs. Wherever possible, ALS references the latest versions of published standard methods developed by organizations such as American Public Health Association, United States Environmental Protection Agency, NIOSH, Environment Canada, and other international, regional or regulatory organizations or equipment manufacturers.

Method validations are conducted to confirm that our test methods are fit for their intended use. The validations are as extensive as necessary to meet the needs of the given application. The extent depends on the source of the method. Test methods are revalidated periodically to ensure continued suitability and fitness for purpose.

Method Detection Limits and Limits of Reporting:

ALS Limits of Reporting (LORs) are established using rigorous experimental and statistical procedures that begin with the determination of the Method Detection Limit (MDL) at 99% confidence. The MDL takes into account several factors, like long term Method Blanks, low level Sample Duplicates, and low level Spiked Samples. When detected at or above the MDL, ALS test results are considered to be qualitatively accurate, and a parameter can be reported with 99% confidence as being present in the sample.

$$\boxed{\mathrm{MDL} = (s_0 \times t_{n-1}) + |\mathrm{MBlk}|}$$

Where:
- s_0 = the standard deviation derived from the analysis of blank or low level samples, whichever gives a higher standard deviation,
- t_{n-1} = the Student's t-distribution with n-1 degrees of freedom for the one-sided 99% confidence interval.
- |MBlk|= the absolute value of the mean method blank.

ALS takes a conservative approach to detection limits. Our goal is to minimize false positives, because we recognize that any false positive results can be damaging for our clients. Where possible, we establish LORs at levels well-above the statistical MDL, and ideally at the LOQ_5. This improves the accuracy and precision of results near the detection limit, and reduces the chance of false positives due to sample-specific issues. At or above the LOQ_5, test results are considered to be quantitatively accurate. A reported parameter at the LOQ_5 is considered to be within 40% of the true value 95% of the time.

$$\boxed{\mathrm{LOQ}_5 = 5s_0 + |\mathrm{MBlk}|}$$

Where:
s_0 = the standard deviation used in the MDL calculation,
|MBlk | = the absolute value of the mean method blank.

The D.L. column on ALS analytical reports contains the LOR (also known as Detection Limit). The LOR may be the MDL as calculated above, or a higher value. ALS does not report LORs that are less than the calculated MDL.

Measurement Uncertainty (MU):

ALS procedures for calculating measurement uncertainty are based on accepted practices of identifying components contributing to uncertainty, compiling data that represents or includes these components, evaluating the data using appropriate statistical calculations, and reporting in a manner that prevents misunderstanding of the result. ALS follows the Type A method of calculating measurement uncertainty, however additional factors are considered to ensure the best and most complete information is derived from our evaluation of test method performance.

The ALS model describes the dependency of uncertainty on three factors. The first is a constant contribution to uncertainty attributable to s_0, the standard deviation of the method for concentrations that approach zero. The second is a constant relative uncertainty associated with higher parameter concentrations. The third is a constant contribution to uncertainty attributable to the mean long-term method blank value where it is significant. The following is the ALS equation for measurement uncertainty, using an expansion factor of k=2:

Expanded 95% Uncertainty as a Function of Concentration

$$U(c) = 2 * [\sqrt{ \{ s_0^2 + (\Theta c)^2 \} }] + |MBlk_{LT}|$$

Where:

U(c) = The expanded uncertainty at concentration c. The range c ± U(c) represents approximately the 95% confidence interval (two standard deviations).

c = Measured concentration of parameter in the sample.

s_0 = A constant contribution to standard uncertainty represented by the standard deviation at zero concentration, which is related to the method detection limit.

θ = Combined relative standard uncertainty, excluding MDL and Method Blank contributions. Theta has no units.

$|MBlk_{LT}|$ = Absolute value of the mean long-term Method Blank value, where significant (i.e. if > 1/5 s_0). [Note that the Method Blank term is not expanded because it represents a constant bias, not a variance.]

Uncertainty values obtained from this procedure must be regarded as estimates. Primarily, this is because all environmental samples are different, especially with regard to matrix effects and heterogeneity. It is our intent with this procedure to arrive at an estimate of a 95% confidence level uncertainty value that can be assumed to apply to 95% (or more) of the samples that a laboratory receives for a given test. It follows that for samples where undetected matrix effects or interferences occur, or for samples that are atypically heterogeneous, uncertainty estimates may be low.

Another aspect of reporting MU is the reporting of test method bias. Bias occurs in a small number of test methods that cannot recover 100% of a parameter from a sample. In these cases ALS reports bias along with the MU to aid with the interpretation of the test result.

Participation in Interlaboratory Proficiency Testing (PT) Programs:

ALS locations participate in an extensive variety of proficiency testing programs. Where available, formal programs operated by outside agencies are used. When not available, ALS utilizes less formal proficiency testing studies.

Root cause analysis is initiated and corrective action plans are developed when PT program results indicate a decline in test method performance.

Staff Training:

Formal training procedures are in place to ensure all staff are trained in ALS polices and analytical procedures prior to performing analyses. A staff orientation program communicates ALS polices to newly hired staff. Task specific training is performed, and analyst proficiency is demonstrated and documented before staff are authorized to work independently. On-going analyst proficiency is monitored using proficiency testing programs. Records are maintained in training logs issued to staff upon hiring.

As well, ALS Canada promotes continuing education and learning by offering advanced courses covering technical and quality functions.

Employee Agreements:

ALS protects our customers’ confidential information and proprietary rights. We require all employees to review and sign a Code of Conduct policy that communicates the ALS confidentiality policy. It is ALS practice to never disclose information about a client’s analysis to a third party without prior consent of the client, or unless compelled to by law. If we are obligated by law to disclose such information, we will inform the client prior to doing so.

ALS employees avoid involvement in activities that would diminish confidence in their competence, impartiality, judgment, or integrity by complying with the ALS Code of Conduct and Data Integrity Policy.

Sample Tracking:

Procedures are in place to track samples from receipt at the lab through to final reporting. A data management system (LIMS – Laboratory Information Management System) is used to generate a work order number for each sample submission, and a unique identification number is generated for each sample within the work order. The system is then used to assign specific analyses for the samples, to identify methods to be used, and to assign due dates for the results. The system is used to manage analytical workloads and track the status of all samples in-house. LIMS is a secure system that can only be accessed using login passwords. Controlling the level of access according to the needs of individual staff members provides additional security.

When requested by the client, legal sample protocols are implemented to ensure chain of custody defensibility in a court of law. Contact the lab for legal sampling and transportation instructions if this service is needed.

Equipment Calibration:

Measuring and testing equipment used by ALS laboratories that can have a significant effect on the accuracy or validity of test results is calibrated using established procedures. These procedures ensure traceability through an unbroken chain of calibrations or comparisons to national measurement standards. Where traceability of measurements to SI units is not possible and/or not relevant, traceability is provided by the use of certified reference materials and/or consensus standards.

Management Reviews (MR):

ALS management conducts a review at least annually to ensure our management system is effective, and continues to be suitable for our operations, and to identify necessary changes or improvements. Senior management is included in the review process for all locations.

ALS
Environmental

Quality Control Report Guide

Matrix is the substance type of the QC sample.

Common matrices are water, soil, and tissue.

The **Reference** column contains:

a) Lab sample number (L#) or work group number (WG#) of samples that were used for duplicates or matrix spikes - this information is for internal tracking purposes.

b) Test results for actual samples that were duplicated for QC purposes.

Result from analyzing the QC sample.

% Recovery is calculated for QC samples with known target values (e.g. Spikes or CRMs).

Actual (absolute) test results are reported for the second aliquot of a duplicate pair and method blanks.

A **Qualifier** is used to communicate important information about the QC sample test results.

Sample parameter qualifiers used in the report are defined near the end of the Quality Control Report.

Also refer to the *Sample Parameter Qualifier Definitions* on the next page.

Units of the QC sample test results.

Test results are reported in % recovery for samples with known target values.

Actual (absolute) concentration units are used for reporting duplicate sample and Method Blank test results.

The calculated **Relative % Difference** between duplicate pairs.

RPD is calculated as follows:
|{(Sample Result - Duplicate Result) / [Mean]}| x 100

Duplicate pairs with test results that are < 5 x LOR are reported in sample concentration units (absolute units) and are accompanied by a J qualifier.

The Control **Limit** for the QC sample (ALS Data Quality Objective (DQO)).

QC samples must fall within Control Limits or appropriate action is taken, such as reanalysis where possible, or the data is qualified.

QC samples with known target values have a range for % recovery (eg) 85-115%.

Duplicates have a ± RPD range (e.g. ± 20 RPD). The RPD is reported as an absolute value (e.g. 20 RPD).

Method Blank control limit is the parameter Detection Limit (DL), also known as the Limit of Reporting (LOR).

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-WP	**Water**							
Batch R2179887								
WG1269694-3 DUP		**L997018-4**						
Sulfate		**60.1**	**62.0**		**mg/L**	**3.1**	**20**	**21-APR-11**
WG1269674-2 LCS								
Sulfate			**100**		**%**		**85-115**	**21-APR-11**
WG1269674-1 MB								
Sulfate			**<0.50**		**mg/L**		**0.5**	**21-APR-11**
WG1269674-4 MS		**L997018-4**						
ulfate			**N/A**	**MS-B**	**%**		**-**	**21-APR-11**
G1269674-5 CVS								
ulfate			**103**		**%**		**85-115**	**21-APR-11**
G1269674-6 CRM								
lfate			**95**		**%**		**80-120**	**21-APR-11**

Test Code:
Sulfate (SO4), analyzed by Ion Chromatography (IC), in ALS Winnipeg (WP).

DUP: **Laboratory Sample Duplicate** - a second portion of sample taken from the same container as the sub-sample used for the primary analysis. Assesses variance of the total method including lab sub-sampling and analysis.

The results for this duplicate pair are 60.1 and 62.0 mg/L. The RPD is 3.1 and the control limits are ± 20 RPD.

LCS: Laboratory Control Sample – a known matrix spiked with target analytes. Verifies the accuracy of the performance of the test.

The recovery for this LCS is 100%, with control limits of 85 to 115% recovery.

MB: **Method Blank** – a blank matrix taken through the entire test method. Monitors variability of the blank response and bias of the test method.

The result for this MB is less than 0.50 mg/L. The control limit for the MB is equal to the LOR.

MS: **Matrix Spike** – a known amount of target analytes are added to a client sample. Measures the effect of the sample matrix on a method's recovery efficiency.

In this example, the recovery of the MS could not be calculated. The qualifier explains why – refer to the *Sample Parameter Qualifier Definitions*.

CVS: Calibration Verification Standard - a second source reference standard containing known concentrations of target analytes. Confirms the accuracy and stability of the calibration standards.

This CVS has a recovery of 103% and control limits of 85 to 115% recovery.

CRM/IRM: **Certified or Internal Reference Material** – a homogeneous sample whose analyte values have been well characterized.

This CRM has a 95% recovery and control limits of 80 to 120% recovery.

Quality Control Report Guide

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Legend: explains acronyms that may be used in the QC Report.

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Qualifiers: QC sample qualifiers are listed and explained here.

The three examples are common qualifiers. They explain unusual or special circumstances that pertain to the QC sample results.

Quality Control Report Guide

Parameters and sample numbers that had Hold Time exceedances are listed in this table.

Hold Times are tracked from sampling date and time to the date and time when the sample was processed in the lab.

The recommended Hold Times.

See the Notes* section for sources of recommendations.

Hold time exceedance Qualifiers are explained in the *Legend and Qualifiers Definitions* section below.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Transmittance, UV (254 nm)	1	19-APR-11 14:00	25-APR-11 08:16	48	38	hours	EHTL
pH	1	19-APR-11 14:00	10-MAY-11 09:32	0.25	499	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Explanations for the Qualifiers listed above.

See also the additional Notes below.

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L997206 were received on 21-APR-11 07:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.