

# **QUALITY ASSURANCE AND QUALITY CONTROL PLAN**



**HOPE BAY, NUNAVUT**

**MARCH 2019**

## Quality Assurance and Quality Control Plan

### Plain Language Overview:

This Plan describes the quality assurance and quality control procedures to be used at the TMAC Resources Inc. Hope Bay Project when conducting environmental sampling, analysis and reporting. This Plan outlines 1) the criteria for sample collection, preservation, documentation, transportation, and 2) data management and reporting practices associated with environmental sampling.

Hope Bay, Nunavut

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## Revisions

Revision #	Date	Section	Changes Summary	Author	Approver
0	Feb 2002	Original	Original Document	MHBL	MHBL
1	Mar 2004	Throughout	Review	MHBL	MHBL
2	Oct 2007	Throughout	Review to include NWB specific concerns	MHBL	MHBL
3	Mar 2008	Throughout	Review to include changes	HBML	HBML
4	Feb 2009	Throughout	Annual Review	HBML	HBML
5	Jan 2011	Throughout	Annual Review	HBML	HBML
6	Jun 2011	Throughout	Added ST-6a and b, ST-11 to the required sampling stations; added ST-1, ST-2, ST-4, and ST-6a and b to the current sample stations; incorporated 2BE-HOP0712 and 2BB-BOS0712 within the document	HBML	HBML
7	Jun 2012	Throughout	Added ash characterization sampling, waste oil sampling, flow meter calibration and equipment blanks. Updated photos and samples lists to reflect camp status.	HBML	HBML
8	Nov 2012	Throughout	Minor edits, updated licence numbers. No technical content changes.	HBML	HBML
9	Jan 2017	Throughout	Updated to TMAC ownership and format; revision to section regarding soil sampling to expand beyond sampling hydrocarbon contaminated soils. Included subsequent Modules A, B and C to provide details for each site and the associated water licence.	TMAC	TMAC
10	Mar 2019	Section 1.3 Section 1.4 Section 5 Section 6 Appendix D through F Module A, C, D and E	Revised Table 1-2 reference to management plans. Updated Roles and Responsibilities. Included Maxxam and Nautilus Labs in Section 5. Update to Section 6 with change from EQWin to MonitorPro database management software. Update to Appendix D (ALS CALA Certificates and Scope). Addition of Appendix E and F (Maxxam and Nautilus Labs CALA Certificates and Scope). Updated SNP Stations and Conformity tables in Modules A and C for amended 2AM-DOH1335 and renewed 2BB-BOS1727 licences. Added Modules D and E for 2BB-MAE1727 and 2AM-BOS1835.	TMAC	TMAC

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## Glossary

Term	Definition
Accuracy	A measure of the closeness of the analytical result to the true value
ALS	ALS Environmental Laboratories
CCME	Canadian Council of Ministers of the Environment
Composite Sample	Obtained by combining portions of multiple grab samples or by using specially designed automatic sampling devices. Provide a more representative sampling of heterogeneous matrices in which the concentration of the analytes of interest may vary over short periods of time and/or space
Grab Sample	An undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected
INAC	Indigenous and Northern Affairs Canada
NWB	Nunavut Water Board
Precision	A measure of the closeness with which multiple analyses of a given sample agree with each other
Quality Assurance (QA)	The system of activities designed to better ensure that quality control is done effectively
Quality Control (QC)	The use of established procedures to achieve standards of measurement for the three principal components of quality: precision, accuracy and reliability
Reliability	A measure of the frequency at which the standards of precision and accuracy are achieved
TMAC	TMAC Resources Inc.

# 1 Introduction

This Hope Bay Quality Assurance and Quality Control Plan (the Plan) for has been prepared by TMAC Resources Inc. (TMAC) in accordance with various water licences held by TMAC associated with developments throughout the Hope Bay region.

The Plan is intended primarily for use by TMAC and its contractors to ensure that best practices with respect to conducting environmental sampling, analysis and reporting are followed, and that the conditions of water licences are met.

This Plan is structured in a manner such that one document pertaining to quality assurance and quality control is approved and implemented across all TMAC Hope Bay project sites, while still addressing site- and licence-specific needs: the main document outlines TMAC's approach to conducting environmental sampling, analysis and reporting as it pertains to all TMAC Hope Bay developments; subsequent modules provide details for each site and the associated water licence. In the event of a new water licence, or an existing licence amendment, only the specific modules pertaining to that licence and site will need to be revised. This is intended for consistency and efficiency across operations and for compliance management.

## 1.1 Objectives

The main objective of this Plan is to outline a set of operating principles that, if strictly followed during sample collection and analysis, will produce data of known and legally defensible quality. Consistent with TMAC's intent to be a responsible operator, the following objectives will be applied to achieve a high level of quality assurance:

- Provide standard procedures for sample collection, preservation, documentation and transportation, to achieve precision, accuracy and reliability in data quality;
- Ensure personnel involved in sampling and analysis are trained and competent;
- Utilize high quality laboratory supplies and sampling equipment that are reliable and maintained in good working condition;
- Ensure that all chemical analyses are conducted at a certified external laboratory;
- Describe a standard process for managing analytical data results and completing internal and external reporting;
- Establish and review Data Quality Objectives (DQOs) to ensure that data required for environmental management is available;
- Implement quality control programs, based on recognized best operating practices, to assess the quality of analytical data, provide warning of unacceptable analytical or sample errors, and initiate prompt remedial action when deficiencies are identified;
- Apply these principals to all environmental samples, whether analyzed for the purpose of regulatory compliance monitoring, or for the purpose of internal environmental management.

## 1.2 Relevant Legislation and Guidance

Table 1-1 provides a summary of federal and territorial regulations governing this Plan and associated guidelines. Additional regulations and standards govern other TMAC plans which are implemented in conjunction with this Plan.

Table 1-1. List of federal and territorial regulations governing the Quality Assurance and Quality Control Plan

Regulation	Year	Governing Body	Relevance
Quality Assurance and Quality Control Guidelines For Use by Class "A" Licensees	1996	INAC Water Resources Division	Describes information to be included in the development of a QA/QC Plan
Standard Methods for the Examination of Water and Wastewater	1999		Provides procedures and methods of analysis for examination of water quality
Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites Volume I	1993	CCME	Technical support document which provides approach to sampling, analysis and data management.

## 1.3 Related Documents

The documents listed in Table 1-2 are expected to be referenced and utilized in conjunction with the QA/QC Plan.

Table 1-2. List of documents related to the Quality Assurance and Quality Control Plan

Document Title	Year	Relevance
Hope Bay Project Aquatic Effects Monitoring Plan	2018	Describes the monitoring schedule, sampling methods, analysis and determination of environmental effects, and the quality assurance and quality control procedures to be conducted in aquatic environments.
Hope Bay Project Doris-Madrid Water Management Plan	2017	Describes effluent discharge quality, monitoring programs and sampling locations associated with water management at Hope Bay.
Hope Bay Project Boston Water Management Plan	2018	Describes effluent discharge quality, monitoring programs and sampling locations associated with water management at Boston.
Hope Bay Project Groundwater Management Plan	2018	Describes monitoring schedule and analysis procedures associated with monitoring of mine groundwater.
Incinerator Management Plan	2017	Describes characterization sampling of incinerator bottom ash.
Hope Bay Project Hydrocarbon Contaminated Material Management Plan	2018	Describes sampling of soil and effluent placed in the Landfarm facility. Outlines remediation criteria for hydrocarbon contaminated soil.
Hope Bay Project Hazardous Waste Management Plan	2018	Describes waste oil and bottom ash characterization sampling.

Document Title	Year	Relevance
Hope Bay Project Waste Rock, Ore and Backfill Management Plan	2018	Describes environmental monitoring required in pollution control ponds and seep sampling programs.
Hope Bay Project, Phase 2 Doris Tailings Impoundment Area – Operations, Maintenance and Surveillance Manual	2017	Describes sample schedule, documentation and reporting required for confirmatory monitoring of tailings geochemical characterization and thermal monitoring of infrastructure associated with the TIA.
Hope Bay Project Boston Tailings Management Area – Operations, Maintenance and Surveillance Manual	2017	Describes sample schedule, documentation and reporting required for confirmatory monitoring of tailings geochemical characterization and thermal monitoring of infrastructure associated with the TMA.

## 1.4 Plan Management

In accordance with the requirements of the General Conditions (Part B) of the applicable water licences, this plan will be immediately implemented following its submission, subject to any modifications proposed by the NWB as a result of the review and approval process.

This plan will be reviewed annually and updated as necessary. Personnel responsible for implementing and updating the QA/QC Plan are identified in Table 3.

Table 1-3. Roles and Responsibilities

Role	Responsibility
VP Environmental Affairs	Overall responsibility for and implementation of this management plan; Provide the on-site resources to operate and maintain environmental sampling in accordance with this plan.
Environmental Manager	Review and update this plan as required; Ensure Environmental staff are trained in monitoring and quality assurance and quality control procedures; Support implementation of this management plan.
Environmental Supervisor	Provide training and support to environmental staff on the procedures contained in this plan; Ensure that required sampling is carried out in accordance with this plan and licence/permit requirements; Conduct regular inspections of the monitoring stations and audits of the maintenance records; Manage analytical data in accordance with this plan; Assess whether samples have met applicable regulatory standards and guidelines; Ensure sampling gear is in good working order and calibrated; Prepare and submit compliance reports to regulatory agencies.

## **2 Sample Collection in the Field**

Environmental sampling is conducted to provide information required by TMAC for effective environmental management of the site, to provide information on follow-up monitoring of previous spill sites, and to monitor regulatory compliance. It is necessary to ensure sample integrity is maintained for all samples collected whether for regulatory compliance or internal management decisions.

### **2.1 Sample Locations**

The Surveillance Network Program (SNP) is required by each water licence. The SNP defines a specific water-sampling program for the site, including sampling locations, sampling frequency and analytical parameters.

The SNP samples must always be taken at the same location and these sampling stations must be clearly identified in the field by posted signs. The location of signs and the precise location of sampling will be approved by the designated Inspector for the site. Sampling locations will be relocated as required by the water use permits or as recommended by the designated site Inspector. The appended modules provide information on the SNP stations to be monitored for each of the water licence areas.

Additional sampling sites will be added on an as needed basis in response to regulatory requirements or an identified internal monitoring need. These include samples taken on ice to compare water quality before and after a drilling effort, sites of new or previous petroleum product or chemical spills, and spring runoffs associated with construction activities. GPS coordinates of all sampling sites will be recorded using a handheld GPS and maintained on file.

### **2.2 Sample Types**

Different sample types, such as composites or grabs, can be collected at various sampling locations. Water and liquid effluent samples (i.e., natural lakes, streams, treatment ponds, process streams, sumps, effluent discharges) will generally be grab samples. Solid material samples (i.e., soil, ash, tailings solids) will usually be composite samples, although the purpose of the sampling program will dictate whether grab samples or composite samples will be used (i.e., characterization, delineation). For example, monitoring of the remediation levels in the land treatment area will usually require a composite sample within a homogenized area. Sampling hydrocarbon contaminated sites may require grab samples from various locations within the area to delineate a zone of contamination.

### **2.3 Sample Bottles**

The laboratory analytical method and the parameter of interest will dictate the size and type of bottle (i.e., glass, plastic, amber glass) to be used for the sample. All sample bottles will be prepared and supplied by the contracted laboratory. Only clean unused bottles will be used to collect all samples to limit field generated contamination or preservation errors. If there is a need for bacterial testing, the bottles must be autoclaved (sterilized) by the contracted laboratory prior to use. New powder-free nitrile gloves will be worn at all times when handling sample bottles.

Some sampling bottle types require rinsing with the water to be sampled prior to collecting the sample. The contracted laboratory can provide instruction for the type of bottle and the rinsing requirements for each analytical parameter. If the sample bottle requires rinsing, the sample bottle should be partially filled with the water to be sampled and rinsed with the cap in place three times. Rinse water will be emptied away from the sampling point so that surface water is not contaminated and sediments are not disturbed. As a general rule:

- Plastic bottles require triple rinsing
- Glass bottles should not be triple rinsed because hydrocarbons can adsorb to the glass surface and increase sample concentrations during the rinsing process
- Sample bottles that are pre-charged with preservative must not be rinsed to prevent loss of the sample preservative

Bottles should be filled to near full capacity while allowing enough room for the preservative addition and mixing. Some bottles must be filled to the indicated fill-line on the bottle. Some analytical parameter samples must be collected without leaving head-space, which means that the bottle will be filled in such a way to prevent inclusion of air or bubbles. This is very important when sampling volatile parameters (e.g., volatile organic carbon or chlorine) which may evaporate out of solution if airspace is present. Typically, the easiest way to accomplish this is to place the cap on the bottle while the bottle is submerged. This can also be accomplished by filling the bottle to form a meniscus at the top and then carefully replacing the cap to ensure no water is lost. The contracted laboratory can provide instruction for the specific bottle filling requirements for each analytical parameter.

The sample bottles necessary for the different analyses required by the water licence SNPs are provided in the Appendix B.

## **2.4 Field Sampling Log Book**

Details of all sampling activities are recorded in a field logbook. The sampler will record the sampling stations visited, the samples taken at each station, the date and time for each sample collected and the names of the individuals collecting the sample. The results of any field measurements (i.e., temperature, pH, etc.) will be recorded as well as information on sample preservation.

The sampler will also record any information that may influence the analytical results, such as weather conditions, stream flow rates, and unusual conditions at the site. Any necessary deviations from standard procedures or sampling location need to be documented and reasons for the change included in the field log book.

A scanned copy of the field log book pages should be made as soon as possible after sample collection and filed on the Environment server. This copy serves as backup in the event the log book were lost or destroyed, and as a reference for others who may need to review this data.

Field notes and the field log book are considered legal documents and should be kept legibly in permanent ink. In the event that an error is made it should be crossed out with a single line and



initialled by the one making the correction. Pages should never be removed and space or pages being left blank should be labelled with a single diagonal line and the phrase “intentionally left blank”. When filled, the field log book should be filed and retained in case of future need.

## **2.5 Sampling Methods**

The following sections discuss methods that should be used to collect samples in different sampling locations. The bottle rinsing and filling techniques described in Section 2.3 will be incorporated into each of these methods.

### **2.5.1 Streams**

The sample should be collected as close as practical to the middle of the stream, where water flows freely and is free of debris. If wading into the stream to collect the sample, the sampler should face upstream and wait to allow any sediment that may have been stirred up to settle or wash away. A sample pole may also be used to collect the sample from shoreline in situations where it is unsafe to enter the flowing stream. If a sample pole is used, the collection end of the pole will be cleaned prior to arriving at the sample location, transported to the sample site covered in a plastic bag and then rinsed in the water to be sampled prior to inserting the sample bottle into the collection end.

Ideally, the bottle will be submerged into the stream to a depth of approximately half the total stream depth to collect the sample. At minimum, the sample bottle will be submerged to approximately 10cm below the water surface. If the stream is too shallow to submerge the bottle to 10cm below the surface, care will be taken to prevent surface debris or sediments from contaminating the sample. If necessary, a smaller bottle or an individually-packaged sterile plastic syringe provided by the contract laboratory can be used to transfer water to the larger sample bottles, provided that these are rinsed as required.

### **2.5.2 Lakes and Ponds**

Surface samples from lakes and ponds should be collected using the same procedures as above. Subsequent samples should always be taken at the same location. Sample bottles should be submerged to a depth of approximately 10cm below the water surface.

Water quality samples collected at depth in lakes or ponds will be collected with a clean discrete water sampler (e.g., Niskin sampler, Go-Flo sampler), which is lowered to the required depth and triggered to trap a sample of water by releasing a messenger weight from the surface down the rope used to lower the sampler. The sampler is lowered to depth three times and rinsed with the water to be sampled before collecting the sample the fourth time it is lowered to depth.

### **2.5.3 Process Streams (Pipes, Valves and Auto Samplers)**

Some sampling of process streams may be required by the SNP and for environmental management purposes. These may be grab samples taken from a valve or pipe discharge, or composite samples collected by combining multiple grab samples or by an automated sampling system. The same principles used in natural stream sampling should be applied when collecting grab samples. Valves should be open

for at least one minute before taking the sample to help ensure that the water is representative of the process stream.

#### **2.5.4 Soil Sampling**

The location, number and depth of soil samples will depend on the purpose of the sampling program (i.e., characterization, delineation) and nature of the parameters of interest. All sampling equipment (e.g. trowel, scoop, augers) will be made of stainless steel or high density polyethylene, and will be cleaned prior to and between sample events. Powder-free nitrile gloves will be worn and gloves will be changed before each new sample is collected. Samples should be gathered from freshly exposed soil and preserved as soon as possible.

#### **2.5.5 Ash Sampling**

The monitoring, characterization and disposal of bottom ash generated through incinerating or open burning appropriate waste streams is a requirement of the water licences associated with the project. Ash is collected at intervals to be representative of all the ash and the analysis is used to determine suitability for landfill placement.

During each incinerator ash cleaning an ash sample is collected. These samples are combined together at month end into a composite which is then subsampled for analysis.

Each time ash is cleaned out of the burn pan an ash sample is collected. These samples are combined together at month end into a composite which is then subsampled and sent for analysis.

Bottom ash is analyzed for flash point, paint filter test, leachable metals, leachable mercury and leachable BTEX. Sub-samples are packed tightly into glass jars with no headspace and submitted to the contract laboratory for analysis.

#### **2.5.6 Waste Oil Sampling**

Feedstock oil to be burned in a waste oil burner must be analyzed to determine the content of metals and other substances known to exist in used oil from the lubrication of machinery components and internal combustion engines. This is a requirement of territorial guidelines, federal regulations and the water licences issued to TMAC by the NWB.

An annual supply of waste oil totes is identified and a representative sample is collected from each of the totes to create a composite which is then sent for analysis.

The samples are analyzed for glycol, PCBs, ash, flashpoint, metals, sulphur, total chlorine, heating value, viscosity, and water.

#### **2.5.7 Environmental Surveillance Monitoring**

Some of the monitoring required under the water licences does not involve collection of samples or laboratory analysis. This may include monitoring shoreline erosion or ground temperatures around

infrastructure facilities. The timely acquisition and preservation of this data provides documentation for aspects relating to how the camp is affecting the local environment. For example, if runoff from the site is not properly controlled permafrost degradation may be observed and documented. On the same note, a warming trend in a temperature monitoring station could be an early indicator of permafrost degradation. Field notes and measurements are collected for these programs and are an important part of the site environmental management.

## **2.5.8 Flow Measurements**

Seametric TX-115 Flow meters are used to measure piped water movements and discharge within the water management facilities. The calibration procedure for the Seametric TX-115 Flow meters includes testing of the flow measurement reading against a known flow to determine accuracy, adjusting the K-factor to ensure the flowmeters are within 10% and recording the information in a flowmeter calibration log. This calibration is conducted prior to deployment in the field for water management related activities.

## **2.5.9 Field Measurements**

Water temperature, electrical conductivity and pH are typically measured and recorded in the field when the sample is taken. The calibration of the meters must be verified against a known standard solution and recalibrated if necessary prior to each day's sampling activities. The calibration data is recorded in a calibration log. Additionally, the calibration of the meter should be checked against a known standard at the end of the days sampling. Any issues with the meter calibration, or discrepancies with the end of day calibration check should be noted in the field log book along with that days sampling data. Calibration check data will not be used to alter any reading taken during the day. Instead, these results may be used to help explain anomalous data.

Field measurements should be taken directly from the water body being sampled. Where this is impractical, perhaps due to high velocity of a sample stream, the measurements can be taken from a triple rinsed sample jug or pail. It is important that field meters are never introduced into sample bottles that are destined for laboratory analysis to prevent sample contamination.

# **3 Sample Handling**

## **3.1 Sample Identification**

Prior to beginning a sample event, the required sample bottles and preservatives should be gathered, prepared and organized into sample sets inside a plastic bag which should be supplied by the contract laboratory.

When sampling and sample preservation is completed, the bottles should be clearly marked with all information that the laboratory analyst will need to report the result. The following information should be included:

- Sample location (or SNP station number)
- Date of sampling
- Parameters to be analyzed
- Preservation method used
- Filtering method used
- Name or initials of sampler
- Temperature and pH (where applicable)
- Company name, and
- Property name

Prior to taking the bottles to the field, each bottle will be labelled with as many of the items above as possible using waterproof pre-printed labels. The sampling time, temperature and pH (where applicable) will be recorded on the label in the field using permanent waterproof ink

In some cases, permanent markers can be used to identify sample bottles, however these markings can be erased with wear and may not be clearly legible. Whenever possible pre-printed waterproof labels can be used to mark the sample bottles.

## 3.2 Chain of Custody Forms

A Chain-of-Custody (CoC) form has to be completed for each sample collected. Template CoC forms are saved on the Environment server. The completed form is to be filed on the server in the Laboratory Data folder. A copy of this form must also be printed, signed and sent accompanying the samples.

## 3.3 Sample Preservation

As samples cannot be delivered to the analytical laboratory within two hours of sampling, preservation may be required for some parameters to prevent chemical reactions that may affect the concentration of the parameter of interest. The samples must be preserved within two hours of sampling. Preservative must be analytical grade and must not be used after the expiry date. Expired preservative is returned to the laboratory for proper disposal. The contracted laboratory can provide instruction for the preservative requirements for each analytical parameter and will provide appropriate preservatives for parameters to be analyzed.

Samples must be kept dark and cool ( $\sim 4^{\circ}\text{C}$ ), but not frozen. Samples will be packed in a cooler with ice packs for transport and for shipment to the laboratory. Samples will be stored in a refrigerator if they will not be shipped to the laboratory immediately after sampling. Samples should be delivered to the analytical laboratory as soon as possible after collection.

The sample preservatives necessary for the different analyses required by the water licence SNPs are provided in Appendix B.

### **3.4 Transportation**

Care should be taken when packing samples for shipment. To help prevent leakage and cross contamination, sample bottles should be packed standing upright in the cooler. Sample bottles laid on their side are much more likely to leak, especially if they have other samples on top of them. When possible, samples known or suspected to have elevated contaminate levels should not be shipped together with samples expected to be clean (i.e. sewage samples not shipped in same cooler as potable water samples).

The contracted laboratory can provide details on the storage or holding time for each parameter to be analyzed (i.e. can be as little as 24 hours). Where possible, sample dates will be scheduled so that a flight is available to transport the sample to the lab within the specified holding time. In all cases, samples will be shipped to the laboratory as quickly as possible and will be labelled as “Time Sensitive, Keep Cool” to ensure proper handling during shipment.

## **4 Quality Control Samples**

There are six types of QC samples that can be collected and analyzed to verify the quality of the sample collection and analysis methods. These are described in the section below. These QC samples are analyzed for the same suite of analytical parameters as the SNP sampling station samples.

### **4.1 Travel Blanks**

Travel blanks are used to check for contamination during the movement process of samples and are subjected to the same potential sources of contamination as the samples to be analyzed. The travel blanks are prepared by the analytical laboratory with de-ionized water and appropriate preservative. The travel blank bottles are shipped to site, transported to the field, carried through the sample collection and shipped back to the laboratory with the field samples. Travel blank bottles should not be opened at any time.

### **4.2 Equipment Blanks**

Equipment blanks are collected after cleaning of field equipment and prior to sampling. De-ionized water provided by the contract laboratory is used to rinse the equipment. The field equipment is then filled with de-ionized water, and then collected and preserved in new sample bottles for the same analysis as the field samples (de-ionized water expires within six months of being produced by the laboratory; expired de-ionized water will not be used). The results from this blank sample assure adequate decontamination of the field equipment. The Niskin or other sampling equipment used to collect samples will be decontaminated prior to use.

### **4.3 Field Blanks**

Field blanks are samples of laboratory-grade de-ionized water that are subjected to the same procedures as routine field samples. Any measurement of the parameter of interest, above method detection limits, will indicate an analytical error, impurities in the laboratory distilled water supply, contaminated sample preservatives or contamination of the sample during the handling process.

Combined with the results of other QC procedures, analysis of field blanks can help identify sources of contamination and error.

A set of field blanks should be made up once each month and taken into the field when the SNP stations are sampled. New sample bottles will be rinsed as directed by the contract laboratory and filled using de-ionized water provided by the contracted laboratory (de-ionized water expires within six months of being produced by the laboratory; expired de-ionized water will not be used). The samples will be poured directly from the bottles provided by the laboratory into the sample bottles to replicate grab sample methods. The field blank set should represent all the parameters routinely analyzed at that sample location. The bottles should be preserved using the same protocol as the regular samples and submitted to the laboratory identified as field blanks.

### **4.4 Replicate Samples**

Replicate samples (sometimes referred to as duplicate samples) test precision and assure that sample results are reproducible. They are prepared by collecting two separate samples for each given analytical parameter at a given sample location. The replicate samples are collected, handled and analyzed using the same procedures applied to routine samples. The samples are also analyzed by the same analytical method in the laboratory. Replicate samples are usually used to identify sampling procedure errors.

Once per operating season, for each active SNP station, a set of duplicate samples will be taken representing as many of the routine analyses as possible. Where possible, this should be carried out in conjunction with audit sampling conducted by the designated Inspector. Replicate sampling should rotate between prescribed SNP stations.

### **4.5 Split Samples**

Two or more representative sub-samples are removed from one collected sample and analyzed separately at the laboratory. This data is used as a check of the precision of the analytical procedure employed by the laboratory and is a normal part of the laboratory QA/QC program. These can also be collected in the field by dividing a composite sample into two sets of samples. If field split samples are collected, it is common to label each sample with a different station name, to provide a blind assessment of the laboratory's analytical program.

## **4.6 Method “Spiked” Samples and Certified Standards**

The recovery of “known additions” from “spiked” samples is used as a check on the recovery of the parameter to be analyzed using a given analytical procedure. It is periodically carried out at the laboratories employed to analyze the samples and forms part of the laboratory’s normal QA/QC program.

## **5 Laboratory Analysis**

All environmental monitoring samples are submitted to an offsite analytical laboratory which is accredited by the Canadian Association for Laboratory Accreditation (CALA). Currently, TMAC uses ALS Environmental Laboratories (ALS), Maxxam Analytics and Nautilus Environmental Inc. for analyses of all environmental samples. A cover letter from ALS confirming approval of the Plan for analyses to be performed under this Licence is provided in Appendix A of this plan. The quality control protocols used by ALS are provided in Appendix C of this plan. The CALA scope and Certificates for ALS can be found in Appendix D. The CALA scope and Certificates for Maxxam Analytics can be found in Appendix E. The CALA scope and Certificates for Nautilus Environmental Inc. can be found in Appendix F.

## **6 Reporting**

All analytical results are forwarded in electronic format to TMAC’s Environmental Supervisor for filing. TMAC uses a MonitorPro electronic database to manage data and make data easily accessible. This database is maintained by the Environmental Supervisor.

After receipt, the results are screened for anomalies and/or trends, and are placed into the appropriate environmental files on the Environmental server. Results that appear to be anomalous are flagged and a review is conducted to identify potential sources of the anomaly. In some instances, the analysis is repeated. Analyses that indicate contamination or changes are subjected to further study and reported to the appropriate agencies. The environmental files are maintained on the server as a management tool for environmental risk assessment and in preparation of summary reports for the regulatory agencies and company officials. In compliance with the Surveillance Network Program, reports of analytical results for SNP samples are submitted electronically to the NWB and the Inspector within 30 days following the month in which the samples were taken. The NWB distributes the reports to other agencies and interested parties.

## 7 References

Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites Volume I: Main Report. 1993, Canadian Council of Ministers of the Environment

Protocols Manual for Water Quality Sampling in Canada. 2011, Canadian Council of Ministers of the Environment

Standard Methods for the Examination of Water and Wastewater. 1999, American Public Health Association, American Water Works Association and Water Environment Federation

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees. 1996, Indian and Northern Affairs Canada Water Resources Division and Northwest Territories Water Board.





**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

# **Appendix A – ALS QA/QC Plan Review Confirmation Letter**



8081 Lougheed Highway  
Burnaby, British Columbia V5A 1W9  
T: +1 604 253 4188  
F: +1 604 253 6700  
[www.alsglobal.com](http://www.alsglobal.com)

January 4, 2017

TMAC Resources Inc.  
Hope bay, Nunavut

**RE: APPROVAL CONFIRMATION FROM ALS ENVIRONMENTAL FOR ANALYSES PERFORMED  
UNDER THE TMAC QA/QC PLAN**

ALS Environmental has reviewed the Quality Assurance and Quality Control Plan – Appendix A – Analytical Parameters, Sample Bottles and Required Preservatives, provided to ALS by TMAC Resources.

ALS has the capability to conduct all analyses listed in Appendix A of the above referenced QA/QC plan. In addition, ALS is accredited by the Canadian Association of Laboratory Accreditation (CALA) for all analyses listed in Appendix A.

Please feel free to contact myself or Amber Springer if you require any additional information.

Sincerely,



Katherine B. Thomas, B.Sc.  
Operations Manager  
Vancouver, BC



Amber Springer, B.Sc.  
Senior Account Manager,  
Vancouver, BC



**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

## **Appendix B – Analytical Parameters, Sample Bottles and Required Preservatives**

### Analytical Parameters, Sample Bottles and Required Preservatives

SNP Monitoring Group Reference	Analytical Parameters	Measurement Units	Sample Bottle	Preservative
General (G)	pH	pH units	500 mL plastic	None
	TSS	mg/L		
Nutrients (N1)	Orthophosphate-P	mg/L		
	Nitrate-N	mg-N/L		
	Nitrite-N	mg-N/L		
Nutrients (N2)	Total Ammonia-N	mg-N/L	120 or 250 mL amber glass	1 mL of 1:3 H <sub>2</sub> SO <sub>4</sub> or 1 mL of 1:1 H <sub>2</sub> SO <sub>4</sub>
	Total Phosphate-P	mg/L		
Total Metals - Unfiltered (MT)	T-Aluminum	mg/L	60 mL, 125 mL or 250 mL plastic	0.75 mL of 1:3 HNO <sub>3</sub> , 1.5 mL of 1:3 HNO <sub>3</sub> or 3 mL of 1:3 HNO <sub>3</sub>
	T-Arsenic	mg/L		
	T-Copper	mg/L		
	T-Iron	mg/L		
	T-Nickel	mg/L		
	T-Lead	mg/L		
	T-Zinc	mg/L		
Dissolved Metals - Filtered (MT)	D-Iron	mg/L	60 mL, 125 mL or 250 mL plastic	0.75 mL of 1:3 HNO <sub>3</sub> , 1.5 mL of 1:3 HNO <sub>3</sub> or 3 mL of 1:3 HNO <sub>3</sub>
	D-Copper	mg/L		
	D-Arsenic	mg/L		
	D-Zinc	mg/L		
	D-Cadmium	mg/L		
	D-Nickel	mg/L		
Biological (B)	Biochemical Oxygen Demand	mg/L	250 or 500 mL plastic	None
	Fecal Coliforms	CFU/100 mL (colony forming units)	Sterile 250 mL plastic	Sodium Thiosulfate (precharged)
Hydrocarbons (HC)	Total Oil & Grease	mg/L	2 X 250 mL or 2 X 500 mL amber glass	0.5 mL of 1:1 HCl or 1 mL of 1:1 HCl
	Benzene	mg/L	2 X 40 mL glass	Sodium Bisulphate or Thiosulfate (precharged)
	Toluene	mg/L		
	Ethyl Benzene	mg/L		
Discharge (D)	Flow	m <sup>3</sup> /day	None, field measured	N/A
	Volume	m <sup>3</sup>		
	Duration	Day		

\*ALS methodological change. Fecal coliforms now in MPN/100mL (Most Probable Number).



**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

## **Appendix C – ALS Quality Control Protocols**



## ALS Quality Control Protocols

08 May, 2012

Quality control samples are introduced into batches of 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.

### 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.

- o Verification of initial calibration - criteria varies with each test.
- o 2<sup>nd</sup> source Calibration Verification Standard (CVS) – at minimum, with each initial calibration.
- o Continuing Calibration Verification (CCV) – frequency varies by test.
- o 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:

- o 1 Method Blank.
- o 1 Sample Duplicate. \*
- o 1 Lab Control Sample.
- o 1 Reference Material or Matrix Spike. \*\*
- o 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.

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 take precedence over internal DQOs. Current DQOs are available upon request.

Detailed descriptions of how DQOs are evaluated for different types of Quality Control samples 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  $RPD = [(Result2 - Result1) / \text{Mean}] * 100$ . Duplicate samples should normally agree to within the ALS Precision DQO for the test and parameter (expressed as RPD), or within  $\pm 2 \times$  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.<sup>1</sup>

**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 lie within  $\pm 1 \times$  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

---

<sup>1</sup> 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.





Spikes. Matrix Spike results cannot be calculated or reported in cases where the background concentration of the test parameter in the sample is too high relative to 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 concentration 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. 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 is normally done in the field. Filtration processes are a common source of low level metals contaminants. Contamination of a sample during filtration is the most common source of significant D > T issues.
- iii) Field samples for Dissolved and Total Metals are normally collected independently, so variability of the sampling process 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 20% 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.***

The mechanism of this relational check is derived from the ALS Duplicate DQOs for Metals in Water.

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. In most cases, results will be re-analyzed to confirm or correct the anomalous relationship. 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 ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

## **Appendix D – ALS CALA Certificates and Scopes**

Canadian Association  
for Laboratory Accreditation Inc.



Certificate of Accreditation

ALS Environmental (Edmonton)  
ALS Canada Ltd.  
9450-17th Ave. NW  
Edmonton, Alberta

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.: A1352  
Issued On: October 30, 2018  
Accreditation Date: January 3, 2005  
Expiry Date: April 29, 2021

  
President & CEO



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](http://www.cala.ca).



**CALA**

Canadian Association for  
Laboratory Accreditation Inc.

## CALA Directory of Laboratories

---

**Membership Number:** 1352

**Laboratory Name:** ALS Environmental (Edmonton)

**Parent Institution:** ALS Canada Ltd.

**Address:** 9450-17th Ave. NW Edmonton AB T6N 1M9

**Contact:** Ms. Sarah Stilson

**Phone:** (780) 413-5226

**Fax:** (780) 437-2311

**Email:** alsed.quality@alsglobal.com

---

**Standard:** Conforms with requirements of ISO/IEC 17025

**Clients Served:** All Interested Parties

**Revised On:** October 30, 2018

**Valid To:** April 29, 2021

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### Scope of Accreditation

**Air (Inorganic)**

Dustfall - Air [Dustfall] (120)

ED-TM-1030; modified from ALBERTA ENVIRONMENT 32020

GRAVIMETRIC

Dustfall, Fixed

Dustfall, Total

**Air (Inorganic)**

Fluoride - Air (188)

ED-TM-1028; modified from SM 4500-F- C

SELECTIVE ION ELECTRODE

Fluoride

**Air (Inorganic)**

Fluoride - Air [Filter] (219)

ED-TM-1008, NA-TM-1001; modified from NIOSH 7906

ION CHROMATOGRAPHY

Hydrogen Fluoride (as F)

**Air (Inorganic)**

Mercury - Air [Filter] (190)

ED-TP-2001, NA-TM-1005; modified from EPA 245.1 and NIOSH 6009

COLD VAPOUR AA - DIGESTION

Mercury

**Air (Inorganic)**

Metals - Air [Filter] (016)

ED-TP-2001, NA-TM-1002; modified from EPA 6020A and NIOSH 7303

ICP/MS - DIGESTION

Aluminum

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Sulfur  
Thallium  
Tin  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Air (Inorganic)**

Particulates - Air [Particulate] (223)

ED-TM-1140; modified from NIOSH 0500 and NIOSH 0600

GRAVIMETRIC

Particulates

**Air (Inorganic)**

Total Solids - Air [Impinger] (205)

ED-TM-1157; modified from EPA 5

GRAVIMETRIC

Total Solids

**Air (Organic)**

Formaldehyde - Air (221)

ED-TM-1151; modified from EPA TO-11A and NIOSH 2016

HPLC/UV - EXTRACTION

Formaldehyde

**Air (Organic)**

Gas - Air [Compressed Breathing Air] (218)

ED-TM-1144; modified from ASTM D1946 and CSA 180 and EPA 3C

GC/TCD

Nitrogen

Oxygen

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**Air (Organic)**

Hydrocarbons - Air (217)

ED-TM-1142, ED-TM-1144; modified from CSA Z180 and EPA 18

GC/FID

Carbon dioxide

Carbon monoxide

Ethane

Methane

Total Volatile Hydrocarbons (TVH): C1-C16

**Air (Organic)**

Volatile Organic Compounds (VOC) - Air (216)

ED-TM-1142; modified from EPA 018 and EPA 25C

GC/FID

Benzene

Ethylbenzene

Non-methane organic carbons

Toluene

Xylenes

**Oil (Organic)**

Polychlorinated Biphenyls (PCB) - Oil (002)

ED-TM-1104, ED-TM-1116; modified from ASTM D4059 and EPA 8082

GC/ECD - EXTRACTION

Aroclor 1016

Aroclor 1221

Aroclor 1232

Aroclor 1242

Aroclor 1248

Aroclor 1254

Aroclor 1260

Aroclor 1262

Aroclor 1268

Total PCB

**Paint (Inorganic)**

Lead - Paint (153)

ED-TM-1021, NA-TP-2004; modified from EPA 200.2 and EPA 200.7

ICP - DIGESTION

Lead

**Soil (Inorganic)**

Ammonia - Solids [Soil] (225)

ED-TM-1024, ED-TP-2019; modified from EPA 350.1 and SM 4500-NH3 and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1

COLORIMETRIC - SATURATED PASTE

Ammonia

**Solids (Inorganic)**

Anions - Solids [Soil] (176)

ED-TP-2019, NA-TM-1001; modified from EPA 300.1 and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1

ION CHROMATOGRAPHY (IC) - SATURATED PASTE

Chloride

Nitrate

Nitrate-N

Nitrite

Sulphate

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

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**Solids (Inorganic)**

Asbestos - Solids [Bulk] (222)

ED-TM-1152; modified from EPA 600/R-93/116 and NIOSH 9002

POLARIZED LIGHT MICROSCOPY (PLM)

Bulk Asbestos

**Solids (Inorganic)**

Barium - Solids [Soil] (172)

ED-TM-1021, ED-TM-1055; modified from EPA 200.7 and SSSA PART 3, 1996, PG 202

ICP - FUSION

Barium

**Solids (Inorganic)**

Chloride - Solids [Saturated Paste, Soil] (168)

ED-TM-1032, ED-TP-2019; modified from SM 4500-CL- E and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1

COLORIMETRIC

Chloride

**Solids (Inorganic)**

Conductivity - Solids [Soil] (156)

ED-TM-1004, ED-TP-2019; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1 and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.3

SATURATED PASTE, METER

Conductivity

**Solids (Inorganic)**

Density - Solids [Soil] (170)

ED-TM-1025; modified from ASTM D5057

GRAVIMETRIC

Density

**Solids (Inorganic)**

Extractable Barium - Solids [Soil] (182)

ED-TM-1021, ED-TM-1051; modified from BARITE WASTE GUIDELINES

ICP - EXTRACTION

Barium

**Solids (Inorganic)**

Grain Size - Solids [Soil] (028)

ED-TM-1014; modified from ASTM D422-63

SIEVING

PSA% >75um

**Solids (Inorganic)**

Hexavalent Chromium - Solids [Soil] (148)

ED-TM-1023; modified from EPA 3060A

IC-ALKALINE DIGESTION

Chromium

**Solids (Inorganic)**

Hot Water Soluble Boron - Solids [Soil] (145)

ED-TM-1021, ED-TM-1040; modified from KEREN 1996 METHODS OF SOIL ANALYSIS

ICP - EXTRACTION

Boron

**Solids (Inorganic)**

Mercury - Solids [Soil] (164)

NA-TM-1005, NA-TP-2004; modified from EPA 200.2 and EPA 245.1

COLD VAPOUR AA - DIGESTION

Mercury

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The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Solids (Inorganic)**

**Metals - Solids [Soil] (023)**

NA-TM-1002, NA-TP-2004; modified from EPA 200.2 and EPA 6020

ICP/MS - DIGESTION

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  
Sulfur  
Thallium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

**Oil and Grease - Solids [Soil] (029)**

ED-TM-1131; modified from SM 5520

GRAVIMETRIC - EXTRACTION

Oil and Grease

**Solids (Inorganic)**

**Paint Filter - Solids [Paint, Soil] (231)**

ED-TM-1042; EPA 9095A

FILTRATION

Paint Filter (Free Liquid)

**Solids (Inorganic)**

**Particle Size Analysis (PSA) - Solids [Soil] (110)**

ED-TM-1010; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 55.3

PARTICLE SIZE

% clay

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% Sand
Silt
<b>Solids (Inorganic)</b>
Percent Moisture - Solids [Soil] (179)
ED-TM-1200; modified from ASTM D2216-80
GRAVIMETRIC
Percent Moisture
<b>Solids (Inorganic)</b>
Percent Saturation - Solids [Soil] (169)
ED-TP-2019; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1
GRAVIMETRIC
Percent Saturation
<b>Solids (Inorganic)</b>
pH - Solids [Soil] (099)
ED-TM-1003, ED-TP-2019; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1 and
SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 16.2
SATURATED PASTE, METER
pH
<b>Solids (Inorganic)</b>
pH - Solids [Soil] (100)
ED-TM-1003; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 16.2
EXTRACTION, METER
pH (1:1)
pH (1:2)
<b>Solids (Inorganic)</b>
pH - Solids [Soil] (163)
ED-TM-1015; modified from SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 16.3
1:2 CaCl <sub>2</sub> EXTRACTION - METER
pH (1:2): CaCl <sub>2</sub>
<b>Solids (Inorganic)</b>
Salinity - Solids [Soil] (160)
ED-TM-1021, ED-TP-2019; modified from EPA 200.7 and SOIL SAMPLING & METHODS OF ANALYSIS,
CARTER 15.2.1
ICP (SATURATED PASTE)
Boron
Calcium
Magnesium
Potassium
Sodium
Sulfur
Sulphate
<b>Solids (Inorganic)</b>
Sulfate - Solids (173)
ED-TM-1046, NA-TM-1001; modified from CSA A23.2
IC - DIGESTION
Sulfate
<b>Solids (Organic)</b>
Alkanolamines - Solids [Soil] (210)
ED-TM-1155; modified from "QUANTITATIVE ANALYSIS OF AMINO ACIDS" T. NASHOLM, G. SANDLBERG, &
A. ERICSSON. J. CHROMATOGRAM. 396:225-236 (1987)
HPLC - EXTRACTION
DEA (Diethanolamine)

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DIPA (Diisopropanolamine)  
MEA (Monoethanolamine)  
MIPA (Monoisopropanolamine)

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (154)

NA-TM-1102, NA-TP-2102; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 8260

GC/MS - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
o-xylene  
Toluene

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (155)

NA-TM-1102, NA-TP-2102; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 5021 and EPA 8260

GC/FID - HEADSPACE

F1: C6-C10  
VH: C6-C10

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (158)

NA-TM-1100, NA-TP-2100; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD

GC/FID - EXTRACTION TUMBLER

F2: C10-C16  
F3: C16-C34  
F4: C34-C50

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (171)

NA-TM-1100, NA-TP-2100; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD

GRAVIMETRIC - TUMBLER

F4: Gravimetric

**Solids (Organic)**

Phenols - Solids [Soil] (077)

ED-TM-1113; modified from EPA 3540 and EPA 8270

GC/MS - EXTRACTION

2-Chlorophenol  
2-Methylphenol (o-Cresol)  
2-Nitrophenol  
2,3-Dichlorophenol  
2,3,4-Trichlorophenol  
2,3,4,5-Tetrachlorophenol  
2,3,4,6-Tetrachlorophenol  
2,3,5-Trichlorophenol  
2,3,5,6-Tetrachlorophenol  
2,3,6-Trichlorophenol  
2,4 + 2,5-Dichlorophenol  
2,4-Dimethylphenol  
2,4-Dinitrophenol  
2,4,5-Trichlorophenol  
2,4,6-Trichlorophenol  
2,6-Dichlorophenol  
3-Chlorophenol

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3-Methylphenol (m-Cresol)  
3,4-Dichlorophenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Chloro-3-methyl phenol  
4-Chlorophenol  
4-Methylphenol (p-Cresol)  
4-Nitrophenol  
4,6-Dinitro-2-methylphenol  
Pentachlorophenol  
Phenol

**Solids (Organic)**

Polychlorinated Biphenyls (PCB) - Solids [Soil] (097)

ED-TM-1102, ED-TM-1116; modified from EPA 3550 and EPA 8082

GC/ECD - EXTRACTION

Aroclor 1016  
Aroclor 1221  
Aroclor 1232  
Aroclor 1242  
Aroclor 1248  
Aroclor 1254  
Aroclor 1260  
Aroclor 1262  
Aroclor 1268  
Total PCB

**Solids (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Solids (227)

NA-TM-1105, NA-TP-2103; modified from EPA 3570 and EPA 8270

GC/MS - EXTRACTION

1-Methylnaphthalene  
2-Methylnaphthalene  
Acenaphthene  
Acenaphthylene  
Anthracene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b,i) 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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**Solids (Organic)**

Volatile Organic Compounds (VOC) - Solids [Soil] (167)

ED-TM-1111, NA-TM-1102, NA-TP-2102; modified from EPA 5021 and EPA 8260

GC/MS - HEADSPACE/EXTRACTION

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  
1,3,5-Trimethylbenzene  
1,4-dichlorobenzene  
2-Chlorotoluene  
2-Hexanone (MBK)  
2,2-Dichloropropane  
4-Chlorotoluene  
Acetone (2-Propanone)  
Acrylonitrile  
Benzene  
Bromobenzene  
Bromochloromethane  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon disulfide  
Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
cis-1,4-Dichloro-2-butene  
Dibromomethane  
Dichlorodifluoromethane  
Dichloromethane  
Ethyl alcohol  
Ethyl methacrylate  
Ethylbenzene  
Ethylene Dibromide  
Hexachlorobutadiene

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Isopropylbenzene  
m/p-xylene  
Methyl Ethyl Ketone  
Methyl iodide  
Methyl isobutyl Ketone  
Methyl t-butyl ether  
n-Butylbenzene  
n-Propylbenzene  
o-xylene  
p-Isopropyltoluene  
sec-Butylbenzene  
Styrene  
tert-Butylbenzene  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
trans-1,4-Dichloro-2-butene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl chloride

**Swab (Inorganic)**

Mercury - Solids [Swab] (211)  
ED-TP-2004, NA-TM-1005; modified from EPA 245.1 and EPA 3050B  
COLD VAPOUR AA - DIGESTION  
Mercury

**Swab (Inorganic)**

Metals - Solids [Swab] (201)  
ED-TP-2004, NA-TM-1002; modified from EPA 200.2 and EPA 6020  
ICP/MS - EXTRACTION  
Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Tin  
Vanadium

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## Zinc

### Swab (Organic)

Polychlorinated Biphenyls (PCB) - Solids [Swab] (202)

ED-TM-1102, ED-TM-1116; modified from EPA 3550 and EPA 8082

GC/ECD - EXTRACTION

Aroclor 1016

Aroclor 1221

Aroclor 1232

Aroclor 1242

Aroclor 1248

Aroclor 1254

Aroclor 1260

Aroclor 1262

Aroclor 1268

Total PCB

### Waste (Inorganic)

Flashpoint - Waste (055)

ED-TM-1012; modified from ASTM 93-D

PENSKE-MARTEN CLOSED CUP

Flashpoint

### Waste (Inorganic)

Mercury - Waste (162)

NA-TM-1005, NA-TM-1700; modified from EPA 1311 (PREPARATION) and EPA 245.1 (ANALYSIS) and EPA 245.7 (ANALYSIS)

COLD VAPOUR AA - DIGESTION - TCLP

Mercury

### Waste (Inorganic)

Metals - Waste (141)

NA-TM-1002, NA-TM-1700, NA-TP-2001; modified from EPA 1311 (PREPARATION) and EPA 6020 (ANALYSIS)

ICP/MS - TCLP

Antimony

Arsenic

Barium

Beryllium

Boron

Cadmium

Chromium

Cobalt

Copper

Iron

Lead

Nickel

Selenium

Silver

Thallium

Uranium

Vanadium

Zinc

Zirconium

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**Waste (Inorganic)**

Specific Gravity - Waste (174)  
ED-TM-1025; modified from ASTM D5057  
GRAVIMETRIC  
Specific Gravity

**Waste (Organic)**

BTEX - Waste (135)  
ED-TP-2005, NA-TM-1102; modified from EPA 1311 (PREPARATION) and EPA 8260B (ANALYSIS)  
GC/MS - TCLP  
Benzene  
Ethylbenzene  
m,p-Xylene  
o-Xylene  
Toluene

**Water (Inorganic)**

Acidity - Water (206)  
ED-TM-1049; modified from SM 2310  
TITRATION  
Acidity

**Water (Inorganic)**

Acidity - Water (212)  
ED-TM-1049; modified from SM 2310  
TITRATION - POTENTIOMETRIC  
Acidity

**Water (Inorganic)**

Acidity - Water (229)  
ED-TM-1026; modified from SM 2310  
TITRIMETRIC  
Acidity

**Water (Inorganic)**

Alkalinity - Water (004)  
ED-TM-1026; modified from SM 2320 B  
TITRIMETRIC  
Alkalinity (pH 4.5)  
Alkalinity (pH 8.3)

**Water (Inorganic)**

Ammonia - Water (178)  
ED-TM-1016; modified from SM 4500-NH3  
COLORIMETRIC  
Ammonia

**Water (Inorganic)**

Ammonia - Water (213)  
ED-TM-1024; modified from EPA 350.1  
COLORIMETRIC  
Ammonia

**Water (Inorganic)**

Anions - Water (005)  
NA-TM-1001; modified from EPA 300.1  
ION CHROMATOGRAPHY  
Bromide  
Chloride  
Fluoride

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Nitrate  
Nitrite  
Sulfate

**Water (Inorganic)**

Biochemical Oxygen Demand (BOD) - Water (013)  
ED-TM-1007, ED-TM-1037; modified from SM 5210 B  
D.O. METER  
BOD (5 day)  
BOD<sub>u</sub> (ultimate)  
CBOD (5 day)

**Water (Inorganic)**

Carbon - Water (118)  
ED-TM-1002; modified from SM 5310 B  
IR - COMBUSTION  
Inorganic Carbon  
Organic Carbon  
Total Carbon

**Water (Inorganic)**

Chemical Oxygen Demand (COD) - Water (051)  
ED-TM-1009; modified from SM 5220 D  
COLORIMETRIC - DIGESTION  
COD

**Water (Inorganic)**

Chlorine - Water (123)  
ED-TM-1036; modified from SM 4500-CL A and SM 4500-CL F and SM 4500-CL G  
COLORIMETRIC  
Free Chlorine  
Total Chlorine

**Water (Inorganic)**

Colour - Water (152)  
ED-TM-1038; modified from SM 2120 A and SM 2120 C  
SPECTROPHOTOMETRIC  
True Colour

**Water (Inorganic)**

Colour - Water (199)  
ED-TM-1052; modified from SM 2120 A and SM 2120 C  
COLORIMETRIC  
True Colour

**Water (Inorganic)**

Conductivity - Water (006)  
ED-TM-1026; modified from SM 2510 B  
CONDUCTIVITY METER  
Conductivity (25°C)

**Water (Inorganic)**

Dissolved Metals - Water (007)  
NA-TM-1002, NA-TP-2002; modified from EPA 6020  
ICP/MS  
Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium

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Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Dissolved Oxygen - Water (214)  
ED-TM-1054; modified from SM 4500-O  
TITRATION  
Dissolved Oxygen

**Water (Inorganic)**

Hexavalent Chromium - Water (035)  
ED-TM-1023; modified from SM 3500-CR C  
ION CHROMATOGRAPHY  
Hexavalent Chromium

**Water (Inorganic)**

Mercury - Water (149)  
NA-TM-1005; modified from EPA 245.1 and EPA 245.7  
COLD VAPOUR AA, COLD OXIDATION  
Mercury

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**Water (Inorganic)**

Microtox - Water (161)  
NA-TM-1400; modified from AER D50  
BIOLUMINESCENCE  
Microtox IC50 (15 min)

**Water (Inorganic)**

Oil and Grease - Water (038)  
ED-TM-1132; modified from SM 5520 A and SM 5520 B and SM 5520 F  
GRAVIMETRIC  
Total Oil and Grease

**Water (Inorganic)**

Oil and Grease - Water (159)  
ED-TM-1133; modified from SM 5520 C and SM 5520 F  
INFRA-RED  
Hydrocarbon Oil and Grease  
Total Oil and Grease

**Water (Inorganic)**

pH - Water (015)  
ED-TM-1026; modified from SM 4500-H+ A and SM 4500-H+ B  
pH METER  
pH

**Water (Inorganic)**

Phosphate - Water (084)  
ED-TM-1031; modified from SM 4500-P  
COLORIMETRIC  
Phosphate

**Water (Inorganic)**

Phosphate - Water (183)  
ED-TM-1018; modified from SM 4500-P  
COLORIMETRIC - TECHNICON  
Phosphate

**Water (Inorganic)**

Phosphorus - Water (011)  
ED-TM-1031; modified from SM 4500-P B and SM 4500-P E  
COLORIMETRIC - DIGESTION  
Total Dissolved Phosphorus  
Total Phosphorus

**Water (Inorganic)**

Phosphorus - Water (119)  
ED-TM-1031, ED-TP-2006; modified from SM 4500 A and SM 4500 B and SM 4500 E  
COLORIMETRIC  
Inorganic Phosphorus

**Water (Inorganic)**

Phosphorus - Water (184)  
ED-TM-1018; modified from SM 4500-P B and SM 4500-P E  
COLORIMETRIC - TECHNICON  
Total Dissolved Phosphorus  
Total Phosphorus

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**Water (Inorganic)**

Phosphorus - Water (224)

ED-TM-1018; SM 4500-P

COLORIMETRIC - TECHNICON

Inorganic Phosphorus

**Water (Inorganic)**

Reactive Silica - Water (200)

ED-TM-1053; modified from SM 4500-SIO2 A and SM 4500-SIO2 E

COLORIMETRIC

Reactive Silica

**Water (Inorganic)**

Solids - Water (012)

ED-TM-1005; modified from SM 2540 A and SM 2540 B and SM 2540 C and SM 2540 D and SM 2540 E

GRAVIMETRIC

Fixed Suspended Solids

Total Dissolved Solids

Total Suspended Solids

Volatile Suspended Solids

**Water (Inorganic)**

Sulphide - Water (033)

ED-TM-1001; modified from SM 4500-S2- A and SM 4500-S2- D and SM 4500-S2- E

COLORIMETRIC

Sulphide

**Water (Inorganic)**

Total Kjeldahl Nitrogen (TKN) - Water (010)

ED-TM-1017, NA-TM-1006; modified from EPA 351.2

COLORIMETRIC - DIGESTION

Dissolved Kjeldahl Nitrogen

Total Kjeldahl Nitrogen

**Water (Inorganic)**

Total Metals - Water (082)

NA-TM-1002, NA-TP-2001; modified from EPA 6020 and SM 3030 E

ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Cesium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

Magnesium

Manganese

Molybdenum

Nickel

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Phosphorus	
Potassium	
Rubidium	
Selenium	
Silicon	
Silver	
Sodium	
Strontium	
Sulphur	
Tellurium	
Thallium	
Thorium	
Tin	
Titanium	
Tungsten	
Uranium	
Vanadium	
Zinc	
Zirconium	
<b>Water (Inorganic)</b>	
Turbidity - Water (078)	
ED-TM-1011; modified from SM 2130 A and SM 2130 B	
TURBIDIMETRIC	
Turbidity	
<b>Water (Inorganic)</b>	
UV Absorbance and Transmittance - Water (230)	
ED-TM-1058; modified from SM 5910 B	
SPECTROPHOTOMETRIC	
UV Absorbance	
UV Transmittance	
<b>Water (Microbiology)</b>	
Coliforms - Water (196)	
NA-TM-1300; modified from SM 9223 B	
MOST PROBABLE NUMBER (QUANTI-TRAY)	
Escherichia coli (E. coli)	
Total Coliforms	
<b>Water (Microbiology)</b>	
Fecal (Thermotolerant) Coliforms - Water (197)	
NA-TM-1300; modified from SM 9223 B	
MOST PROBABLE NUMBER (QUANTI-TRAY)	
Fecal (Thermotolerant) Coliforms	
<b>Water (Microbiology)</b>	
Heterotrophic Plate Count (HPC) - Water (198)	
NA-TM-1300; modified from SM 9215 E	
MOST PROBABLE NUMBER (QUANTI-TRAY)	
Heterotrophic Plate Count (HPC)	
<b>Water (Organic)</b>	
Alkanolamines - Water (209)	
ED-TM-1155; modified from "QUANTITATIVE ANALYSIS OF AMINO ACIDS" T. NASHOLM, G. SANDLBERG, & A. ERICSSON. J. CHROMATOGRAM. 396:225-236 (1987)	
HPLC - EXTRACTION	
DEA (Diethanolamine)	
DIPA (Diisopropanolamine)	

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MEA (Monoethanolamine)  
MIPA (Monoisopropanolamine)

**Water (Organic)**

Base Neutral Extractables - Water (117)

ED-TM-1124; modified from EPA 3510 and EPA 8270

GC/MS - EXTRACTION

1,2,3-Trichlorobenzene

1,2,4-Trichlorobenzene

2-Chloronaphthalene

2,4-Dinitrotoluene

2,6-Dinitrotoluene

Hexachlorobenzene

Hexachlorobutadiene

Hexachlorocyclopentadiene

Hexachloroethane

Pentachlorobenzene

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (075)

NA-TM-1112; modified from EPA 3511

GC/FID - EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

Total Extractable Hydrocarbons (TEH): C11-C30

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (165)

NA-TM-1102; modified from EPA 5021 and EPA 8260

GC/FID - HEADSPACE

F1: C6-C10

Volatile Hydrocarbons (VH): C6-C10

**Water (Organic)**

Phenols - Water (076)

ED-TM-1114; modified from EPA 3510 and EPA 8270

GC/MS - EXTRACTION

2-Chlorophenol

2-Methylphenol (o-Cresol)

2-Nitrophenol

2,3-Dichlorophenol

2,3,4-Trichlorophenol

2,3,4,5-Tetrachlorophenol

2,3,4,6-tetrachlorophenol

2,3,5-Trichlorophenol

2,3,5,6-Tetrachlorophenol

2,3,6-Trichlorophenol

2,4 + 2,5-Dichlorophenol

2,4-Dimethylphenol

2,4-Dinitrophenol

2,4,5-Trichlorophenol

2,4,6-trichlorophenol

2,6-Dichlorophenol

3-Chlorophenol

3-Methylphenol (m-Cresol)

3,4-Dichlorophenol

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3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Chloro-3-methyl phenol  
4-Chlorophenol  
4-Methylphenol (p-Cresol)  
4-Nitrophenol  
4,6-Dinitro-2-methylphenol  
Pentachlorophenol  
Phenol

**Water (Organic)**

Phenols - Water (228)

ED-TM-1057; modified from EPA 9066

COLORIMETRIC

Total Phenolics

**Water (Organic)**

Polyaromatic Hydrocarbons (PAH) - Water (226)

NA-TM-1112, NA-TP-2019; modified from EPA 3511 and EPA 8270D

GC/MS - MICROEXTRACTION

1-Methylnaphthalene

2-Methylnaphthalene

Acridine

Benzo(e)pyrene

Perylene

Quinoline

**Water (Organic)**

Resin and Fatty Acids - Water (020)

ED-TM-1106; modified from ALBERTA ENVIRONMENT 129.0

GC/MS - EXTRACTION

12-Chlorodehydroabietic acid

12,14-Dichlorodehydroabietic Acid

14-Chlorodehydroabietic acid

9,10-Dichlorostearic acid

Abietic acid

Arachidic acid

Dehydroabietic acid

Isopimaric acid

Levopimaric acid

Linoleic acid

Linolenic acid

Myristic acid

Neoabietic acid

Oleic acid

Palmitic acid

Palustric acid

Pimaric acid

Sandaracopimaric acid

Stearic acid

**Water (Organic)**

Resin and Fatty Acids - Water (132)

ED-TM-1106; modified from ALBERTA ENVIRONMENT 129.0

GC/MS - EXTRACTION (RFA-Low ED)

12-Chlorodehydroabietic acid

12,14-Dichlorodehydroabietic Acid

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14-Chlorodehydroabietic acid  
9,10-Dichlorostearic acid  
Abietic acid  
Arachidic acid  
Dehydroabietic acid  
Isopimaric acid  
Levopimaric acid  
Linoleic acid  
Linolenic acid  
Myristic acid  
Neobietic acid  
Oleic acid  
Palmitic acid  
Palustric acid  
Pimaric acid  
Sandaracopimaric acid  
Stearic acid

#### Water (Organic)

Volatile Organic Compounds (VOC) - Water (166)  
NA-TM-1102; modified from EPA 5021 and EPA 8260  
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  
1,3,5-Trimethylbenzene  
1,4-dichlorobenzene  
2-Chlorotoluene  
2-Hexanone (MBK)  
2,2-Dichloropropane  
4-Chlorotoluene  
Acetone (2-Propanone)  
Acrylonitrile  
Benzene  
Bromobenzene  
Bromochloromethane  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon disulfide

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Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
cis-1,4-Dichloro-2-butene  
Dibromomethane  
Dichlorodifluoromethane  
Dichloromethane  
Ethyl alcohol  
Ethyl methacrylate  
Ethylbenzene  
Ethylene Dibromide  
Hexachlorobutadiene  
Isopropylbenzene  
m/p-xylene  
Methyl Ethyl Ketone  
Methyl iodide  
Methyl isobutyl Ketone  
n-Butylbenzene  
n-Propylbenzene  
Naphthalene  
o-xylene  
p-Isopropyltoluene  
sec-Butylbenzene  
Styrene  
tert-Butylbenzene  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
trans-1,4-Dichloro-2-butene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

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## Canadian Association for Laboratory Accreditation Inc.



### Certificate of Accreditation

ALS Environmental (Vancouver)  
ALS Canada Ltd.  
8081 Lougheed Highway  
Suite 100  
Burnaby, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
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 8 January 2009).



Accreditation No.: A1719  
Issued On: November 4, 2016  
Accreditation Date: January 3, 2005  
Expiry Date: May 5, 2019

  
President & CEO



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](http://www.cala.ca).



**CALA**  
Canadian Association for  
Laboratory Accreditation Inc.

## CALA Directory of Laboratories

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**Membership Number:** 1719  
**Laboratory Name:** ALS Environmental (Vancouver)  
**Parent Institution:** ALS Canada Ltd.  
**Address:** 8081 Lougheed Highway Suite 100 Burnaby BC V5A 1W9  
**Contact:** Ms. Helenita Franco  
**Phone:** (604) 253-4188  
**Fax:** (604) 253-6700  
**Email:** quality.vancouver@ALSGlobal.com

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**Standard:** Conforms with requirements of ISO/IEC 17025  
**Clients Served:** All Interested Parties  
**Revised On:** December 12, 2018  
**Valid To:** June 11, 2021

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### Scope of Accreditation

#### Air (Inorganic)

Dustfall - Air [Dustfall] (227)

VA-TM-1039; ASTM D1739-98 and BC MOE LABORATORY MANUAL

GRAVIMETRIC

Fixed Dustfall

Total Dustfall

Total Insoluble Dustfall

Total Soluble Dustfall

#### Air (Inorganic)

Mercury - Dustfall (271)

NA-TM-1005, NA-TP-2012, VA-TP-2063; modified from BC MOE LABORATORY MANUAL and EPA 1631E  
COLD VAPOUR AAS - DIGESTION

Mercury

#### Air (Inorganic)

Metals - Air [Dustfall] (224)

NA-TM-1002, NA-TP-2007, VA-TP-2063; modified from BC MOE LABORATORY MANUAL and EPA 6020B  
ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

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Cobalt  
Copper  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Thallium  
Tin  
Uranium  
Vanadium  
Zinc

#### Air (Inorganic)

Total Particulates - Air [Filter, Particulate] (035)

VA-TM-1041; modified from ASTM D2009-65 and BC WORKERS COMPENSATION BOARD STANDARDS (BCWCB) 1150

GRAVIMETRIC

Respirable Dust

Total Particulate

#### Air (Organic)

Volatile Organic Compounds (VOC) - Air (206)

VA-TM-1109; modified from EPA TO-17

GC/MS

1,1-Biphenyl  
1,1-Dichloroethane  
1,1-Dichloroethylene  
1,1-Dichloropropylene  
1,1,1-Trichloroethane  
1,1,1,2-Tetrachloroethane  
1,1,2-Trichloroethane  
1,1,2-Trichlorotrifluoroethane  
1,1,2,2-Tetrachloroethane  
1,2-Dibromo-3-chloropropane (DBCP)  
1,2-Dibromoethane  
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-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trimethylbenzene  
1,4-Dichlorobenzene  
2-Butanone (Methyl ethyl ketone, MEK)

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2-Chlorophenol  
 2-Chlorotoluene  
 2-Hexanone (MBK)  
 2-Propanol  
 2,2-Dichloropropane  
 4-Chlorotoluene  
 4-Isopropyltoluene  
 4-Methyl-2-pentanone (MIBK)  
 Acetone  
 Benzene  
 Bromobenzene  
 Bromochloromethane  
 Bromodichloromethane  
 Bromoform  
 Bromomethane  
 Carbon disulfide  
 Carbon tetrachloride  
 Chlorobenzene  
 Chloroethane  
 Chloroform  
 Chloromethane  
 cis-1,2-Dichloroethylene  
 cis-1,3-Dichloropropylene  
 Cyclohexane  
 Decane  
 Dibromochloromethane  
 Dibromomethane  
 Dichlorodifluoromethane  
 Dichloromethane (Methylene Chloride)  
 Ethyl acetate  
 Ethylbenzene  
 Hexachlorobutadiene  
 Isopropylbenzene  
 m,p-Xylene  
 Methyl t-butyl ether (MTBE)  
 Methylcyclohexane  
 n-Butylbenzene  
 n-Heptane  
 n-Hexane  
 n-Octane  
 n-Propylbenzene  
 Naphthalene  
 o-Xylene  
 sec-Butylbenzene  
 Styrene  
 tert-Butylbenzene  
 Tetrachloroethylene  
 Toluene  
 trans-1,2-Dichloroethylene  
 trans-1,3-Dichloropropene  
 Trichloroethylene  
 Trichlorofluoromethane  
 Vinyl chloride

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#### **Air (Organic)**

Volatile Organic Compounds (VOC) - Air (207)

VA-TM-1109; modified from EPA TO-17

GC/FID

F1: C6-C10

F2: C10-C16

Total Volatile Organic Compounds (TVOC): >C10-C12

Total Volatile Organic Compounds (TVOC): >C12-C16

Total Volatile Organic Compounds (TVOC): >C6-C8

Total Volatile Organic Compounds (TVOC): >C8-C10

Volatile Hydrocarbons (VH): C6-C13

#### **Dust (Inorganic)**

Soluble Anions - Dustfall (255)

NA-TM-1001, VA-TM-1039; modified from BC MOE LABORATORY MANUAL and EPA 300.0 and SM 4110

ION CHROMATOGRAPHY

Chloride

Nitrate

#### **Food**

Arsenic Speciation - Food [Egg, Fresh Fruit, Meat, Processed Food, Vegetables] (236)

NA-TM-1002, NA-TP-2007, VA-TM-1082; modified from CFIA SOM-DAR-CHE-053-04 and EPA 6020A

HPLC - ICP/MS

Arsenate (As(V))

Arsenite (As(III))

Arsenobetaine (AsB)

Arsenocholine (AsC)

Dimethyl arsinic acid (DMA)

Monomethyl arsenate (MMA)

#### **Food (Inorganic)**

Methyl mercury - Seafood (272)

NA-TM-1002, VA-TM-1088; modified from FDA METHOD 4.8

HPLC - ICP/MS

Methyl Mercury

#### **Oil (Organic)**

Total Polychlorinated Biphenyls (PCB) - Oil (080)

VA-TM-1118, VA-TP-2116; modified from EPA 3620C and EPA 3660B and EPA 3665A and EPA 600/4-81-045 and EPA 8082A

GC/ECD

Aroclor 1242

Aroclor 1248

Aroclor 1254

Aroclor 1260

PCB-1016

PCB-1221

PCB-1232

PCB-1262

PCB-1268

Total PCB

#### **Paint (Inorganic)**

Lead - Paint (261)

NA-TM-1002, NA-TP-2004; modified from EPA 200.2 and EPA 6020B

ICP/MS - DIGESTION

Lead

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**Seawater (Inorganic)**

Dissolved Metals - Water [Seawater] (118)

NA-TM-1002, NA-TP-2002, NA-TP-2007, VA-TM-1076; modified from EPA 200.8 and PUGET SOUND PROTOCOLS

ICP/MS - EXTRACTION/FILTRATION

Cadmium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Nickel  
Uranium  
Zinc

**Seawater (Inorganic)**

Dissolved Metals - Water [Seawater] (204)

NA-TP-2002, VA-TM-1068, VA-TP-2074; modified from EPA 200.8 and SM 3030 B

HI RESOLUTION ICP/MS-Filtration

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

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Tungsten  
Uranium  
Vanadium  
Yttrium  
Zinc  
Zirconium

**Seawater (Inorganic)**

Total Metals - Water [Seawater] (205)

NA-TP-2001, VA-TM-1068, VA-TP-2074; modified from EPA 200.8 and SM 3030 E

HI RESOLUTION ICP/MS-Digestion

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gallium  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Rhenium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Yttrium  
Zinc  
Zirconium

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**Seawater (Inorganic)**

Total Metals - Water [Seawater] (222)

NA-TM-1002, NA-TP-2001, NA-TP-2007, VA-TM-1076; modified from EPA 6020B and PUGET SOUND PROTOCOLS

ICP/MS - EXTRACTION/DIGESTION

Cadmium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Nickel  
Uranium  
Zinc

**Soil (Inorganic)**

Acidity - Soil (257)

VA-TM-1053, VA-TM-1074; modified from MEND REPORT 1.20.1 and SM 2320 B  
TITRIMETRIC - SHAKEFLASK EXTRACTION

Acidity

**Soil (Inorganic)**

Alkalinity - Soil (258)

VA-TM-1053, VA-TM-1074; modified from MEND REPORT 1.20.1 and SM 2320 B  
TITRIMETRIC - SHAKEFLASK EXTRACTION

Alkalinity

**Soil (Inorganic)**

Anions - Leachates (256)

NA-TM-1001, VA-TM-1078; modified from BC MOE LABORATORY MANUAL and EPA 300.0 and SM 4110  
ION CHROMATOGRAPHY (IC) - FIXED RATIO EXTRACTION

Chloride  
Chloride  
Sulfate  
Sulphate

**Soil (Inorganic)**

Leachable Anions - Solids [Soil] (244)

NA-TM-1001, VM-TM-1074; modified from EPA 300.1 and MEND REPORT 1.20.1  
IC - SHAKEFLASK EXTRACTION

Bromide  
Chloride  
Fluoride  
Nitrate as Nitrogen  
Nitrite as Nitrogen  
Sulfate

**Soil (Inorganic)**

Leachable Metals - Solids [Soil] (247)

NA-TM-1002, NA-TP-2007, VA-TM-1074; modified from EPA 6020B and MEND REPORT 1.20.1  
ICP/MS - SHAKEFLASK EXTRACTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron

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Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Thallium  
Tin  
Uranium  
Vanadium  
Zinc

**Soil (Inorganic)**

pH - Solids [Soil] (250)

VA-TM-1074; modified from MEND REPORT 1.20.1 and SM 4500-H

pH METER-Shake flask Extraction

pH

**Soil (Microbiology)**

Fecal (Thermotolerant) Coliforms - Solids [Soil] (245)

VA-TM-1200; modified from EPA 1680

MOST PROBABLE NUMBER

Fecal (Thermotolerant) Coliforms

**Solids (Inorganic)**

Acid Volatile Sulphide (AVS) - Solids [Soil] (230)

VA-TM-1021; modified from EPA 821-R-91-100

COLORIMETRIC - EXTRACTION

Acid Volatile Sulfides

**Solids (Inorganic)**

Anions - Solids [Soil] (148)

NA-TM-1001, VA-TP-2066; modified from EPA 300.1 and SM 4110 B and SOIL SAMPLING & METHODS OF ANALYSIS CHAPTER 15

IC-SATURATED EXTRACTION

Bromide

Chloride

Fluoride

Nitrate-N

Nitrite

Sulphate

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**Solids (Inorganic)**

Conductivity - Solids [Soil] (147)

VA-TM-1053, VA-TP-2066; modified from SM 2510 B and SOIL SAMPLING & METHODS OF ANALYSIS  
CHAPTER 15

METER - SATURATION EXTRACTION

Conductivity

**Solids (Inorganic)**

Cyanide - Solids [Soil] (213)

NA-TM-1003, VA-WI-3019; modified from BC MOE LABORATORY MANUAL and ISO 14403 and ON MOECC  
E3015 and SM 4500-CN- I

AUTO COLOR - DISTILLATION-EXTRACTION

Cyanide (SAD)

Cyanide (WAD)

**Solids (Inorganic)**

Cyanide - Solids [Soil] (214)

NA-TM-1003, VA-WI-3019; modified from ASTM 7237 and BC MOE LABORATORY MANUAL and ON MOECC  
E3015

AUTO COLOR/GAS DIFFUSION-EXTRACTION

Cyanide, Free

**Solids (Inorganic)**

Flashpoint - Waste (264)

VA-TM-1090; modified from ASTM D93-15

PENSKE-MARTEN CLOSED CUP

Flashpoint

**Solids (Inorganic)**

Leachable Mercury - Soil (270)

NA-TM-1005, NA-TP-2012, VA-TM-1074; modified from MEND REPORT 1.20.1

COLD VAPOUR AA - SPECTROMETRIC SHAKE FLASK EXTRACTION

Mercury

**Solids (Inorganic)**

Leachable Mercury - Waste (267)

NA-TM-1005, NA-TP-2012, VA-TM-1071; modified from BC MOE ENVIRONMENTAL MANAGEMENT ACT  
HAZARDOUS WASTE REGULATION (EMA/HWR) and EPA 1631E

CVAAS-MELP EXTRACTION

Mercury

**Solids (Inorganic)**

Leachable Mercury - Waste (268)

NA-TM-1005, NA-TM-1700, NA-TP-2012; modified from EPA 1311 (PREPARATION) and EPA 1631E  
(ANALYSIS)

COLD VAPOUR AA - TCLP EXTRACTION

Mercury

**Solids (Inorganic)**

Leachable Metals - Solids (121)

VA-TM-1066, VA-TM-1071, VA-TP-2072; modified from BC MOE ENVIRONMENTAL MANAGEMENT ACT  
HAZARDOUS WASTE REGULATION (EMA/HWR) and EPA 6010D

ICP/OES- MLEP EXTRACTION

Arsenic

Barium

Boron

Cadmium

Chromium

Copper

Lead

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Selenium  
Silver  
Uranium  
Zinc

**Solids (Inorganic)**

Leachable Metals - Solids (122)

NA-TM-1700, VA-TM-1066, VA-TP-2072; modified from EPA 1311 (PREPARATION) and EPA 6010D (ANALYSIS)

ICP/OES - EXTRACTION - TCLP

Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Nickel  
Selenium  
Silver  
Thallium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Leachable Metals - Solids [Soil] (235)

NA-TM-1002, NA-TM-1700, NA-TP-2007; modified from BC PROTOCOL 13 (ANALYSIS) and EPA 1311 (PREPARATION) and EPA 6020B (ANALYSIS)

ICP/MS - Extraction - TCLP

Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Nickel  
Selenium  
Silver  
Thallium  
Uranium  
Vanadium

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Zinc  
Zirconium

**Solids (Inorganic)**

Mercury - Soil (269)

NA-TM-1005, NA-TP-2004, NA-TP-2012; modified from BC MOE LABORATORY MANUAL, SALM (PREPARATION) and EPA 1631E (ANALYSIS) and EPA 200.2 (ANALYSIS)  
COLD VAPOUR AAS - DIGESTION

Mercury

**Solids (Inorganic)**

Metals - Solids [Soil] (152)

NA-TM-1002, NA-TP-2004, NA-TP-2007; modified from BC MOE LABORATORY MANUAL, SALM (PREPARATION) and EPA 200.2 (ANALYSIS) and EPA 6020B (ANALYSIS)  
ICP/MS - DIGESTION

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  
Thallium  
Tin  
Titanium  
Uranium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Metals - Solids [Soil] (153)

VA-TM-1066, VA-TP-2066, VA-TP-2072; modified from EPA 6010D and SOIL SAMPLING & METHODS OF ANALYSIS CHAPTER 15  
ICP/OES - SATURATION EXTRACTION

Calcium  
Magnesium  
Potassium

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Sodium
<b>Solids (Inorganic)</b>
Methyl Mercury - Solids [Soil] (173)
VA-TM-1062; modified from EPA 1630
P&T - GC - CVAFS - EXTRACTION
Methylmercury
<b>Solids (Inorganic)</b>
Moisture - Solids [Soil] (089)
NA-TM-1200; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD
GRAVIMETRIC
Percent Moisture
<b>Solids (Inorganic)</b>
Oil and Grease - Solids [Soil] (239)
VA-TM-1125; modified from BC MOE LABORATORY MANUAL
GRAVIMETRIC - EXTRACTION
Mineral Oil and Grease
Oil and Grease
<b>Solids (Inorganic)</b>
Paint Filter - Soil, Waste (262)
VA-TM-1055; modified from EPA 9095B
FILTRATION
Paint Filter (Free Liquid)
<b>Solids (Inorganic)</b>
Percent Saturation - Solids [Saturated Paste] (149)
VA-TP-2066; modified from SOIL SAMPLING & METHODS OF ANALYSIS CHAPTER 15
SATURATION EXTRACTION
Percent Saturation
<b>Solids (Inorganic)</b>
pH - Solids [Soil] (120)
VA-TM-1078, VA-TP-2066; modified from SM 4500-H+ B and SOIL SAMPLING & METHODS OF ANALYSIS
CHAPTER 15
METER - SATURATION EXTRACTION
pH
<b>Solids (Inorganic)</b>
pH - Solids [Soil] (169)
VA-TM-1078; modified from BC MOE LABORATORY MANUAL and SM 4500-H+ B
METER - FIXED RATIO EXTRACTION
pH
<b>Solids (Inorganic)</b>
Simultaneously Extracted Metals (SEM) - Solids [Soil] (228)
NA-TM-1005, NA-TP-2011, NA-TP-2012, VA-TM-1021; modified from EPA 1631E and EPA 821-R-91-100
CVAFS - SEM EXTRACTION
Mercury
<b>Solids (Inorganic)</b>
Simultaneously Extracted Metals (SEM) - Solids [Soil] (229)
VA-TM-1021, VA-TM-1066, VA-TP-2072; modified from EPA 6010D and EPA 821-R-91-100
ICP/OES - SEM EXTRACTION
Arsenic
Cadmium
Copper
Lead
Nickel

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## Zinc

### Solids (Inorganic)

Waste Oil - Solids (123)

VA-TM-1111; BC MOE LABORATORY MANUAL  
GRAVIMETRIC - EXTRACTION

Waste Oil Content

### Solids (Organic)

Extractable Hydrocarbons - Solids [Soil] (184)

NA-TM-1106, NA-TP-2106; modified from BC MOE LABORATORY MANUAL and EPA 3570  
GC/FID - EXTRACTION (COLD SHAKE)

EPH C10-C19

EPH C10-C19 (sg)

EPH C19-C32

EPH C19-C32 (sg)

### Solids (Organic)

Glycols - Solids [Soil] (156)

VA-TM-1113; modified from EPA 8015B  
GC/FID - EXTRACTION

1,2-Propylene glycol

Diethylene glycol

Ethylene glycol

Triethylene glycol

### Solids (Organic)

Organochlorine (OC) Pesticides - Solids [Soil] (079)

VA-TM-1121, VA-TP-2117; modified from EPA 3540C and EPA 3630C and EPA 3660B and EPA 8081B  
GC/ECD - EXTRACTION

2,4'-DDD

2,4'-DDE

2,4'-DDT (o,p'-DDT)

4,4'-DDD

4,4'-DDE

4,4'-DDT (p,p'-DDT)

Aldrin

alpha-BHC

beta-BHC

cis-Chlordane (alpha)

cis-Nonachlor

delta-BHC

Dieldrin

Endosulfan I

Endosulfan II

Endosulfan Sulfate

Endrin

gamma-BHC (Lindane)

Heptachlor

Heptachlor epoxide

Methoxychlor

Mirex

Oxychlordane

trans-Chlordane

trans-Nonachlor

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**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (189)

NA-TM-1100, NA-TP-2100; modified from ALBERTA ENVIRONMENT INTERPRETATION, SEPT 2003 and CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD (DEC 2000 NO. 1310)

GC/FID - TUMBLER EXTRACTION

F2: C10-C16

F3: C16-C34

F4: C34-C50

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (190)

NA-TM-1100; modified from ALBERTA ENVIRONMENT INTERPRETATION, SEPT 2003 and CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD (DEC 2000 NO. 1310)

GRAVIMETRIC - TUMBLER EXTRACTION

F4: Gravimetric

F4G-SG: Gravimetric Heavy Hydrocarbons - Silica

**Solids (Organic)**

Phenols - Solids [Soil] (071)

VA-TM-1122, VA-TP-2113; modified from EPA 3570 and EPA 8270D and KNAPP 1979

GC/MS - EXTRACTION

2-Chlorophenol

2,3-Dichlorophenol

2,3,4-Trichlorophenol

2,3,4,5-Tetrachlorophenol

2,3,4,6-Tetrachlorophenol

2,3,5-Trichlorophenol

2,3,5,6-Tetrachlorophenol

2,3,6-Trichlorophenol

2,4-Dichlorophenol + 2,5-Dichlorophenol

2,4-Dimethylphenol

2,4,5-Trichlorophenol

2,4,6-Trichlorophenol

2,6-Dichlorophenol

3-Chlorophenol

3,4-Dichlorophenol

3,4,5-Trichlorophenol

3,5-Dichlorophenol

4-Chloro-3-methyl phenol

4-Chlorophenol

m-Cresol

o-Cresol

p-Cresol

Pentachlorophenol

Phenol

**Solids (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Solids [Soil] (185)

NA-TM-1106, NA-TP-2103; modified from EPA 3570 and EPA 8270D

GC/MS - EXTRACTION (COLD SHAKE)

2-Methylnaphthalene

Acenaphthene

Acenaphthylene

Anthracene

Benzo (a) anthracene

Benzo (a) pyrene

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Benzo (b,i) fluoranthene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Phenanthrene  
Pyrene  
Quinoline

**Solids (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Solids [Soil] (203)

NA-TM-1105, NA-TP-2103; modified from EPA 3570 and EPA 8270D

GC/MS - EXTRACTION (SHORT COLD SHAKE)

2-Methylnaphthalene  
Acenaphthene  
Acenaphthylene  
Anthracene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b,i) fluoranthene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Phenanthrene  
Pyrene

**Solids (Organic)**

Total Polychlorinated Biphenyls (PCB) - Solids [Soil] (112)

VA-TM-1119, VA-TP-2116; modified from EPA 3570 and EPA 3620C and EPA 3660B and EPA 3665A and EPA 8082A

GC/ECD - EXTRACTION

Aroclor 1242  
Aroclor 1248  
Aroclor 1254  
Aroclor 1260  
PCB-1016  
PCB-1221  
PCB-1232  
PCB-1262  
PCB-1268  
Total PCB

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**Solids (Organic)**

Volatile Hydrocarbons (VH) - Solids [Soil] (202)

NA-TM-1102, NA-TP-2102; modified from BC MOE LABORATORY MANUAL and CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 5021A

GC/FID - HEADSPACE

F1: C6-C10

VH: C6-C10

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Solids (263)

NA-TM-1102, VA-TM-1126; modified from EPA 1311 (PREPARATION) and EPA 8260C (ANALYSIS)

GC/MS - HEADSPACE - TCLP

1,1-Dichloroethene

1,2-Dichlorobenzene

1,2-Dichloroethane

1,4-Dichlorobenzene

Bromodichloromethane

Bromoform

Carbon tetrachloride

Chlorobenzene

Chlorodibromomethane

Chloroform

Ethylbenzene

m&p-xylenes

Methyl ethyl ketone

Methylene chloride

o-Xylene

Tetrachloroethylene

Toluene

Trichloroethylene

Vinyl chloride

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Solids [Soil] (201)

NA-TM-1102, NA-TP-2102; 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

1,1,2-Trichloroethane

1,1,2,2-Tetrachloroethane

1,2-Dichlorobenzene

1,2-Dichloroethane

1,2-Dichloropropane

1,2,4-Trimethylbenzene

1,3-Dichlorobenzene

1,3,5-Trimethylbenzene

1,4-Dichlorobenzene

4-Isopropylbenzene

Benzene

Bromodichloromethane

Bromoform

Carbon Tetrachloride

Chlorobenzene

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Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Cumene (Isopropylbenzene)  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl t-butyl ether  
n-Propylbenzene  
Naphthalene  
o-xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl chloride

**Swab (Organic)**

Total Polychlorinated Biphenyls (PCB) - Solids [Swab] (249)

VA-TM-1120, VA-TP-2116; modified from EPA 3620C and EPA 3660B and EPA 3665A and EPA 8082A

GC/ECD - EXTRACTION

PCB-1016

PCB-1221

PCB-1232

PCB-1242

PCB-1248

PCB-1254

PCB-1260

PCB-1262

PCB-1268

**Tissue (Inorganic)**

Ashfree - Tissue (259)

VM-TM-1051; modified from SM 10300

GRAVIMETRIC

Ash-free weight

**Tissue (Inorganic)**

Lipid Content - Tissue (241)

VA-TM-1112; modified from EPA 3570 and EPA 8290A

GRAVIMETRIC

Lipid Content

**Tissue (Inorganic)**

Methyl Mercury - Tissue (172)

VA-TM-1062; modified from EPA 1630

P&T - GC - CVAFS - DIGESTION

Methylmercury

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**Tissue (Inorganic)**

Moisture - Tissue (090)

VA-TM-1087; modified from PUGET SOUND PROTOCOLS

GRAVIMETRIC

Moisture %

**Tissue (Inorganic)**

Selenium Speciation - Tissue (253)

NA-TM-1002, NA-TP-2007, VA-TM-1085; CFIA METHOD SOM-DAR CHE-053-04

HPLC - ICP/MS

Selenium (IV)

Selenium (VI)

SelenoMethionine

**Tissue (Inorganic)**

Total Mercury - Tissue (266)

NA-TM-1005, NA-TP-2006, NA-TP-2012; modified from EPA 1631E and EPA 200.3

COLD VAPOUR AA - SPECTROMETRIC

Mercury

**Tissue (Inorganic)**

Total Metals - Tissue (100)

NA-TM-1002, NA-TP-2006, NA-TP-2007; modified from EPA 200.3 and EPA 6020A

ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Cesium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Rubidium

Selenium

Silver

Sodium

Strontium

Sulfur

Tellurium

Thallium

Tin

Titanium

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Uranium  
Vanadium  
Zinc  
Zirconium

**Tissue (Inorganic)**

Total Metals - Tissue (200)

NA-TP-2006, VA-TM-1068, VA-TP-2074, VA-TP-2077; modified from EPA 200.3 and EPA 200.8

HI RESOLUTION ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Rubidium  
Selenium  
Silver  
Sodium  
Strontium  
Sulfur  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Uranium  
Vanadium  
Zinc  
Zirconium

**Urine (Inorganic)**

Creatinine - Biomaterials [Urine] (234)

VA-TM-1052; THERMO DRI CREATININE-DETECT SPECIMEN VALIDITY TEST

COLORIMETRIC

Creatinine

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**Urine (Organic)**

Arsenic Speciation - Biomaterials [Urine] (233)

NA-TM-1002, NA-TP-2007, VA-TM-1081; modified from CDC METHOD ID ITU003B, 2004 and EPA 6020A  
HPLC-ICPMS

Arsenate (As(V))  
Arsenite (As(III))  
Arsenobetaine (AsB)  
Dimethylarsenic acid (DMA)  
Monomethyl arsenate (MMA)  
Total Arsenic Species  
Total Inorganic Arsenic  
Total Inorganic Arsenic and Methylated Metabolites

**Water (Inorganic)**

Acidity - Water (219)

VA-TM-1053; modified from SM 2310

TITRIMETRIC

Acidity

**Water (Inorganic)**

Alkalinity - Water (001)

VA-TM-1053; modified from SM 2320 B

TITRIMETRIC

Alkalinity (pH 4.5)  
Alkalinity-Bicarbonate  
Alkalinity-Carbonate  
Alkalinity-Hydroxide  
Alkalinity-Phenolphthalein

**Water (Inorganic)**

Ammonia - Water (208)

VA-TM-1024; JOURNAL OF ENVIRONMENTAL MONITORING (2005) SECTION 7, P. 37-42

AUTO-FLUORESCENCE

Ammonia

**Water (Inorganic)**

Anions - Water (026)

NA-TM-1001; modified from EPA 300.1

IC

Bromide  
Chloride  
Fluoride  
Nitrate  
Nitrate plus Nitrite  
Nitrite  
Sulfate

**Water (Inorganic)**

Arsenic - Water (232)

NA-TM-1002, NA-TP-2007, VA-TM-1086; modified from USGS Water Resources Investigation Report 02-4144

HPLC - ICPMS

Arsenate (AsV)  
Arsenite (AsIII)  
Arsenobetaine (AsB)  
Dimethylarsenic acid (DMA)  
Monomethyl arsenate (MMA)  
Total Arsenic Species  
Total Inorganic Arsenic

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<b>Total Inorganic Arsenic and Methylated Metabolites</b>	
<b>Water (Inorganic)</b>	
Biochemical Oxygen Demand (BOD) - Water (027)	
VA-TM-1032; modified from SM 5210 B	
D.O. METER	
BOD (5 day)	
CBOD (5 day)	
Soluble Biological Oxygen Demand (BOD)	
<b>Water (Inorganic)</b>	
Carbon - Water (091)	
VA-TM-1037; modified from SM 5310 B	
IR - COMBUSTION	
Inorganic Carbon	
Organic Carbon	
Total Carbon	
<b>Water (Inorganic)</b>	
Chemical Oxygen Demand (COD) - Water (028)	
VA-TM-1033; modified from SM 5220 D	
COLOR - DIGESTION	
COD	
<b>Water (Inorganic)</b>	
Chlorophyll A - Water (220)	
VA-TM-1038, VA-TP-2011; modified from EPA 445.0	
FLUORIMETRY	
Chlorophyll a	
<b>Water (Inorganic)</b>	
Colour - Water (015)	
VA-TM-1004; modified from BC MOE Laboratory Manual and SM 2120 C	
COLORIMETRIC	
Apparent Colour	
True Colour	
<b>Water (Inorganic)</b>	
Conductivity - Water (004)	
VA-TM-1053; modified from SM 2510 B	
CONDUCTIVITY METER	
Conductivity (25°C)	
<b>Water (Inorganic)</b>	
Cyanide - Water (209)	
NA-TM-1003 ; modified from ISO 14403 and SM 4500-CN- I	
AUTO COLOR - DISTILLATION	
Cyanide (SAD)	
Cyanide (WAD)	
<b>Water (Inorganic)</b>	
Cyanide - Water (210)	
NA-TM-1003; modified from ASTM D7237	
AUTO COLOR (GAS DIFFUSION)	
Cyanide, Free	
<b>Water (Inorganic)</b>	
Dissolved Ferrous Iron - Water (242)	
VA-TM-1046, VA-TP-2009; modified from SM 3500-FE	
COLORIMETRIC - FILTRATION	
Ferrous Iron	

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**Water (Inorganic)**

**Dissolved Metals - Water (032)**

NA-TM-1002, NA-TP-2002, NA-TP-2007; modified from EPA 6020B and SM 3030 B

**ICP/MS - FILTRATION**

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

**Water (Inorganic)**

**Dissolved Metals - Water (036)**

NA-TP-2002, VA-TM-1066, VA-TP-2072; modified from EPA 6010D and SM 3030 B

**ICP/OES**

Aluminum  
Antimony  
Arsenic

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Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Thallium  
Tin  
Titanium  
Vanadium  
Zinc

**Water (Inorganic)**

Dissolved Metals - Water (198)

NA-TP-2002, VA-TM-1068, VA-TP-2074; modified from EPA 200.8 and SM 3030 B  
HI RESOLUTION ICP/MS - FILTRATION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gallium  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum

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Nickel  
Niobium  
Phosphorus  
Potassium  
Rhenium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Tantalum  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Yttrium  
Zinc  
Zirconium

**Water (Inorganic)**

Fluoride - Water (005)  
VA-TM-1016; modified from SM 4500-F- C  
SIE  
Fluoride

**Water (Inorganic)**

Mercury - Water (136)  
NA-TM-1005, NA-TP-2002, VA-TP-2068; modified from EPA 1631E  
CVAFS - BrCl DIGESTION  
Mercury

**Water (Inorganic)**

Mercury - Water (265)  
NA-TM-1005, NA-TP-2002, NA-TP-2012; modified from EPA 1631E  
COLD VAPOUR AA - SPECTROMETRIC  
Mercury

**Water (Inorganic)**

Methyl Mercury - Water (192)  
VA-TM-1062; modified from EPA 1630  
P&T GC-CVAFS-DISTILLATION  
Methylmercury

**Water (Inorganic)**

Nitrogen - Water (217)  
VA-TM-1047, VA-WI-3046; modified from SM 4500-P J  
AUTO COLOR - DIGESTION  
Total Dissolved Nitrogen  
Total Nitrogen

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**Water (Inorganic)**

Oil and Grease - Water (061)  
NA-TM-1107; modified from EPA 1664  
GRAVIMETRIC - EXTRACTION  
Mineral Oil and Grease  
Total Oil and Grease

**Water (Inorganic)**

pH - Water (018)  
VA-TM-1053; modified from SM 4500-H+ B  
pH METER  
pH

**Water (Inorganic)**

Phosphorus - Water (179)  
VA-TM-1025, VA-TP-2009, VA-WI-3046; modified from SM 4500-P B and SM 4500-P E  
COLOR - DIGESTION (AUTOCLAVE)  
Phosphate  
Total Dissolved Phosphorus  
Total Phosphorus

**Water (Inorganic)**

Reactive Silica - Water (008)  
VA-TM-1018; modified from SM 4500-SIO2 D  
COLORIMETRIC  
Reactive Silica

**Water (Inorganic)**

Selenium Speciation - Water (252)  
NA-TM-1002, NA-TP-2007, VA-TM-1084; Spectrochimica Acta Part B60 (2005) 633-641  
HPLC - ICP/MS  
Selenium (IV)  
Selenium (VI)  
SelenoMethionine

**Water (Inorganic)**

Solids - Water (016)  
NA-TM-1004, VA-TM-1009, VA-TM-1050; modified from SM 2540 B and SM 2540 C and SM 2540 D and SM 2540 E  
GRAVIMETRIC  
Fixed Suspended Solids  
Total Dissolved Solids  
Total Solids  
Total Suspended Solids  
Volatile Suspended Solids

**Water (Inorganic)**

Sulphide - Water (010)  
VA-TM-1020; modified from SM 4500-S2- D  
COLOR  
Sulphide

**Water (Inorganic)**

Thiocyanate - Water (014)  
VA-TM-1029; modified from SM 4500-CN- M  
COLOR  
Thiocyanate

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**Water (Inorganic)**

Total Kjeldahl Nitrogen (TKN) - Water (211)  
VA-TM-1044; modified from SM 4500-NORG D  
AUTO FLUORESCENCE - DIGESTION  
Dissolved Kjeldahl Nitrogen  
Total Kjeldahl Nitrogen

**Water (Inorganic)**

Total Metals - Water (031)  
NA-TM-1002, NA-TP-2001, NA-TP-2007; modified from EPA 200.2 and EPA 6020B  
ICP/MS - DIGESTION  
Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gallium  
Gold  
Indium  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulfur  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

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The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

**Water (Inorganic)**

**Total Metals - Water (041)**

NA-TP-2001, VA-TM-1066, VA-TP-2072; modified from EPA 6010D and SM 3030 E

**ICP/OES - DIGESTION**

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Thallium  
Tin  
Titanium  
Vanadium  
Zinc

**Water (Inorganic)**

**Total Metals - Water (199)**

NA-TP-2001, VA-TM-1068, VA-TP-2074; modified from EPA 200.8 and SM 3030 E

**HI RESOLUTION ICP/MS - DIGESTION**

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gallium

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The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Niobium  
Phosphorus  
Potassium  
Rhenium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Tantalum  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Yttrium  
Zinc  
Zirconium

**Water (Inorganic)**

Turbidity - Water (020)  
VA-TM-1011; modified from SM 2130 B  
TURBIDIMETRIC  
Turbidity

**Water (Inorganic)**

UV Absorbance and Transmittance - Water (254)  
VA-TM-1042, VA-TP-2011; modified from SM 5910 B  
SPECTROPHOTOMETRIC  
UV Absorbance  
UV Transmittance

**Water (Microbiology)**

Coliforms - Water (145)  
NA-TM-1300; modified from SM 9223 B  
MOST PROBABLE NUMBER (ENZYME SUBSTRATE)  
Escherichia coli (E. coli)  
Fecal (Thermotolerant) Coliforms  
Total Coliforms

**Water (Microbiology)**

Enterococci - Water (186)  
VA-TM-1203; modified from SM 9230 C  
MEMBRANE FILTRATION (mENTEROCOCCUS)  
Enterococci

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**Water (Microbiology)**

Escherichia coli (E. coli) - Water (240)  
VA-TM-1201; modified from SM 9222 G  
MEMBRANE FILTRATION (mFC/NA-MUG)  
Escherichia coli (E. coli)

**Water (Microbiology)**

Fecal (Thermotolerant) Coliforms - Water (029)  
VA-TM-1200; modified from SM 9221 E  
MOST PROBABLE NUMBER  
Fecal (Thermotolerant) Coliforms

**Water (Microbiology)**

Fecal (Thermotolerant) Coliforms - Water (030)  
VA-TM-1201; modified from SM 9222 D  
MEMBRANE FILTRATION (mFC)  
Fecal (Thermotolerant) Coliforms

**Water (Microbiology)**

Heterotrophic Plate Count (HPC) - Water (126)  
NA-TM-1301; modified from SM 9215 B  
POUR PLATE (PLATE COUNT AGAR)  
Heterotrophic Plate Count (HPC)

**Water (Microbiology)**

Pseudomonas aeruginosa - Water (187)  
VA-TM-1204; modified from SM 9213 E  
MEMBRANE FILTRATION (mPAC)  
Pseudomonas aeruginosa

**Water (Microbiology)**

Total Coliforms - Water (142)  
VA-TM-1200; modified from SM 9221 B  
MOST PROBABLE NUMBER  
Total Coliforms

**Water (Microbiology)**

Total Coliforms - Water (143)  
VA-TM-1201; modified from SM 9222 B  
MEMBRANE FILTRATION (mENDO)  
Total Coliforms

**Water (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Water (251)  
NA-TM-1112, VA-TP-2127, VA-TP-2129; BC MOE LABORATORY MANUAL  
GC/FID - EXTRACTION  
EPH C10-C19  
EPH C10-C19 (sq)  
EPH C19-C32  
EPH C19-C32 (sq)  
Total Extractable Hydrocarbons (TEH): C10-C30

**Water (Organic)**

Glycols - Water (155)  
VA-TM-1113; modified from EPA 8015C  
GC/FID - EXTRACTION  
1,2-Propylene glycol  
Diethylene glycol  
Ethylene glycol  
Triethylene glycol

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**Water (Organic)**

Organochlorine (OC) Pesticides - Water (065)

VA-TM-1121, VA-TP-2117; modified from EPA 3510C and EPA 3630C and EPA 3660B and EPA 8081B

GC/ECD - EXTRACTION

2,4'-DDD

2,4'-DDE

2,4'-DDT

4,4'-DDD

4,4'-DDE

4,4'-DDT

A -BHC

α - Chlordane

Aldrin

beta-BHC

cis-Nonachlor

delta-BHC

Dieldrin

Endosulfan I

Endosulfan II

Endosulfan Sulfate

Endrin

γ - Chlordane

Heptachlor

Heptachlor Epoxide

Lindane (γ-BHC)

Mirex

o,p' - DDT

Oxychlordane

p,p' - DDT

p,p' Methoxychlor

trans-Nonachlor

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (238)

NA-TM-1112, NA-TP-2100; 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)**

Phenols - Water (059)

VA-TM-1101, VA-TP-2113; modified from BC MOE LABORATORY MANUAL and EPA 3510C and EPA 8270D

GC/MS - EXTRACTION

2-Chlorophenol

2,3-Dichlorophenol

2,3,4-Trichlorophenol

2,3,4,5-Tetrachlorophenol

2,3,4,6-tetrachlorophenol

2,3,5-Trichlorophenol

2,3,5,6-Tetrachlorophenol

2,3,6-Trichlorophenol

2,4-Dichlorophenol

2,4-Dimethylphenol

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2,4,5-Trichlorophenol  
2,4,6-trichlorophenol  
2,6-Dichlorophenol  
3-Chlorophenol  
3,4-Dichlorophenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Chloro-3-methyl phenol  
4-Chlorophenol  
m-Cresol  
o-Cresol  
p-Cresol  
Pentachlorophenol  
Phenol

**Water (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Water (237)

NA-TM-1112, VA-TP-2128; 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,i)fluoranthene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
Naphthalene  
Phenanthrene  
Pyrene  
Quinoline

**Water (Organic)**

Resin and Fatty Acids - Water (212)

VA-TM-1105, VA-TP-2114; modified from EPA 3510C and EPA 8270D

GC/MS/LIQUID-LIQUID EXTRACTION

12-Chlorodehydroabietic acid  
14-Chlorodehydroabietic acid  
Abietic acid  
Arachidic acid  
Behenic acid  
Dehydroabietic acid  
Dichlorodehydroabietic acid  
Isopimaric and Palustric Acid  
Lauric acid  
Levopimaric acid  
Lignoceric acid

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Linoleic acid  
Linolenic acid  
Myristic acid  
Neoabietic acid  
Oleic acid  
Palmitic acid  
Pimaric acid  
Sandaracopimaric acid  
Stearic acid

**Water (Organic)**

Total Polychlorinated Biphenyls (PCB) - Water (115)

VA-TM-1115, VA-TP-2116; modified from EPA 3510C and EPA 3620C and EPA 3660B and EPA 3665A and EPA 8082A

GC/ECD - EXTRACTION

Aroclor 1242  
Aroclor 1248  
Aroclor 1254  
Aroclor 1260  
PCB-1016  
PCB-1221  
PCB-1232  
PCB-1262  
PCB-1268  
Total PCB

**Water (Organic)**

Volatile Hydrocarbons (VH) - Water (197)

NA-TM-1102; modified from BC MOE LABORATORY MANUAL and CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD and EPA 5021A

GC/FID - HEADSPACE

F1: C6-C10

Volatile Hydrocarbons (VH): C6-C10

**Water (Organic)**

Volatile Organic Compounds (VOC) - Water (196)

NA-TM-1102, NA-TP-2102; 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  
1,1,2-Trichloroethane  
1,1,2,2-Tetrachloroethane  
1,2-Dichlorobenzene  
1,2-Dichloroethane  
1,2-Dichloropropane  
1,2,4-Trimethylbenzene  
1,3-Dichlorobenzene  
1,3,5-Trimethylbenzene  
1,4-Dichlorobenzene  
4-Isopropyltoluene  
Acetone (2-Propanone)  
Benzene  
Bromodichloromethane  
Bromoform

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Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
Cumene (Isopropylbenzene)  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
m/p-xylene  
Methyl ethyl ketone  
Methyl isobutyl ketone  
Methyl t-butyl ether  
n-Propylbenzene  
Napthalene  
o-xylene  
Styrene  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

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Canadian Association  
for Laboratory Accreditation Inc.



Certificate of Accreditation

ALS Environmental (Yellowknife)  
ALS Canada Ltd.  
116 314 Old Airport Road  
Yellowknife, Northwest Territories

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
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 8 January 2009).



Accreditation No.: A3590  
Issued On: July 25, 2016  
Accreditation Date: February 4, 2008  
Expiry Date: January 23, 2019

  
President & CEO



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](http://www.cala.ca).





**CALA**  
Canadian Association for  
Laboratory Accreditation Inc.

## CALA Directory of Laboratories

**Membership Number:** 3590

**Laboratory Name:** ALS Environmental (Yellowknife)

**Parent Institution:** ALS Canada Ltd.

**Address:** 116 314 Old Airport Road Yellowknife NT X1A 3T3

**Contact:** Mr. Rick Zolkiewski

**Phone:** (867) 873-5593

**Fax:** (780) 437-2311

**Email:** rick.zolkiewski@alsglobal.com; alsed.quality@alsglobal.com

**Standard:** Conforms with requirements of ISO/IEC 17025

**Clients Served:**

**Revised On:** November 5, 2018

**Valid To:** May 5, 2021

### Scope of Accreditation

#### Water (Inorganic)

pH - Water (005)

YL-TM-1004; modified from SM 4500-H+ B

pH METER

pH

#### Water (Microbiology)

Coliforms and Escherichia coli (E. coli) - Water (006)

NA-TM-1300; modified from SM 9223 B

MOST PROBABLE NUMBER (COLILERT)

Escherichia coli (E. coli)

Total Coliforms

#### Water (Microbiology)

Fecal (Thermotolerant) Coliforms - Water (018)

NA-TM-1300; modified from SM 9223 B

MOST PROBABLE NUMBER (COLILERT)

Fecal (Thermotolerant) Coliforms

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**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

## **Appendix E – Maxxam CALA Certificate and Scope**

# Canadian Association for Laboratory Accreditation Inc.



## Certificate of Accreditation

Maxxam Analytics (Burnaby, Canada Way)  
Maxxam Analytics International Corporation  
4606 Canada Way  
Burnaby, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
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.: A2168  
Issued On: May 28, 2018  
Accreditation Date: January 3, 2005  
Expiry Date: November 25, 2020

*Andrew M. Adams*  
President & CEO



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](http://www.cala.ca).



**CALA**  
Canadian Association for  
Laboratory Accreditation Inc.

## CALA Directory of Laboratories

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**Membership Number:** 2168

**Laboratory Name:** Maxxam Analytics (Burnaby, Canada Way)

**Parent Institution:** Maxxam Analytics International Corporation

**Address:** 4606 Canada Way Burnaby BC V5G 1K5

**Contact:** Mr. Ray Chapman-Chen

**Phone:** (604) 639-2619

**Fax:** (604) 731-2386

**Email:** rchen2@maxxam.ca

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**Standard:** Conforms with requirements of ISO/IEC 17025

**Clients Served:** All Interested Parties

**Revised On:** February 26, 2019

**Valid To:** November 25, 2020

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### Scope of Accreditation

#### Air (Inorganic)

Metals - Air [Cassette] (015)

BBY7SOP-00016, BBY7SOP-00018; modified from NIOSH 7303

ICP - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Selenium

Sodium

Strontium

Sulphur

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Air (Inorganic)**

Metals - Air [Filter] (183)

BBY7SOP-00002, BBY7SOP-00016; modified from EPA 6020A

ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Cadmium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Selenium  
Strontium  
Vanadium  
Zinc

**Air (Inorganic)**

Total Particulates - Air [Particulate] (181)

BBY5SOP-00005; modified from BC MOE LABORATORY MANUAL SECTION G and EPA 600/R-94/038B

GRAVIMETRIC

Particulate>2.5 microns

**Air (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Air (281)

BBY8SOP-00027; modified from BC MOE LABORATORY MANUAL (PREPARATION) and EPA 8270D

(ANALYSIS)

GC/MS

Acenaphthene  
Acenaphthylene  
Anthracene  
Benz(a)anthracene  
Benzo(a)pyrene  
Benzo(b,i)fluoranthene  
Benzo(e)pyrene  
Benzo(g,h,i)perylene  
Benzo(k)fluoranthene  
Chrysene  
Dibenz(a,h)anthracene  
Fluoranthene  
Fluorene  
Indeno(1,2,3-cd)pyrene

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Naphthalene  
Perylene  
Phenanthrene  
Pyrene

**Air (Organic)**

Volatile Hydrocarbons (VH) - Air (184)  
BBY5SOP-00031; BC MOE LABORATORY MANUAL SECTION H  
GC/MS - THERMAL DESORPTION  
Volatile Hydrocarbons (VH): C6-C13

**Air (Organic)**

Volatile Organic Compounds (VOC) - Air (180)  
BBY8SOP-00058; modified from BC MOE LABORATORY MANUAL SECTION H  
GC/MS - THERMAL DESORPTION

1,1-Dichloroethane  
1,1-Dichloroethene  
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-Dibromoethane  
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-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trimethylbenzene  
1,4-Dichlorobenzene  
2-Butanone (Methyl ethyl ketone, MEK)  
2-Chlorophenol  
2-Chlorotoluene  
2-Hexanone (MBK)  
4-Chlorotoluene  
4-isopropyltoluene (cymene)  
4-Methyl-2-pentanone (MIBK)  
Benzene  
Bromobenzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon tetrachloride  
Chlorobenzene  
Chloroethane  
Chloroform  
cis-1,2-dichloroethene  
cis-1,3-Dichloropropene  
Dibromochloromethane

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Dibromomethane  
Dichlorodifluoromethane (Freon12)  
Dichloromethane  
Ethylbenzene  
Hexachlorobutadiene  
Isopropanol  
Isopropylbenzene (Cumene)  
m,p-Xylene  
Methylcyclohexane  
n-Butylbenzene  
n-Decane  
n-Dodecane  
n-Hexane  
n-Propylbenzene  
n-Tridecane  
Naphthalene  
o-Xylene  
sec-Butylbenzene  
Styrene  
t-Butyl methyl ether (MTBE)  
t-Butylbenzene  
Tetrachloroethene  
Toluene  
trans-1,3-Dichloropropene  
Trichloroethene  
Trichlorofluoromethane  
Trichlorotrifluoroethane  
Vinyl chloride

**Leachate (Inorganic)**

Fluoride - Leachate (300)

BBY6SOP-00048, BBY7SOP-00009; modified from BC MOE ENVIRONMENTAL MANAGEMENT ACT  
HAZARDOUS WASTE REGULATION (EMA/HWR) SCHEDULE 4, PART 2 (PREPARATION) and SM 4500-F- C  
(ANALYSIS)

ION SELECTIVE ELECTRODE - (BC MLEP/MODIFIED WEP)

Fluoride

**Leachate (Inorganic)**

Metals - Leachate (308)

BBY7SOP-00001, BBY7SOP-00009; modified from BC MOE ENVIRONMENTAL MANAGEMENT ACT  
HAZARDOUS WASTE REGULATION (EMA/HWR) SCHEDULE 4, PART 2 (PREPARATION) and EPA 6020B  
(ANALYSIS)

ICP/MS

Antimony

Arsenic

Barium

Beryllium

Boron

Cadmium

Chromium

Copper

Lead

Manganese

Mercury

Molybdenum

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Nickel  
Selenium  
Silver  
Thallium  
Tin  
Uranium  
Zinc

**Solids (Inorganic)**

Chloride - Solids [Saturated Paste, Soil] (185)  
BBY6SOP-00011, BBY6SOP-00030; modified from SM 4500-CL- E and SOIL SAMPLING & METHODS OF ANALYSIS, CHAPTER 15, SECTION 15.2.1  
AUTO COLOR - KONELAB  
Chloride

**Solids (Inorganic)**

Conductivity - Solids [Saturated Paste, Saturated Paste Extract] (279)  
BBY6SOP-00029; modified from SM 2510 B  
CONDUCTIVITY METER  
Conductivity

**Solids (Inorganic)**

Extractable Metals - Solids [Saturated Paste, Soil] (303)  
BBY6SOP-00030, BBY7SOP-00018; modified from EPA 6010C (ANALYSIS) and SOIL SAMPLING & METHODS OF ANALYSIS, CARTER 15.2.1, 2008 (PREPARATION)  
ICP/OES  
Soluble Calcium  
Soluble Magnesium  
Soluble Potassium  
Soluble Sodium  
Soluble Sulphur

**Solids (Inorganic)**

Flashpoint - Solids [Ash, Soil] (260)  
BBY6SOP-00042; modified from ASTM D3828-12A  
SETA FLASH CLOSED TESTER  
Flashpoint C

**Solids (Inorganic)**

Free Liquid - Solids [Soil] (261)  
BBY6SOP-00043; modified from EPA 9095B  
VISUAL EXAMINATION  
Free Liquid

**Solids (Inorganic)**

Hexavalent Chromium - Solids [Soil] (302)  
BBY6SOP-00015; modified from SM 3500-CR B  
COLORIMETRIC  
Hexavalent chromium

**Solids (Inorganic)**

Leachable Metals - Solids [Soil] (187)  
BBY7SOP-00001, BBY7SOP-00005; modified from EPA 1311 (PREPARATION) and EPA 6020B (ANALYSIS)  
ICP/MS - TCLP  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron

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Cadmium  
Calcium  
Chromium  
Copper  
Lead  
Mercury  
Molybdenum  
Selenium  
Silver  
Thallium  
Uranium  
Zinc

**Solids (Inorganic)**

Lead - Solids [Paint] (254)

BBY7SOP-00004, BBY7SOP-00018; modified from BC MOE LABORATORY MANUAL SECTION C

ICP/OES - DIGESTION

Lead

**Solids (Inorganic)**

Mercury - Solids [Sediment, Soil] (038)

BBY7SOP-00004, BBY7SOP-00012; modified from BC MOE LABORATORY MANUAL SECTION C and EPA 245.7

COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION

Mercury

**Solids (Inorganic)**

Metals - Solids [Sediment, Soil] (037)

BBY7 SOP-00004, BBY7SOP-00018; modified from BC MOE LABORATORY MANUAL SECTION C and EPA 6010C

ICP - DIGESTION

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

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Tin  
Titanium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Mineral Oil and Grease - Solids [Soil] (188)  
BBY8SOP-00007; modified from BC MOE LABORATORY MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Mineral Oil and Grease

**Solids (Inorganic)**

Moisture - Solids [Soil] (189)  
BBY8SOP-00017; modified from ON MOECC E3139  
GRAVIMETRIC  
Moisture %  
Percent Moisture

**Solids (Inorganic)**

Nitrate plus Nitrite and Nitrite - Solids [Soil] (190)  
BBY6SOP-00010, BBY6WI-00009; modified from SM 4500-NO3- I  
AUTO COLOR  
Nitrate + Nitrite Nitrogen  
Nitrate-N  
Nitrite

**Solids (Inorganic)**

Oil and Grease - Solids [Soil] (191)  
BBY8SOP-00006; modified from BC MOE LABORATORY MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Solids (Inorganic)**

Percent Saturation - Solids [Saturated Paste] (193)  
BBY6SOP-00030; modified from SOIL SAMPLING & METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.  
GRAVIMETRIC  
Percent Saturation  
Saturated Paste

**Solids (Inorganic)**

pH - Solids [Saturated Paste] (278)  
BBY6SOP-00025; modified from SM 4500-H+ B  
pH METER  
pH

**Solids (Inorganic)**

pH - Solids [Soil] (192)  
BBY6SOP-00028; modified from BC MOE LABORATORY MANUAL SECTION B and SM 4500-H+ B  
PH METER  
pH

**Solids (Inorganic)**

Sulfate - Solids [Saturated Paste, Soil] (194)  
BBY6SOP-00017, BBY6SOP-00030; modified from SOIL SAMPLING & METHOD OF ANALYSIS, CHAPTER 1  
SECTION 15.2.1  
AUTO COLOR - KONELAB  
Sulphate

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**Solids (Inorganic)**

Total Metals - Solids [Soil] (196)

BBY7SOP-00001, BBY7SOP-00004; modified from BC MOE LABORATORY MANUAL SECTION C and EPA 6020B

ICP/MS - DIGESTION

Aluminum  
Antimony  
Arsenic  
Barium  
Bismuth  
Boron  
Cadmium  
Calcium  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Phosphorus  
Potassium  
Selenium  
Silver  
Sodium  
Strontium  
Tellurium  
Thallium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Solids (Inorganic)**

Total Sulphide - Solids [Soil] (312)

BBY6SOP-00006, BBY6SOP-00052; modified from EPA 821-R-91-100 (PREPARATION) and SM 4500 S2- D (ANALYSIS)

SPECTROPHOTOMETRIC

Total Sulphide

**Solids (Organic)**

BTEX and MTBE and Styrene - Solids [Soil] (198)

BBY8SOP-00010; modified from EPA 5021A and EPA 5035 and EPA 8260C

GC/MS - HEADSPACE

Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

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**Solids (Organic)**

Extractable Petroleum Hydrocarbons (EPH) - Solids [Soil] (202)

BBY8SOP-00029; modified from BC MOE LABORATORY MANUAL SECTION D

GC/FID - EXTRACTION

EPH C10-C19

EPH C19-C32

**Solids (Organic)**

Leachable Polycyclic Aromatic Hydrocarbons (PAH) - Solids [Soil] (307)

BBY7SOP-00005, BBY8SOP-00021; modified from EPA 8270D (PREPARATION) and EPA (ANALYSIS)

GC/MS

1,4-Dimethylnaphthalene

2-Methylnaphthalene

Acenaphthene

Acenaphthylene

Acridine

Anthracene

Benzo(a)anthracene

Benzo(a)pyrene

Benzo(b,i)fluoranthene

Benzo(e)pyrene

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

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (205)

BBY8SOP-00030; 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] (206)

BBY8SOP-00012; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD

GC/FID - HEADSPACE

F1: C6-C10

**Solids (Organic)**

Petroleum Hydrocarbons (PHC) - Solids [Soil] (264)

BBY8SOP-00003; CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD

GRAVIMETRIC - SOXHLET

F4: Gravimetric

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#### **Solids (Organic)**

##### **Phenols - Solids [Soil] (207)**

BBY8SOP-00054; modified from BC MOE LABORATORY MANUAL

##### **GC/MS - EXTRACTION**

2-Chlorophenol  
2-Hydroxyphenol (Catechol)  
2-Methoxyethyl Acetate  
2-Methyl-4,6-dinitrophenol  
2-Methylphenol (o-Cresol)  
2-Nitrophenol  
2,3-Dichlorophenol  
2,3,4-Trichlorophenol  
2,3,4,5-Tetrachlorophenol  
2,3,4,6-Tetrachlorophenol  
2,3,5-Trichlorophenol  
2,3,5,6-Tetrachlorophenol  
2,3,6-Trichlorophenol  
2,4 + 2,5-Dichlorophenol  
2,4-Dimethylphenol  
2,4-Dinitrophenol  
2,4,5-Trichlorophenol  
2,4,6-Trichlorophenol  
2,6-Dichlorophenol  
2,6-Dimethylphenol  
3 + 4-Methylphenol  
3-hydroxyphenol  
3,4-Dichlorophenol  
3,4-Dimethylphenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
4-Chloro-3-Methylphenol  
4-Nitrophenol  
4,6-Dinitro-2-methylphenol  
Pentachlorophenol  
Phenol

#### **Solids (Organic)**

##### **Polycyclic Aromatic Hydrocarbons (PAH) - Solids [Soil] (208)**

BBY8SOP-00022, BBY8SOP-00038; modified from EPA 3570 and EPA 8270D

##### **GC/MS - SHAKE EXTRACTION**

1-Methylphenanthrene  
2-Chloronaphthalene  
2-Methylnaphthalene  
3-Methylcholanthrene  
4-Nitropyrene  
7,12-Dimethylbenz(a)anthracene  
9,10-Anthraquinone  
Acenaphthene  
Acenaphthylene  
Acridine  
Anthracene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b) fluoranthene

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Benzo(e)pyrene  
Benzo (g,h,i) perylene  
Benzo(i)fluoranthene  
Benzo (k) fluoranthene  
Chrysene  
Dibenzo(a,e)pyrene  
Dibenzo (a,h) anthracene  
Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
N-Methylaniline  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene  
Quinoline

**Solids (Organic)**

Tetraethyllead - Solids [Soil] (316)  
BBY8SOP-00060; modified from BC MOE LABORATORY MANUAL SECTION D  
GC/MS/MS  
Tetraethyl lead

**Solids (Organic)**

Tributyltins - Solids [Soil] (276)  
BBY8SOP-00050; modified from RESTEK CORP APPLICATION NOTE# 59550  
GC/MS  
Tributyl tin

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Solids [Soil] (213)  
BBY8SOP-00009, BBY8SOP-00052; modified from EPA 5021 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-Trichloropropane  
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  
1,2,3-Trichloropropene  
1,2,3-Trimethylbenzene  
1,2,4-Trichlorobenzene  
1,2,4-Trimethylbenzene  
1,3-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trichlorobenzene  
1,3,5-Trimethylbenzene

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1,4-dichlorobenzene  
2-Chlorotoluene  
4-Chlorotoluene  
Benzene  
Bromobenzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
cis-1,4-Dichloro-2-butene  
Dibromomethane  
Dichlorodifluoromethane  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
Hexachlorobutadiene  
Hexane  
Isopropylbenzene  
m/p-xylene  
Methyl t-butyl ether  
Methylcyclohexane  
n-Butylbenzene  
n-Decane  
n-Propylbenzene  
Naphthalene  
o-xylene  
p-Isopropyltoluene  
Pentachloroethane  
sec-Butylbenzene  
Styrene  
tert-Butylbenzene  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
trans-1,4-Dichloro-2-butene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl chloride

**Solids (Organic)**

Volatile Organic Compounds (VOC) - Solids [Soil] (313)  
BBY8SOP-00040; BC MOE LABORATORY MANUAL SECTION D  
GC/MS - HEADSPACE  
1-Chlorobutane  
1,4-Dioxane  
2-Butanone (MEK)

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2-Hexanone  
4-Methyl-2-pentanone (MIBK)  
Acetone  
Acrylonitrile  
Allyl chloride  
Alpha-Diisobutylene  
Beta-Diisobutylene  
Butylated hydroxytoluene  
Carbon disulfide  
Chloroprene  
Cyclohexanone  
Cyclohexene  
Dicyclopentadiene  
Ethyl Acrylate  
Ethyl ether  
Hexachloroethane  
Isobutanol  
Isopropanol  
Methyl methacrylate  
Methylacrylonitrile  
n-Butanol  
Tetrahydrofuran  
trans-Crotonaldehyde  
Vinyl Acetate

**Solids (Organic)**

Volatile Petroleum Hydrocarbons (VPH) - Solids [Soil] (214)  
BBY8SOP-00011; modified from BC MOE LABORATORY MANUAL SECTION D  
GC/FID - HEADSPACE  
F1: C6-C10

**Solids (Organic)**

Waste Oil - Solids (306)  
BBY8SOP-00008; BC MOE LABORATORY MANUAL SECTION D  
GRAVIMETRIC  
Waste Oil Content

**Solids (Toxicology)**

Bivalve Larval Survival and Development - Solids [Sediment] (293)  
BBY2SOP-00032; PUGET SOUND ESTUARY PROGRAM 1995 B  
GROWTH AND SURVIVAL  
Bivalves (48hr)

**Solids (Toxicology)**

Chironomids - Solids [Sediment] (150)  
BBY2SOP-00010; EPS 1/RM/32  
SURVIVAL AND GROWTH  
Chironomids (10 days)

**Solids (Toxicology)**

Echinoid Larval Development - Solids [Sediment] (298)  
BBY2SOP-00062; EPS 1/RM/58  
GROWTH AND SURVIVAL  
Echinoid Larval Development (48hr)

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**Solids (Toxicology)**

Hyaella azteca - Solids [Sediment] (149)  
BBY2SOP-00011; EPS 1/RM/33  
SURVIVAL AND GROWTH  
Hyaella azteca (14d)

**Solids (Toxicology)**

Marine Amphipods - Solids [Sediment] (151)  
BBY2SOP-00012; EPS 1/RM/26 and EPS 1/RM/35  
ACUTE LETHALITY (SURVIVAL)  
Marine Amphipods (10 day)

**Solids (Toxicology)**

Microtox - Solids [Sediment, Soil] (152)  
BBY2SOP-00014; EPS 1/RM/42  
BIOLUMINESCENCE  
Microtox IC50

**Solids (Toxicology)**

Neanthes Survival and Growth - Solids [Sediment] (288)  
BBY2SOP-00030; PUGET SOUND ESTUARY PROGRAM, 1995  
GROWTH AND SURVIVAL  
Neanthes (20d)

**Tissue (Inorganic)**

Mercury - Tissue (255)  
BBY7SOP-00012, BBY7SOP-00021; modified from EPA 200.3 and EPA 245.7  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Tissue (Inorganic)**

Total Metals - Tissue (215)  
BBY7SOP-00002, BBY7SOP-00021; modified from BC MOE LABORATORY MANUAL SECTION C and EPA 6020B

ICP/MS  
Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium

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Silicon  
Silver  
Sodium  
Strontium  
Sulfur  
Tellurium  
Thallium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Acidity - Water (137)

BBY6SOP-00037; modified from SM 2310 B

TITRATION

Acidity

**Water (Inorganic)**

Alkalinity - Water (216)

BBY6SOP-00026; modified from SM 2320 B

TITRIMETRIC - AUTOMATED

Alkalinity (pH 4.5)

**Water (Inorganic)**

Ammonia Nitrogen - Water (217)

BBY6SOP-00009; modified from EPA 350.1 and SM 4500-NH3 G

AUTO COLOR - PHENATE

Ammonia

**Water (Inorganic)**

Biochemical Oxygen Demand (BOD) - Water (218)

BBY6SOP-00045; modified from SM 5210 B

D.O. METER

BOD (5 day)

CBOD (5 day)

**Water (Inorganic)**

Carbon - Water (233)

BBY6SOP-00003; modified from SM 5310 C

COLORIMETRIC

Organic Carbon

**Water (Inorganic)**

Carbon - Water (277)

BBY6SOP-00018; modified from SM 5310 C

COLORIMETRIC

Carbon (Dissolved Inorganic Carbon)

Carbon, Total Inorganic

**Water (Inorganic)**

Chemical Oxygen Demand (COD) - Water (220)

BBY6SOP-00024; modified from SM 5220 D

TITRIMETRIC - DIGESTION

COD

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<b>Water (Inorganic)</b>
Chloride - Water (221)
BBY6SOP-00011; modified from SM 4500-CL- E
AUTO COLOR - KONELAB
Chloride
<b>Water (Inorganic)</b>
Chlorophyll A and Phaeophytins - Water (122)
BBY6SOP-00002; modified from SM 10200 H
UV/VIS/SPECTROPHOTOMETER
Chlorophyll a
Phaeophytins
<b>Water (Inorganic)</b>
Colour - Water (023)
BBY6SOP-00021; modified from SM 2120 B
VISUAL COMPARISON
Apparent Colour
<b>Water (Inorganic)</b>
Colour - Water (295)
BBY6SOP-00057; modified from SM 2120 C
SPECTROPHOTOMETRIC
True Colour
<b>Water (Inorganic)</b>
Conductivity - Water (222)
BBY6SOP-00026; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)
<b>Water (Inorganic)</b>
Conductivity - Water [Wastewater] (156)
BBY0SOP-00006; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)
<b>Water (Inorganic)</b>
Dissolved and Extractable Metals - Water (004)
BBY7SOP-00018, BBY7WI-00004; modified from EPA 6010C
ICP
Aluminum
Antimony
Arsenic
Barium
Beryllium (High)
Bismuth (High)
Boron
Cadmium (High Range)
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium (High)
Magnesium
Manganese

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Molybdenum  
Nickel  
Phosphorus  
Potassium  
Selenium  
Silicon  
Silver (High)  
Sodium  
Strontium  
Sulphur  
Tin (High)  
Titanium  
Vanadium  
Zinc  
Zirconium (High)

**Water (Inorganic)**

Dissolved Metals - Water (225)

BBY7WI-00004, BY7SOP-00002; modified from EPA 6020B

ICP/MS  
Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Boron  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gold  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Palladium  
Phosphorus  
Platinum  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur

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Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Fluoride - Water (226)  
BBY6SOP-00048; modified from SM 4500-F- C  
SELECTIVE ION ELECTRODE  
Fluoride

**Water (Inorganic)**

Hexavalent Chromium - Water (227)  
BBY6SOP-00015; modified from SM 3500-CR B  
COLORIMETRIC  
Hexavalent Chromium

**Water (Inorganic)**

Mercury - Water (095)  
BBY7SOP-00015; modified from BC MOE LABORATORY MANUAL SECTION C  
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION  
Mercury

**Water (Inorganic)**

Mercury - Water (299)  
BBY7SOP-00022; EPA 1631  
COLD VAPOUR ATOMIC FLUORESCENCE SPECTROPHOTOMETRY  
Mercury

**Water (Inorganic)**

Metals - Water [Seawater] (228)  
BBY7SOP-00002, BBY7SOP-00007; modified from EPA 200.10  
ICP/MS - CHELATION EXTRACTION  
Cadmium  
Cobalt  
Copper  
Iron  
Lead  
Manganese  
Nickel  
Titanium  
Uranium  
Zinc

**Water (Inorganic)**

Mineral Oil and Grease - Water (229)  
BBY8SOP-00004; modified from BC MOE LABORATORY MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Mineral Oil and Grease

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**Water (Inorganic)**

Nitrate plus Nitrite and Nitrite - Water (230)  
BBY6SOP-00010; modified from SM 4500-NO3- I  
AUTO COLOR  
Nitrate plus Nitrite  
Nitrite

**Water (Inorganic)**

Nitrogen - Water (231)  
BBY6SOP-00016; modified from SM 4500-N C  
AUTO COLOR - DIGESTION  
Total Dissolved Nitrogen  
Total Nitrogen

**Water (Inorganic)**

Oil and Grease - Water (232)  
BBY8SOP-00004; modified from BC MOE LABORATORY MANUAL SECTION D  
GRAVIMETRIC - EXTRACTION  
Total Oil and Grease

**Water (Inorganic)**

pH - Water (155)  
BBY0SOP-00003; modified from SM 4500-H+ B  
pH METER  
pH

**Water (Inorganic)**

pH - Water (234)  
BBY6SOP-00026; modified from SM 4500-H+ B  
pH METER - AUTOMATED  
pH

**Water (Inorganic)**

Phosphorus - Water (236)  
BBY6SOP-00013; modified from SM 4500-P E  
AUTO COLOR - KONELAB  
Phosphate  
Total Dissolved Phosphorus  
Total Phosphorus

**Water (Inorganic)**

Reactive Silica - Water (237)  
BBY6SOP-00014; modified from SM 4500-SiO2 E  
AUTO COLOR  
Reactive Silica

**Water (Inorganic)**

Solids - Water (238)  
BBY6SOP-00033, BBY6SOP-00034; modified from SM 2540 C and SM 2540 D  
GRAVIMETRIC  
Total Dissolved Solids  
Total Suspended Solids

**Water (Inorganic)**

Solids - Water (280)  
BBY6SOP-00035; modified from SM 2540 A  
GRAVIMETRIC  
Total Solids  
Total Solids Fixed

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**Water (Inorganic)**

Sulphate - Water (239)

BBY6SOP-00017; modified from SM 4500-SO42- E

AUTO COLOR - KONELAB

Sulfate

**Water (Inorganic)**

Sulphide - Water (240)

BBY6SOP-00006; modified from SM 4500-S2- D

SPECTROPHOTOMETRIC - METHYLENE BLUE

Sulphide

**Water (Inorganic)**

Total Metals - Water (066)

BBY7SOP-00003, BBY7SOP-00018; modified from BC MOE LABORATORY MANUAL SECTION C and EPA

6010C

ICP - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Selenium

Silicon

Silver

Sodium

Strontium

Sulphur

Tin

Titanium

Vanadium

Zinc

Zirconium

**Water (Inorganic)**

Total Metals - Water (242)

BBY7SOP-00002, BBY7SOP-00003; modified from BC MOE LABORATORY MANUAL SECTION C and EPA

6020B

ICP/MS - DIGESTION

Aluminum

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Antimony  
Arsenic  
Barium  
Beryllium  
Bismuth  
Bromine  
Cadmium  
Calcium  
Cesium  
Chromium  
Cobalt  
Copper  
Gold  
Iron  
Lanthanum  
Lead  
Lithium  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Palladium  
Phosphorus  
Platinum  
Potassium  
Rubidium  
Selenium  
Silicon  
Silver  
Sodium  
Strontium  
Sulphur  
Tellurium  
Tellurium  
Thallium  
Thorium  
Tin  
Titanium  
Tungsten  
Uranium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Total Metals - Water [Seawater] (241)

BBY7SOP-00002, BBY7SOP-00003; modified from EPA 6020B

ICP/MS

Aluminum  
Barium  
Beryllium  
Bismuth  
Boron

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Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Lithium  
Magnesium  
Manganese  
Molybdenum  
Nickel  
Phosphorus  
Potassium  
Silicon  
Silver  
Sodium  
Strontium  
Sulfur  
Tellurium  
Thallium  
Titanium  
Vanadium  
Zinc  
Zirconium

**Water (Inorganic)**

Turbidity - Water (244)  
BBY6SOP-00027; modified from SM 2130 B  
TURBIDIMETRIC  
Turbidity

**Water (Organic)**

BTEX and MTBE and Styrene - Water (252)  
BBY8SOP-00010; modified from EPA 5021A and EPA 5035 and EPA 8260C  
GC/MS - HEADSPACE  
Benzene  
Ethylbenzene  
m/p-xylene  
Methyl t-butyl ether  
o-xylene  
Styrene  
Toluene

**Water (Organic)**

Organotins - Water (310)  
BBY8SOP-00059; modified from RESTEK CORP LIT. CAT#59550  
GC/MS  
Dibutyltin  
Monobutyltin  
Tributyltin

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (263)  
BBY8SOP-00030; modified from CCME CWS PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD  
GC/FID - EXTRACTION  
F2: C10-C16

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F3: C16-C34  
F4: C34-C50

**Water (Organic)**

Petroleum Hydrocarbons (PHC) - Water (305)  
BBY8SOP-00012 (ANALYSIS), BBY8SOP-00018 (PREP); modified from CCME CWS PETROLEUM  
HYDROCARBONS IN SOIL - TIER 1 METHOD (DEC 2000)  
GC/FID - HEADSPACE  
F1: C6-C10

**Water (Organic)**

Phenols - Water (248)  
BBY8SOP-00025; modified from BCMOE LABORATORY MANUAL  
GC/MS - EXTRACTION  
2-Chlorophenol  
2,3-Dichlorophenol  
2,3,4-Trichlorophenol  
2,3,4,5-Tetrachlorophenol  
2,3,4,6-tetrachlorophenol  
2,3,5-Trichlorophenol  
2,3,5,6-Tetrachlorophenol  
2,3,6-Trichlorophenol  
2,4 + 2,5-Dichlorophenol  
2,4,5-Trichlorophenol  
2,4,6-trichlorophenol  
2,6-Dichlorophenol  
3 + 4-Chlorophenol  
3,4-Dichlorophenol  
3,4,5-Trichlorophenol  
3,5-Dichlorophenol  
Pentachlorophenol

**Water (Organic)**

Polycyclic Aromatic Hydrocarbons (PAH) - Water (249)  
BBY8SOP-00021; modified from EPA 3510C and EPA 8270D  
GC/MS - EXTRACTION  
1-Methylnaphthalene  
2-Chloronaphthalene  
2-Methylnaphthalene  
3-Methylcholanthrene  
4-Nitropyrene  
7,12-Dimethylbenz(a)anthracene  
9,10-Anthraquinone  
Acenaphthene  
Acenaphthylene  
Acridine  
Anthracene  
Benzo (a) anthracene  
Benzo (a) pyrene  
Benzo (b,i) fluoranthene  
Benzo(e)pyrene  
Benzo (g,h,i) perylene  
Benzo (k) fluoranthene  
Chrysene  
Dibenzo(a,e)pyrene  
Dibenzo (a,h) anthracene

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Fluoranthene  
Fluorene  
Indeno (1,2,3 - cd) pyrene  
N-Methylaniline  
Naphthalene  
Perylene  
Phenanthrene  
Pyrene  
Quinoline

**Water (Organic)**

Tetraethyllead - Water (315)

BBY8SOP-00060; modified from BC MOE LABORATORY MANUAL SECTION D and EPA 8000C and EPA 8270E

GC/MS/MS

Tetraethyl lead

**Water (Organic)**

Total Extractable Hydrocarbons (TEH) - Water (250)

BBY8SOP-00029; modified from BC MOE LABORATORY MANUAL SECTION D

GC/FID - EXTRACTION

Total Extractable Hydrocarbons (TEH)

**Water (Organic)**

Volatile Hydrocarbons (VH) - Water (251)

BBY8SOP-00011; modified from BC MOE LABORATORY MANUAL SECTION D

GC/FID - HEADSPACE

Volatile Hydrocarbon (VH): C6-C10

**Water (Organic)**

Volatile Organic Compounds (VOC) - Water (253)

BBY8SOP-00009; modified from EPA 5021A and EPA 5035 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-Trichloro-1,2,2-Trifluoroethane  
1,1,2-Trichloroethane  
1,1,2-Trichloropropane  
1,1,2,2-Tetrachloroethane  
1,2-Dibromo-3-chloropropane (DBCP)  
1,2-Dibromoethane  
1,2-dichlorobenzene  
1,2-dichloroethane  
1,2-Dichloropropane  
1,2,3-Trichlorobenzene  
1,2,3-Trichloropropane  
1,2,3-Trichloropropene  
1,2,3-Trimethylbenzene  
1,2,4-Trichlorobenzene  
1,2,4-Trimethylbenzene  
1,3-Butadiene  
1,3-Dichlorobenzene  
1,3-Dichloropropane  
1,3,5-Trichlorobenzene

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1,3,5-Trimethylbenzene  
1,4-dichlorobenzene  
2-Chloropropane  
2-Chlorotoluene  
4-Chlorotoluene  
Benzene  
Bromobenzene  
Bromodichloromethane  
Bromoform  
Bromomethane  
Carbon Tetrachloride  
Chlorobenzene  
Chlorodibromomethane  
Chloroethane  
Chloroform  
Chloromethane  
cis-1,2-Dichloroethylene  
cis-1,3-Dichloropropene  
cis-1,4-Dichloro-2-butene  
Dibromoethane  
Dibromomethane  
Dichlorodifluoromethane  
Dichloromethane  
Ethylbenzene  
Ethylene Dibromide  
Hexachlorobutadiene  
Hexane  
Isopropylbenzene  
m/p-xylene  
Methyl t-butyl ether  
Methylcyclohexane  
n-Butylbenzene  
n-Decane  
n-Propylbenzene  
Naphthalene  
o-xylene  
p-Isopropyltoluene  
Pentachloroethane  
sec-Butylbenzene  
Styrene  
tert-Butylbenzene  
Tetrabromomethane  
Tetrachloroethylene  
Toluene  
trans-1,2-Dichloroethylene  
trans-1,3-Dichloropropene  
trans-1,4-Dichloro-2-butene  
Trichloroethylene  
Trichlorofluoromethane  
Vinyl Chloride

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#### **Water (Organic)**

Volatile Organic Compounds (VOC) - Water (314)

BBY8SOP-00040; BC MOE LABORATORY MANUAL SECTION D

GC/MS - HEADSPACE

1-Chlorobutane  
1,4-Dioxane  
2-Butanone (MEK)  
2-Chloroethanol  
2-Hexanone  
4-Methyl-2-pentanone (MIBK)  
Acetone  
Acrolein  
Acrylonitrile  
Allyl chloride  
Alpha-Diisobutylene  
Beta-Diisobutylene  
Butylated hydroxytoluene  
Carbon disulfide  
Chloroprene  
Cyclohexanone  
Cyclohexene  
Dicyclopentadiene  
Ethyl Acrylate  
Ethyl ether  
Hexachloroethane  
Isobutanol  
Isopropanol  
Methyl methacrylate  
Methylacrylonitrile  
n-Butanol  
Tetrahydrofuran  
trans-Crotonaldehyde  
Vinyl Acetate

#### **Water (Toxicology)**

Bivalve Larval Survival and Development - Water (309)

BBY2SOP-00029; EPA 600/R-95/136 (1995)

GROWTH AND SURVIVAL

Bivalves (48hr)

#### **Water (Toxicology)**

Ceriodaphnia dubia - Water (139)

BBY2SOP-00001; EPS 1/RM/21

SURVIVAL AND REPRODUCTION

Ceriodaphnia dubia (7d)

#### **Water (Toxicology)**

Daphnia magna - Water (141)

BBY2SOP-00007; EPS 1/RM/11 and EPS 1/RM/14

LETHALITY

Daphnia LC50 (48 h)

Single Concentration (48h)

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<b>Water (Toxicology)</b> Echinoid Fertilization - Water (143) BBY2SOP-00009; EPS 1/RM/27 FERTILIZATION SUCCESS Echinoderm Fertilization (20 min)
<b>Water (Toxicology)</b> Fathead Minnow - Water (147) BBY2SOP-00002; EPS 1/RM/22 GROWTH AND SURVIVAL Fathead Minnow (7d)
<b>Water (Toxicology)</b> Lemna minor - Water (289) BBY2SOP-00053; EPS 1/RM/37 GROWTH INHIBITION Lemna minor (7d)
<b>Water (Toxicology)</b> Microtox - Water (144) BBY2SOP-00013; EPS 1/RM/24 BIOLUMINESCENCE Microtox IC50 (15 min)
<b>Water (Toxicology)</b> Pseudokirchneriella subcapitata - Water (146) BBY2SOP-00006; EPS 1/RM/25 GROWTH INHIBITION Pseudokirchneriella subcapitata (72h)
<b>Water (Toxicology)</b> Rainbow Trout - Water (140) BBY2SOP-00004; EPS 1/RM/13 and EPS 1/RM/9 LETHALITY Single Concentration (96h) Trout LC50 (96 h)
<b>Water (Toxicology)</b> Rainbow Trout [pH Stabilization] - Water (294) BBY2SOP-00061; EPS 1/RM/50 ACUTE LETHALITY (SURVIVAL) Single Concentration (96h) - pH Stabilization Trout LC50 (96h) - pH Stabilization
<b>Water (Toxicology)</b> Topsmelt - Water (291) BBY2SOP-00050; EPA 821-02-012 ACUTE LETHALITY Topsmelt (96h)

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)



**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

## **Appendix F – Nautilus CALA Certificate and Scope**



## Canadian Association for Laboratory Accreditation Inc.



### Certificate of Accreditation

Nautilus Environmental Inc.  
8664 Commerce Court  
Burnaby, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
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.: A3525  
Issued On: August 28, 2017  
Accreditation Date: June 7, 2003  
Expiry Date: February 26, 2020

President & CEO



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](http://www.cala.ca).

CALA ACCREDITATION PROGRAM  
FINAL SCOPE OF TESTING

3525

LABORATORY NAME: Nautilus Environmental Inc.

MATRIX

Sediment (Toxicology)

APPENDIX NO. / NAME

NEW	011	Chironomus dilitus - Sediment <u>METHOD</u> SURVIVAL AND GROWTH INHIBITION <u>Parameters:</u> Survival and Growth (10d)	<u>METHOD REFERENCE</u> EPS 1/RM/32	<u>LAB METHOD I.D.</u> 401-1
NEW	012	Hyaella azteca - Sediment <u>METHOD</u> SURVIVAL AND GROWTH INHIBITION <u>Parameters:</u> Survival and Growth (14d)	<u>METHOD REFERENCE</u> EPS 1/RM/33	<u>LAB METHOD I.D.</u> 400-1

Water (Toxicology)

APPENDIX NO. / NAME

	001	Rainbow Trout - Water <u>METHOD</u> ACUTE LETHALITY (SURVIVAL) <u>Parameters:</u> Trout LC50 (96 h)*	<u>METHOD REFERENCE</u> EPS 1/RM/9 and EPS 1/RM/13	<u>LAB METHOD I.D.</u> 201
	002	Daphnia magna - Water <u>METHOD</u> ACUTE LETHALITY (SURVIVAL) <u>Parameters:</u> Daphnia LC50 (48 h)*	<u>METHOD REFERENCE</u> EPS 1/RM/11 and EPS 1/RM/14	<u>LAB METHOD I.D.</u> 205
	003	Ceriodaphnia dubia - Water <u>METHOD</u> SURVIVAL AND REPRODUCTION <u>Parameters:</u> Ceriodaphnia dubia (7d)	<u>METHOD REFERENCE</u> EPS 1/RM/21	<u>LAB METHOD I.D.</u> 209
	004	Salmonid - Water <u>METHOD</u> EARLY LIFE STAGE <u>Parameters:</u> Salmonid embryo (7d)	<u>METHOD REFERENCE</u> EPS 1/RM/28	<u>LAB METHOD I.D.</u> 203
	005	Lemna minor - Water <u>METHOD</u> GROWTH INHIBITION <u>Parameters:</u> Lemna minor (7d)	<u>METHOD REFERENCE</u> EPS 1/RM/37	<u>LAB METHOD I.D.</u> 215
	008	Pseudokirchneriella subcapitata - Water <u>METHOD</u> GROWTH INHIBITION <u>Parameters:</u> Pseudokirchneriella subcapitata (72h)	<u>METHOD REFERENCE</u> EPS 1/RM/25	<u>LAB METHOD I.D.</u> 213
NEW	009	Rainbow Trout - pH Stabilization - Water <u>METHOD</u> pH STABILIZATION <u>Parameters:</u> Survival	<u>METHOD REFERENCE</u> EPS 1/RM/50	<u>LAB METHOD I.D.</u> 204-1

\* CALA Proficiency Testing (PT) Program analyte

Current scope as of 9/5/2017

1

CALA ACCREDITATION PROGRAM  
FINAL SCOPE OF TESTING

3525

LABORATORY NAME: Nautilus Environmental Inc.

MATRIX

NEW	010	Fathead minnow - Water		
		<u>METHOD</u> SURVIVAL AND GROWTH INHIBITION <u>Parameters:</u> Survival and Growth (7d)	<u>METHOD REFERENCE</u> EPS 1/RM/22	<u>LAB METHOD I.D.</u> 220-4
NEW	013	Hyalella azteca - Water		
		<u>METHOD</u> SURVIVAL AND GROWTH INHIBITION <u>Parameters:</u> Survival and Growth (14d)	<u>METHOD REFERENCE</u> EPS 1/RM/33	<u>LAB METHOD I.D.</u> 400-1

+ "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

PT REQUIREMENTS: All tests appearing in the scope of testing must be supported by PT testing where available. Therefore, analytes with a status of Withdrawn, Suspended, or not yet proficient, will NOT appear on the Final Scope of Testing. Once proficiency has been achieved, the affected analyte(s) will appear on the Scope of Testing. Please refer to P02-03 *CALA Program Description - Proficiency Testing (PT) Requirements for Accreditation*.

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at [http://www.cala.ca/cala\\_directories.html](http://www.cala.ca/cala_directories.html)

\* CALA Proficiency Testing (PT) Program analyte

Current scope as of 9/5/2017

2



**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

**Module A: 2AM-DOH1335**

## Conformity Table

Licence	Part	Item	Topic	Report Section
2AM-DOH1335	B	13	The Licensee shall, for all plans submitted under this Licence, implement the plan as approved by the Board in writing. Any changes to the plans deemed significant shall be considered as an amendment to the plan(s) or as a modification and must be submitted to the Board for approval in writing. The Board has approved under this Amended Water Licence 2AM-DOH1335, the following plans for implementation under the relevant sections in the Amended Licence: <i>q. Quality Assurance and Quality Control Plan (January 2017)</i>	This plan
	I	3	The Licensee shall undertake the Monitoring Program provided in the Tables 1, 2, and 3 of Schedule I. The Licensee shall, in consultation with an Inspector, establish the locations and GPS coordinates for all Monitoring Program Stations.	Table A1 and Figure A1
		15	The Licensee shall annually review the approved Quality Assurance and Quality Control Plan and modify the Plan as necessary. Proposed changes shall be submitted to an Accredited Laboratory for approval.	Section 1.4
		16	All analyses shall be conducted as described in the most recent edition of "Standard Methods for the Examination of Water and Wastewater" or by other such methods approved by an Analyst.	Sections 2 and 3
		17	All compliance analyses shall be performed in an accredited laboratory according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.	Section 5

## A1 Introduction

The Type A Water Licence No. 2AM-DOH1323 issued to TMAC by the Nunavut Water Board (NWB) details the sampling and analysis requirements for the SNP program.

## A2 SNP Sampling Stations

Table A1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the Surveillance Network Program for water licence 2AM-DOH1323. The location of each sampling point is illustrated in Figure A1 below.

**Table A1. 2AM-DOH1335 Sample Stations, Sample Frequency and Analytical Parameters**

SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TIA
ST-1	Doris Sedimentation Pond	Construction, Operation, Care and Maintenance, Closure	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Annually
ST-2	Doris Contact Water Pond	Construction, Operation, Care and Maintenance, Closure	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Annually
ST-3	Discharge from Non-hazardous Landfill Contact Water Control Sump	Construction, Care and Maintenance, Operation, Closure	G, MT and Total Ammonia-N, Total Sulphate, Total and Free CN, Total Oil and Grease	Annually. Once prior to every discharge onto the tundra
			D	Daily during periods of discharge
ST-4	Discharge from Landfarm sump	Construction, Operation, Care and Maintenance, Closure	G, HC, total Ammonium, total Lead	Annually. Once prior to every discharge onto the tundra
			D	Daily during periods of discharge
ST-5	Discharge from the Doris Plant Site Fuel Storage and Containment Area Sump	Construction, Operation, Care and Maintenance, Closure	G, HC, Total Pb	Annually. Once prior to every discharge onto the tundra
			D	Daily during periods of discharge
ST-6a and ST-6b	Discharge from the Roberts Bay Fuel Storage and Containment Area Sumps	Construction, Operation, Care and Maintenance, Closure	G, HC, Total Pb	Annually. Once prior to every discharge onto the tundra
			D	Daily during periods of discharge
ST-7	Freshwater pumped from Doris Lake	Construction, Operation, Care and Maintenance, and Closure	G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl	Monthly during periods pumping
			D	Monthly during periods of pumping
			Cl-a	Annually



SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TIA
ST-7a	Freshwater pumped from the Windy Lake freshwater intake	Construction, Operation, Care and Maintenance, Closure	G, N1, N2, MT, Cl and, T-Ag, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, T-Ca, and Total Oil and Grease, Free CN, Total CN	Monthly during periods of pumping
			B	
			D	
ST-8	Discharge from Doris Sewage Treatment Plant bio-membrane	Construction, Operation, Care and Maintenance, Closure	G, B, and Total Oil and Grease	Monthly when discharge to the Tundra, Annually when discharge to the TIA
			Location of discharge	Monthly during periods of discharge
			D	Daily during periods of discharge
ST-9	Runoff from Doris Sewage Treatment Plant discharge - downstream of wastewater treatment plant discharge point and just prior to flow entering Doris Lake	Construction, Operation, Care and Maintenance, Closure	G, B, and Total Oil and Grease	Monthly when ST-8 is discharged to the tundra
ST-10	Doris Site Runoff from Sediment Controls	Construction, Operations, Closure	TSS or Turbidity (following development and approval of a site-specific TSS-Turbidity)	Daily during periods of discharge
ST-11	Reagent and Cyanide Doris Storage Facility Sumps	Construction, Operation, Care and Maintenance, Closure	G, HC, MT, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, Total Ammonia, Total and Free Cyanide, and D	Annually
ST-12	Doris Lake	Operation, Closure	Water Level	Monthly
			Ice Thickness	Annually in April
ST-13	Doris Contact Water Pond associated with Pad U	Construction, Operation, Care and Maintenance, Closure	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Annually
			D	Daily during periods of discharge
TL-1	TIA at the Reclaim Pipeline	Operation, Care and Maintenance, Closure, Post-Closure	G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, HC, FC	Monthly during Operations, Closure and Post Closure. Annually during Care and Maintenance.
			Dissolved Oxygen and Redox Potential, BOD	Annually
			Acute Lethality	Annually during Post-Closure
			D	Daily during periods of discharge

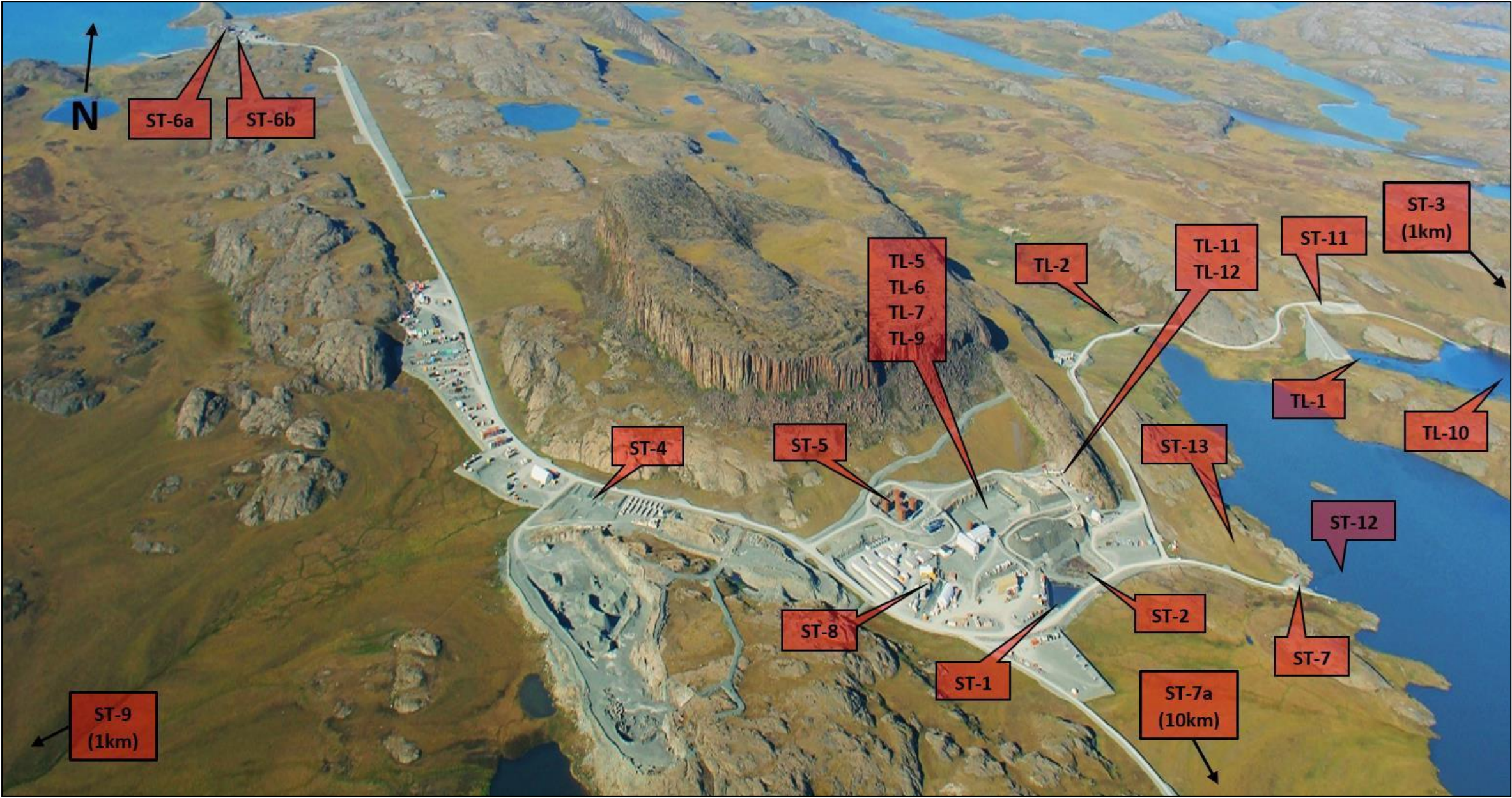
SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TIA
TL-2	Doris Outflow Creek - upstream (at the flow monitoring station adjacent to the bridge)	Closure, Post-Closure	G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, Oil and Grease	Annually during Care and Maintenance Annually for 2 years prior to Post-Closure, and during Post-Closure, Increase to three times per year (under ice, freshet, and pre-freeze up), two years prior to breach of the North Dam.
		Operation	D	Daily upon commencement of mining in or beneath the Doris Lake Talik.
TL-3	Doris Outflow Creek (~80m downstream of the base of the waterfall)	Care and Maintenance, prior to any deposit of tailings to the TIA	G, N1, N2, MT and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, Total Oil and Grease D	Inactive
TL-4	TIA Discharge End-of-Pipe	Care and Maintenance, prior to any deposit of tailings to the TIA	G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226	Inactive
			Acute Lethality	
			B	
			D	
TL-5	Effluent from Doris Process Plant (tailings slurry/ water)	Operations	G, N1, MT, and Free CN, Total CN, WAD CN, Sulphate, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, and Total Metals by ICP-MS	Monthly
			Cyanate and Thiocyanate	Quarterly
TL-6	Tailings Discharged into TIA (Solid Component) taken from a valve in the mill at the discharge end of the mill tailings pumps	Operations	Tonnage of dry tailings solids	Monthly during periods of discharge
			MT and T-Cd, T-Cr, T-Hg, T-Mo, T-Se, Total Inorganic Carbon and Total Metals by ICP-MS (must include Sulphur)	Sampled on a weekly basis with analyses carried out monthly on a composite sample of the TL-6 weekly samples
TL-7a	Detoxified tailings sent underground as backfill	Operations	Dry tonnage of detoxified tailings sent underground; Moisture content of backfill trucked underground	Monthly
TL7b	Filtrate from TL-7a (Detoxified tailings send underground as backfill)	Operations	Cyanate and Thiocyanate, WAD CN, Total Inorganic Carbon, Total Metals by ICP-MS (including Sulphur)	Monthly

SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TIA
TL-8	Reclaim water pumped from TIA to Mill Process water tank taken from a valve at the discharge end of the reclaim water pump	Operations	G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl	Inactive
			D	
TL-9	Detox tailings reactor tank (650-TK-565)	Operations	Continuous automated monitoring. Should the automatic monitor used to carry out this measurement be out of service manual samples from the detox filter feed pumps (650-PU-567/568) will be used to verify process operations.	
TL-10	Water Column in deepest portion of Tail Lake and at a location away from the TIA Reclaim water floating pump house, sampled at surface, mid- depth and near bottom.	Inactive		Inactive
TL-11	Seepage from Doris underground backfilled stopes	Operations	Visual inspection for seepage. If seepage present parameters to be monitored include N1 and pH, EC, Trace metals by ICP-MS, Alkalinity, Acidity, Sulphate, Total, Free and WAD CN	Survey Twice annually
TL-12	Doris Mine Water Discharge Point	Operations during continuous pumping	Chloride, TDS and nitrate	Weekly
			Total Ammonia, Nitrate, Nitrite, pH, EC, Total Metals by ICPMS, alkalinity, bromide, fluoride, sulphate, TSS, and Total and WAD Cyanide	Monthly
			D	Daily during periods of discharge
MMS-1	Madrid North Contact Water Pond	Construction, Operations, Care and Maintenance	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Sampled twice annually, Weekly water levels
MMS-2	Madrid South Primary Contact Water Pond	Construction, Operations, Care and Maintenance, Closure	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Sampled twice annually, Weekly water levels
MMS-3	Madrid South Secondary Contact Water Pond	Construction, Operations, Care and Maintenance, Closure	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS	Sampled twice annually, Weekly water levels
MMS-4a	Fresh Water Intake at Windy Lake North	Construction, Operations, Care and Maintenance, Closure	G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl, D	Sampled monthly during active pumping periods

SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TIA
MMS-4b	Fresh Water Intake at Windy Lake South (Windy Camp)	Construction, Operations, Care and Maintenance, Closure	G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl, and Total Oil and Grease, Cl, D	Sampled monthly during active pumping periods
MMS-5	Discharge from Madrid South Fuel Storage Facility	Construction, Operations, Care and Maintenance, Closure	G, HC, Total Pb	Annually. Once prior to every discharge onto the tundra
MMS-6	Brine Mixing Facility	Operations during continuous pumping	G, N1, Chloride, Fluoride, Bromide, Sulphate, TDS, EC, Total Metals ICPMS, Alkalinity and Total and WAD Cyanide	Sampled monthly during active pumping periods
MMS-7	Effluent from Madrid North Connector to TIA	Operations	G, N1, MT, and Free CN, Total CN, WAD CN, Sulphate, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, and Total Metals by ICP-MS	Sampled quarterly during active pumping periods
MMS-8	Discharge from Madrid North Fuel Storage Facility	Construction, Operations, Care and Maintenance, Closure	G, HC, Total Pb	Annually. Once prior to every discharge onto the tundra
MMS-9	Site runoff from sediment controls during construction	Construction	TSS or Turbidity	Sampled daily during period of discharge
MMS-10	Mine Water Discharge Point	Operations during continuous pumping	Chloride, TDS and nitrate	Weekly
			Total Ammonia, Nitrate, Nitrite, pH, EC, Total Metals ICPMS, alkalinity, Fluoride, Bromide, Sulphate, TSS, and Total and WAD Cyanide	Monthly



Figure A.1 2AM-DOH1335 Sample Station Locations





**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

**Module B: 2BE-HOP1222**



## Conformity Table

Licence	Part	Item	Topic	Report Section
2BE-HOP1222	J	14	The Licensee shall implement the Hope Bay Mining Limited, Quality Assurance and Quality Control Plan R5, for the Windy Lake Camp and the Patch Lake Fuel Farm Area, dated December 31, 2010, prepared in accordance with the INAC document "Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field, 1996" approved by an Analyst on July 4, 2011.	
		15	The Licensee shall annually review the approved Quality Assurance/Quality Control plan and modify it as necessary. Proposed modifications shall be submitted to an Analyst for approval.	Section 1.4
		16	The approved Quality Assurance/Quality Control Plan shall be submitted to the Board for review and implemented as approved by an Analyst.	This plan
		17	All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater, or by such other methods approved by the Board.	Sections 2 and 3
		18	All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.	Section 5

## B1 Introduction

The Type B Water Licence No. 2BE-HOP1222 issued to TMAC by the Nunavut Water Board (NWB) details the sampling and analysis requirements for the SNP program. Windy Camp and the Patch Lake Laydown facility are no longer in use; therefore, sampling stations associated with camp operations and fuel storage facility are not being used or monitored. There are currently no active sampling stations at Windy Camp or Patch Lake. Water drawn from Windy Lake for domestic use at Doris Camp is monitored under the 2AM-DOH1323 Licence SNP Station ST-7A.

## B2 SNP Sampling Stations

**Table B1. 2BE-HOP1222 Sample Stations, Sample Frequency and Analytical Parameters**

SNP Station	Description	Monitoring Parameters	Frequency
HOP-1	Raw water supply intake at Windy Lake	B, G, Oil and Grease	Monthly (when in use for Doris)
		D	Daily during periods of pumping
HOP-2*	WWTF effluent discharge at the surge tank prior to being pumped over the ridge east of the Windy Camp Facilities	G, B, MT, Oil and Grease	Monthly
		D	Daily during periods of discharge
HOP-3*	WWTF effluent at a point of entry into Windy lake	G, B, Oil and Grease	Monthly
		Acute Lethality	Annually
		D	Daily during periods of discharge
HOP-4*	Effluent from the Landfarm Treatment Facility pumped to the WWTF surge tank	B, G, Oil and Grease	Once before any discharge, daily when discharging onto the tundra
		D	Daily during periods of discharge
HOP-5*	Effluent from the Bulk Fuel Storage Facility located at the Windy Camp, prior to release	G, MT, HC, TPH, PAH, Nitrate, Nitrite, Total Phenols, Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium	Once before any discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge
HOP-6*	Effluent from the Bulk Fuel Storage Facility located at the Patch Lake location, prior to release to a location approved by an Inspector	G, MT, HC, Oil and Grease Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium	Once before any discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge
HOP-7A, B and D	Discharge from Quarries A, B and D respectively	G, N1, MT, Total Sulphate, Alkalinity, Oil and Grease, Electrical Conductivity and Reduction potential (Eh)	Once before any discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge
HOP-8*	Effluent from the Bulk Fuel Storage Facility located at the new Windy Camp location, prior to release to a location approved by an Inspector	G, MT, HC, Total Hardness, Total Alkalinity, Calcium, Potassium, Sulphate, Sodium, Magnesium	Once before any discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge
Drill Sites	Under-ice sampling before and after drilling	G, MT, Electrical Conductivity, Oil and Grease	Before and after on-ice drilling
	Water intake from all sources	D	Daily during periods of discharge

Figure B1. 2BE-HOP1222 Sample Stations Locations





**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

**Module C: 2BB-BOS1727**

## Conformity Table

Licence	Part	Item	Topic	Report Section
2BB-1727	J	16	The Board has accepted the Plan entitled “Quality Assurance and Quality Control Plan, Hope Bay, Nunavut, Module C: 2BB-BOS1217 Boston” dated January 2017, submitted as additional information with the Application. The Licensee shall submit with the Annual Report an addendum to the Plan; the addendum is to include an updated Table of Contents.	
		17	The Licensee shall annually review the Quality Assurance/Quality Control plan of Part J, Item 16 and modify it as necessary. Proposed modifications shall be submitted to an Analyst for approval.	Section 1.4
		18	All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater, or by such other methods approved by the Board.	Sections 2 and 3
		19	All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.	Section 5

## C1 Introduction

The Type B Water Licence No. 2BB-BOS1727 issued to TMAC by the Nunavut Water Board (NWB) details the sampling and analysis requirements for the SNP program.

## C2 SNP Sampling Stations

Table C1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the Surveillance Network Program for water licence 2BB-BOS1727. The location of each sampling point is illustrated in Figure C1 below.

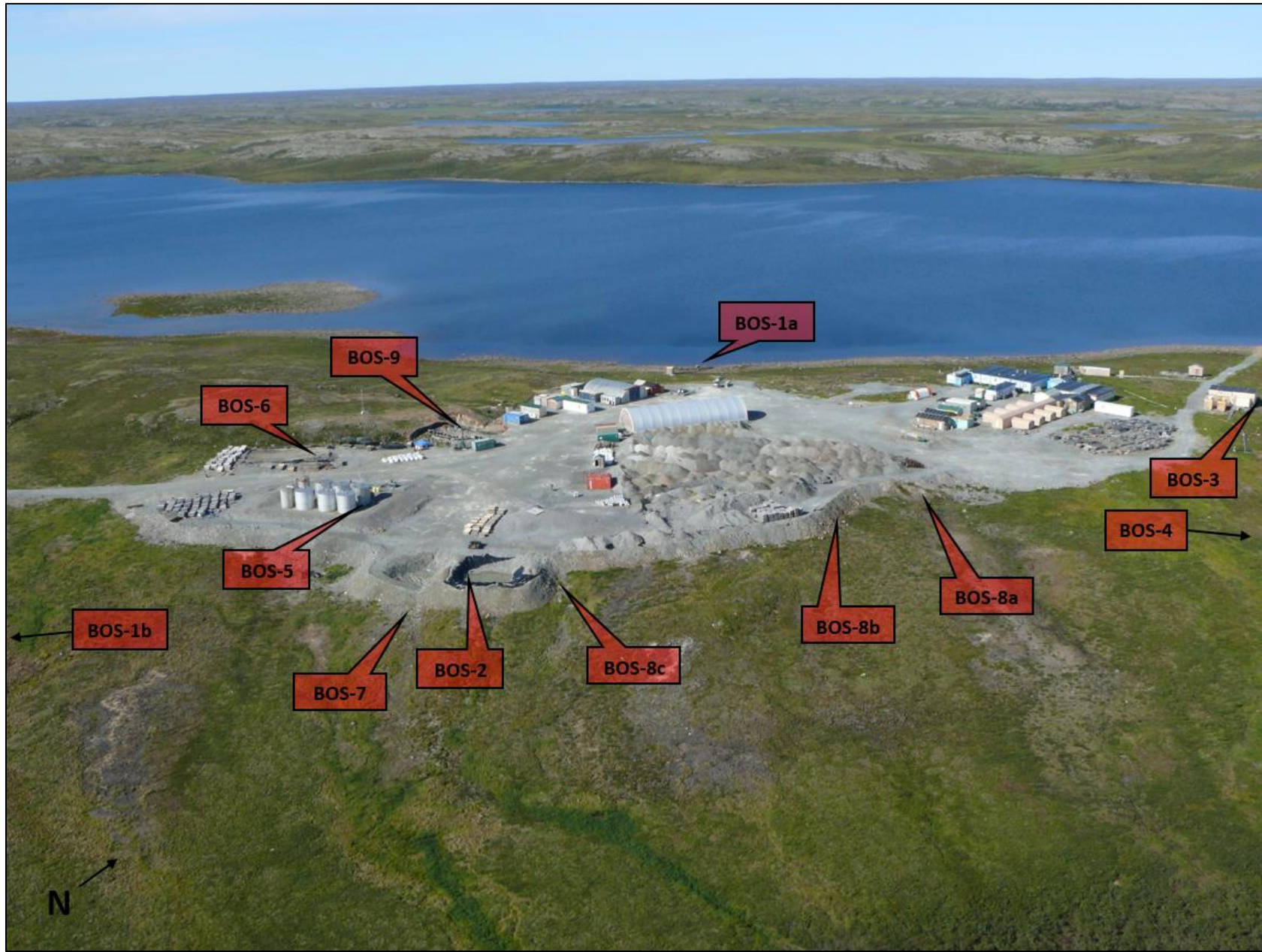
**Table C1. 2BB-BOS1727 Sample Stations, Sample Frequency and Analytical Parameters**

SNP Station	Description	Monitoring Parameters	Frequency
BOS-1a	Raw water supply intake at Aimaokatalok (Spyder) Lake	B, G, Oil and Grease	Monthly
		D	Daily during periods of pumping
BOS-1b	Raw water supply intake at Stickleback Lake	B, G, Oil and Grease	Monthly
		D	Daily during periods of pumping
BOS-2	Containment Pond discharge	G, Electrical Conductivity, Total Hardness, Total Alkalinity, T-As, T-Cd, T-Cu, T-Cr, T-Fe, T-Pb, T-Hg, T- Ni, T-Se, T-Zinc, Oil and Grease, Nitrate, Nitrite, Total Phenols, Ca, Mg, K, Na, Sulphate and Chloride	Prior to discharge, then weekly during discharge
		D	Daily during periods of discharge
BOS-3	Sewage Treatment Facility treated effluent	B, G, Oil and Grease	Prior to discharge, then monthly during discharge
		D	Daily during periods of discharge
BOS-4	Treated sewage effluent at the point prior to entry into Aimaokatalok (Spyder) Lake	B, G, Oil and Grease	Monthly during discharge
BOS-5	Effluent from the Bulk Fuel Storage Facility prior to discharge onto the tundra	G, T-As, T-Ni, T, Cd, T-Cu, T-Cr, T-Fe, T-Hg, T-Se, T-Zn, HC, Total Phenols, Total Hardness, Total Alkalinity, Ca, Mg, K, Na, Sulphate and Chloride, Nitrate- Nitrite, Electrical Conductivity	Prior to discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge
BOS-6	Effluent from the Landfarm Treatment Facility prior to discharge onto the tundra	G, HC, T-As, T-Cd, T-Cu, T-Cr, T-Fe, T-Hg, T-Ni, T-Se, Total Phenols, Total Hardness, Total Alkalinity, Ca, Mg, K, Na, Sulphate and Chloride, Nitrate- Nitrite, Electrical Conductivity	Prior to discharge, monthly when discharging onto the tundra
		D	Daily during periods of discharge



SNP Station	Description	Monitoring Parameters	Frequency
BOS-7	Runoff from the temporary storage area of hydrocarbon contaminated soils prior to discharge onto tundra	G, HC, T-As, T-Cd, T-Cu, T-Cr, T-Fe, T, Hg, T-Ni, T-Se, T-Zn, Total Phenols, Total Hardness, Total Alkalinity, Ca, Mg, K, Na, Sulphate and Chloride, Nitrate- Nitrite, Electrical Conductivity	Prior to discharge, monthly when discharging onto the tundra
BOS-8	Seepage/runoff from the ore stockpiles and camp pad	G, Sulphate and Chloride, Electrical Conductivity, Total Ammonia, Total Arsenic, Total Trace Metals Including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Initially during spring thaw and monthly when flow observed
BOS-9	Portal Decline, surface water runoff discharged onto tundra	G, Oil and Grease, Nitrate, Total Trace Metals Including T-As, T-Cu, T-Pb, T-Ni, T-Zn, T-Al, T, Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Fe, T-Li, T-Mn, T-Mo, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, Sulphate and Chloride, Electrical Conductivity, Total Ammonia	Once prior to discharge
		D	Daily during periods of discharge
BOS-10	Underground Mine Water Sumps	G, Sulphate and Chloride, Electrical Conductivity, Total Ammonia, Total Arsenic, Total Trace Metals Including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Three times a year during periods of water inflow
		D	Daily during periods of discharge
Drill Sites	Under-ice sampling before and after drilling	G, Electrical Conductivity, Total Trace Metals including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn, Trace Arsenic and Mercury	Before and after on-ice drilling
	Water intake from all sources	D	Daily during periods of discharge

Figure C1. 2BB-BOS1727 Sample Stations Locations





**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

**Module D: 2BB-MAE1727**

## Conformity Table

Licence	Part	Item	Topic	Report Section
2BB-MAE1727	J	14	The Licensee shall submit to the Board for review within 60 (sixty) days prior any major monitoring takes place, a Quality Assurance and Quality Control Plan, prepared in consultation with the accredited laboratory conducting the analysis. The Plan shall include a cover letter from the accredited laboratory confirming approval of the Plan for analysis to be performed under this Licence. The Plan shall be developed in accordance with current Standard Methods and the 1996 Quality Assurance and Quality Control Guidelines for Use by Class "A" Licensees (INAC).	
		15	The Licensee shall annually review the approved Quality Assurance/Quality Control plan and modify it as necessary. Proposed modifications shall be submitted to an accredited laboratory for approval.	
		16	All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater, or by such other methods approved by the Board in writing.	
		17	All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.	

## D1 Introduction

The Type B Water Licence No. 2BB-MAE1727 issued to TMAC by the Nunavut Water Board (NWB) details the sampling and analysis requirements for the SNP program.

## D2 SNP Sampling Stations

Table D1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the Surveillance Network Program for water licence 2BB-MAE1727. The locations of these monitoring stations have not yet been established as work at Madrid under this licence has not yet commenced. Locations of these monitoring stations as approved by the Inspector will be provided with the next version of this plan. Proposed locations for monitoring stations MAE-14, MAE-15 and MAE-16 are illustrated in Figure D1 below.

**Table D1. 2BB-MAE1727 Sample Stations, Sample Frequency and Analytical Parameters**

SNP Station	Description	Monitoring Parameters	Frequency
MAE-01	Madrid North Freshwater intake at Windy Lake	B, G, Oil and Grease	Monthly
		D	Daily during periods of pumping
MAE-02	Madrid South Freshwater intake at Patch Lake	B, G, Oil and Grease	Monthly
		D	Daily during periods of pumping
MAE-03	Freshwater intake at other Lakes	B, G, Oil and Grease	Monthly
		D	Daily during periods of pumping
MAE-04	Madrid North Pollution Control Pond	G, Electrical Conductivity, Oil and Grease, Sulphate and Chloride, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Ca, Mg, K, Na, T-As, T, Cd, T-Cu, T-Cr, T-Fe, T-Pb, T-Hg, T-Ni	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-05	Madrid South Pollution Control Pond No. 1	G, Electrical Conductivity, Oil and Grease, Sulphate and Chloride, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Ca, Mg, K, Na, T-As, T, Cd, T-Cu, T-Cr, T-Fe, T-Pb, T-Hg, T-Ni	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-06	Madrid South Pollution Control Pond No. 2	G, Electrical Conductivity, Oil and Grease, Sulphate and Chloride, Total Ammonia, Nitrate-Nitrite, Total Phenols, Total Alkalinity, Total Hardness, Ca, Mg, K, Na, T-As, T, Cd, T-Cu, T-Cr, T-Fe, T-Pb, T-Hg, T-Ni	Prior to discharge to tundra
		D	Daily during periods of pumping

SNP Station	Description	Monitoring Parameters	Frequency
MAE-07	Madrid North Fuel Storage Area Water Sump	G, HC, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-08	Madrid North Fuel Transfer Station Water Sump	G, HC, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-09	Madrid South Fuel Storage Area Water Sump	G, HC, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-10	Madrid South Fuel Transfer Station Water Sump	G, HC, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-11	Quarry G Contact Water Sump	G, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As, and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-12	Quarry H Contact Water Sump	G, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As, and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Prior to discharge to tundra
		D	Daily during periods of pumping
MAE-13	Quarry I Contact Water Sump	G, Sulphate, Chloride, Electrical Conductivity, Total Ammonia, T-As, and Trace Metals by ICP-Scan including T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co,	Prior to discharge to tundra



SNP Station	Description	Monitoring Parameters	Frequency
		T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	
		D	Daily during periods of pumping
MAE-14	Windy Lake immediately downgradient of the Pollution Control Pond Discharge	Chloride, Electrical Conductivity, Total Dissolved Solids	Monthly
MAE-15	Patch Lake immediately downgradient of the Pollution Control Pond Discharge	Chloride, Electrical Conductivity, Total Dissolved Solids	Monthly
MAE-16	Wolverine Lake immediately downgradient of the Pollution Control Pond Discharge	Chloride, Electrical Conductivity, Total Dissolved Solids	Monthly
Mine Water	Madrid South Underground Mine Water Sumps	Total Dissolved Solids, pH, Electrical Conductivity, Chloride, Total Ammonia and Nitrate, Alkalinity, Sulphate, Total Trace Metals by ICP Scan including T-As, T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Three times a year during periods of water inflow
Drill Sites	Under-ice sampling before and after drilling	G, Electrical Conductivity, Total Trace Metals by ICP Scan including T-As, T-Al, T-Sb, T-Ba, T-Be, T-Cd, T-Cr, T-Co, T-Cu, T-Fe, T-Hg, T-Pb, T-Li, T-Mn, T-Mo, T-Ni, T-Se, T-Sn, T-Sr, T-Tl, T-Ti, T-U, T-V, T-Zn	Before and after on-ice drilling
	Water intake from all sources	D	Daily during periods of discharge

Figure D1. 2BB-MAE1727 Sample Stations Locations





**QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

**HOPE BAY, NUNAVUT**

**Module E: 2AM-BOS1835**

## Conformity Table

Licence	Part	Item	Topic	Report Section
2AM-BOS1835	B	13	The Licensee shall, for all plans submitted under this Licence, implement the plan as approved by the Board in writing. Any changes to the plans deemed significant shall be considered as an amendment to the plan(s) or as a modification and must be submitted to the Board for approval in writing. The Board has approved under this Water Licence 2AM-BOS1835, the following plans for implementation under the relevant sections in the Licence: <i>q. Quality Assurance and Quality Control Plan (January 2017)</i>	
	I	3	The Licensee shall undertake the Monitoring Program provided in the Tables 1 and 2 of Schedule I. The Licensee shall, in consultation with an Inspector, establish the locations and GPS coordinates for all Monitoring Program stations.	Table E1
		14	The Licensee shall annually review the approved Quality Assurance and Quality Control Plan and modify the Plan as necessary. Proposed changes shall be submitted to an Accredited Laboratory for approval.	Section 1.4
		15	All analyses shall be conducted as described in the most recent edition of "Standard Methods for the Examination of Water and Wastewater" or by other such methods approved by an Analyst.	Sections 2 and 3
		16	All compliance analyses shall be performed in an accredited laboratory according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.	Section 5

## E1 Introduction

The Type A Water Licence No. 2AM-BOS1835 issued to TMAC by the Nunavut Water Board (NWB) details the sampling and analysis requirements for the SNP program.

## E2 SNP Sampling Stations

Table E1 summarizes the sampling stations, sampling frequency and monitoring parameters required as part of the Surveillance Network Program for water licence 2AM-BOS1835. The locations of these monitoring stations have not yet been established as work at Boston under this licence has not yet commenced. Locations of these monitoring stations as approved by the Inspector will be provided with the next version of this plan.

**Table E1. 2AM-BOS1835 Sample Stations, Sample Frequency and Analytical Parameters**

SNP Station	Description	Phase	Monitoring Parameters	Frequency during Operations and any time after initial deposit of Tailings to the TMA
BMS-1	Contact Water Pond #1 and #2	Construction, Operations, Care and Maintenance	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS, D	Sampled twice annually; Weekly water levels
BMS-2	Surge pond at intake to Contact Water Treatment Plant	Construction, Operations, Care and Maintenance, Closure	G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226, HC, D	Sampled monthly during discharge periods; Weekly water levels
BMS-3	Discharge from Contact Water Treatment Plant	Construction (upon Effluent release), Operations, Care and Maintenance, Closure	G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, T-Radium 226, HC, D	Sampled weekly during discharge periods and prior to discharge
BMS-4	Reclaim line from TMA Contact Water Pond	Construction, Operations, Care and Maintenance, Closure	G, N1, N2, MT, and TDS, Cl, Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-K, T-Mo, T-Mg, T-Na, T-Se, T-Tl, HC, D, Fecal Coliform	Sampled monthly during reclaim periods; Weekly water levels
BMS-5	Non-contact Water Pond	Construction, Operations, Care and Maintenance	G, N1, MT and Total Sulphate, Total CN, Total Oil and Grease, Alkalinity, Chloride, and Total Metals by ICP-MS, D	Sampled annually; Water levels after large inflow events
BMS-6	Fresh Water intake at Aimaokatalok Lake	Construction, Operations, Care and Maintenance, Closure	G, N1, N2, MT and Free CN, Total CN, T-Ag, T-Ca, T-Cd, T-Cr, T-Hg, T-Mo, T-Se, T-Tl and Total Oil and Grease, Cl, D	Sampled monthly during active pumping periods
BMS-7	Landfill Sump	Construction, Operations, Care and Maintenance, Closure	G, MT and Total Ammonia-N, Total Sulphate, Total and Free CN, Total Oil and Grease, D	Annually. Once prior to every discharge onto the tundra

<b>SNP Station</b>	<b>Description</b>	<b>Phase</b>	<b>Monitoring Parameters</b>	<b>Frequency during Operations and any time after initial deposit of Tailings to the TMA</b>
BMS-8	Discharge of treated Sewage	Construction, Operations, Care and Maintenance, Closure	G, B, and Total Oil and Grease, D	Sampled monthly during active pumping periods
BMS-9	Landfarm Sump	Construction, Operations, Care and Maintenance, Closure	G, HC, Total Ammonium, Total Lead, D	Annually. Once prior to every discharge onto the tundra
BOS-10	Site runoff from sediment controls during construction	Construction	pH, TSS or Turbidity, Oil and Grease	Daily during periods of discharge
BMS-11	Discharge from the Boston Fuel storage and containment sumps	Construction, Operations, Care and Maintenance, Closure	G, HC, Total Pb	Annually. Once prior to every discharge onto the tundra
			D	Daily during periods of pumping