AECOM

# Ennadai Lake Long-Term Monitoring Report

Year 7

Crown-Indigenous Relations and Northern Affairs Canada

Project number: 60686962

February 16, 2023

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# Executive Summary

The Ennadai Lake Site is a former weather station constructed in the 1950s, operated as both a manned and unmanned station at different times throughout its history, then abandoned in the late 1980s to early 1990s. In the 1950s, the Site housed a Department of National Defence (DND) signal station in conjunction with a manned Transport Canada weather station. In the 1980s to early 1990s the site was abandoned, and the weather station was transferred to Environment and Climate Change Canada (ECCC). Remediation activities occurred between 2014 and 2015, which included construction of a Non-Hazardous Waste Landfill (NHWL), demolition and disposal of buildings, structures, and other debris, as well as the cleanup of hazardous materials and contaminated waste. Currently ECCC operates an independent unmanned weather station near the Site.

The field program was conducted on August 11, 2022, to complete Year 7 monitoring activities as described in the *Ennadai Lake Long Term Monitoring Plan* (INAC, 2016; LTMP). The program included visual monitoring of the NHWL, visual inspection of general site conditions, collection and analysis of groundwater samples, and surface water or soil samples, if identified. The visual and environmental monitoring inspection was documented via checklist along with a photographic record.

Groundwater collection continues to be problematic at the Site; only one well (MWLF-3) could be sampled, the other two were found frozen (MWLF-2) and dry within the active layer (MWLF-1). Groundwater samples collected at the NHWL from the one sampled well did exhibit a ULA exceedance for lead, however, it is not cause for concern at this time. The exceedance was not successive with previous years and appears anomalous to historical data. Further monitoring is required to determine if any potential trends are established.

The overall performance condition of the NHWL is rated as acceptable in 2022 based on the severity ratings presented in AMSRP Volume II (INAC, 2009). Settlement features identified on Site do not appear to be notably changing or affecting the stability or performance of the landfill.

Based on the results of the 2022 Year 7 activities, the remediation strategy for Ennadai Lake appears to be meeting the objectives expected for this phase of the LTMP. Geotechnical monitoring and visual inspection rate the NHWL as acceptable as per the AMSRP, consistent with Year 5 results. The landfill condition combined with the lack of cause for surface water or soil samples indicates little to no risk associated with contaminant migration from the landfill. Further monitoring is required to interpret the ULA exceedance of lead, an AMSRP contamination of concern (COC), at MWLF-3.

Continuation of the monitoring schedule as written in the LTMP is recommended, with the next monitoring event being Year 10 in 2025. In addition, it is recommended that consideration be given to collection of soil samples as part of the monitoring program. The collection of addition soil samples, beyond the current LTMP specification of soil sampling in locations showing signs of seepage and staining, could provide a data source to supplement the limited groundwater data for the Site and the historical inability for the monitoring wells to produce water. This approach was used for landfill monitoring by the DND at their Distant Early Warning (DEW) Line sites and could bolster the available data set to inform discontinuation of PCB and PHC sampling.

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# Acronyms and Abbreviations

| | |
|---|---|
| ACM | Asbestos Containing Materials |
| AECOM | AECOM Canada Ltd. |
| ALS | ALS Environmental Laboratories |
| AMSRP | Abandoned Military Site Remediation Protocol |
| CALA | Canadian Association for Laboratory Accreditation |
| CCME | Canadian Council of Ministers of the Environment |
| COC | Contaminant of Concern |
| CIRNAC | Crown-Indigenous Relations and Northern Affairs Canada |
| DEW | Distant Early Warning |
| DND | Department of National Defence |
| DO | Dissolved Oxygen |
| ECCC | Environment and Climate Change Canada |
| GPS | Global Positioning System |
| HASP | Health and Safety Plan |
| INAC | Indigenous and Northern Affairs Canada (*formerly Aboriginal Affairs and Northern Development Canada - AANDC*) |
| IOL | Inuit Owned Land |
| KivIA | Kivalliq Inuit Association |
| LTM | Long-Term Monitoring |
| LTMP | Long-Term Monitoring Plan |
| LDPE | Low Density Polyethylene |
| NHWL | Non-Hazardous Waste Landfill |
| NU | Nunavut |
| ORP | Oxidative-Reduction Potential |
| PCBs | Polychlorinated Biphenyls |
| PHCs | Petroleum Hydrocarbons |
| QA | Quality Assurance |
| QC | Quality Control |
| QA/QC | Quality Assurance/Quality Control |
| RDL | Reportable Detection Limit |
| RPD | Relative Percent Difference |
| TDS | Total Dissolved Solids |
| TSS | Total Suspended Solids |
| ULA | Upper Limit of Acceptability |
| UTM | Universal Transverse Mercator |

# 1. Introduction

AECOM Canada Ltd. (AECOM) was retained by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) to conduct the long-term monitoring (LTM) activities at former weather station Ennadai Lake (herein referred to as "the Site"). Ennadai Lake is located at 61º 07' 57.25"' N, 100º 53' 6.78" W, 370 kilometres (km) west of Arviat and 400 km southwest of Rankin Inlet, Nunavut (NU). This report outlines Year 7, the first year in Phase II of the monitoring program.

## 1.1 Objectives

The objective of the long-term monitoring event was to complete Year 7 monitoring activities as described in the *Ennadai Lake Long Term Monitoring Plan* (INAC, 2016; LTMP). The program included visual monitoring of the Non-hazardous Waste Landfill (NHWL), visual inspection of general site conditions, collection and analysis of groundwater samples, and surface water or soil samples, if identified. Analysis of field data and visual observations was conducted to satisfy the requirements of the Abandoned Military Site Remediation Protocol (INAC, 2009; AMSRP).

## 1.2 Scope of Work

The scope of work for the 2022 long-term monitoring activities included the following:

- Prepare and submit a Logistics Plan detailing the work schedule.
- Prepare and submit a Work Plan detailing the work methodologies.
- Prepare and submit a detailed Health and Safety Plan (HASP).
- Mobilize to and from Ennadai Lake via chartered Twin Otter aircraft, with one field day on Site.
- Provision of a wildlife monitor (with firearm).
- Monitoring of general site conditions (i.e., access roads and airstrip, etc.) as outlined in Section 2.1 and Table 3 of the LTMP.
- Visual inspection of the NHWL in accordance with Appendix C of the LTMP. Observations will be documented via a photographic record, visual monitoring checklist, and a site map.
- Purge monitoring wells, collect in situ field parameters, and collect groundwater samples from three (3) monitoring wells around the NHWL.
- Collect soil samples if seepage or staining was identified during visual inspection. Parameters to be analysed include: polychlorinated biphenyls (PCBs), petroleum hydrocarbons (PHCs), and metals (As, Cd, Co, Cr, Pb, Ni, and Zn).
- Collect and analyse blind duplicates from at least 20% of samples.
- Submit water samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of PHC Fractions F1 and F2, total and dissolved metals, major ions, hardness, total dissolved solids, total suspended solids, pH, and conductivity.
- Prepare a field report summarizing LTM activities within two weeks of fieldwork completion.
- Submit draft and final versions of the Ennadai Lake Long-Term Monitoring Report (Year 7) to CIRNAC.

This report presents the results of the monitoring event completed in August 2022. Sections 2 and 3 provide background information on the Site and reference guideline information, respectively. Details regarding specific methodologies of each task are included in Section 4, while monitoring results are presented in Section 5. Recommendations and conclusions are available in Section 6.

# 2. Background Information

## 2.1 Site Description

The Ennadai Lake Site is located approximately 370 km west of Arviat and 400 km southwest of Rankin Inlet, NU; approximate coordinates of the site are 61º 07' 57.25"' N, 100º 53' 6.78" W. Figure 1 in **Appendix A** shows the general site location. The Site is a former weather station constructed in the 1950s, operated as both a manned and unmanned station at different times throughout its history, then abandoned in the late 1980s to early 1990s. In the 1950s, the site housed a Department of National Defence (DND) signal station in conjunction with a manned Transport Canada weather station. In the 1980s to early 1990s the site was abandoned, and the weather station was transferred to Environment and Climate Change Canada (ECCC). Two smaller parcels of land on the Site are Inuit Owned Land (IOL) transferred through the Nunavut Land Claims Agreement in 1993. The Crown portions of this land are administered by Indian and Northern Affairs Canada (INAC; now CIRNAC) with the IOL portions administered by the Kivalliq Inuit Association (KivIA). Currently ECCC operates an independent unmanned weather station near the Site (see Figure 2 in **Appendix A**).

Remediation activities occurred between 2014 and 2015, which included construction of the NHWL, demolition and disposal of buildings, structures, and other debris, as well as the cleanup of hazardous materials and contaminated waste. The NHWL is located 200 m west of the main site and contains the following:

- Tier I contaminated soil (e.g., soil with lead concentrations up to 500 parts per million (ppm) and PCB concentrations up to 5 ppm;
- Type A PHC contaminated soil;
- Non-hazardous site debris, such as scrap metal and wood; and
- Asbestos containing materials (ACM).

Three groundwater monitoring wells were installed for long-term monitoring. The area is known to be used by hunters and fishermen, however, due to the presence of permafrost and shallow groundwater depth it is assumed that groundwater will not be used for drinking water in this area.

## 2.2 Previous Reports and Monitoring Programs

AECOM reviewed the following reports prior to the field program:

- *Evaluation of Phase I Long Term Monitoring – Ennadai Lake (BluMetric, 2021a)*
- *Ennadai Lake Long Term Monitoring Event - 2020 Long Term Monitoring Report* (BluMetric, 2021b)
- *Ennadai Lake Long Term Monitoring Event Kivalliq Region, Nunavut (SLR, 2018)*
- *Ennadai Lake Long Term Monitoring Plan (INAC, 2016)*
- *Abandoned Military Site Remediation Protocol* (AMSRP) (INAC, 2009)

The requirements for long-term monitoring as laid out in the AMSRP include:

- **Phase I**: Years 1, 3, and 5
- **Phase II**: Years 7, 10, 15, and 25
- **Phase III**: Beyond Year 25, if required

The monitoring program at Ennadai Lake began in 2016 and was scheduled every other year for the first seven years, decreasing frequency to Years 10, 15, 20 and 25. The program will be reviewed at the end of Year 25 to assess the need for continued monitoring.

# 3. Regulatory Guidelines

Review of the Ennadai Lake LTMP and AMSRP identified the applicable guidelines for use in the LTM program. The following sections describe the reference guidelines selected for each type of sample collected at the Site. Comparison to background samples is used in the absence of criteria when applicable.

## 3.1 Groundwater

Three (3) monitoring wells were installed at the Site around the NHWL, MWLF-1 – MWLF-3. Nine groundwater samples were collected at the NHWL prior to the Year 7 monitoring event; two during remediation activities, two in Year 1, two in Year 3, and three in Year 5. Sample collection has been problematic in previous monitoring events and therefore samples are primarily compared to MWLF-3.

Due to the absence of groundwater criteria, the analytical data for groundwater were compared to available historical data from the Site. According to the AMSRP, if the analytical results are within +/- three (3) standard deviations, the landfill is deemed acceptable and performing as expected. If the analytical results do not meet these criteria, further measures are recommended ranging from increased monitoring frequency to development of a new remedial plan.

As per the AMSRP, Upper Limits of Acceptability (ULAs) were calculated using the average + three (3) standard deviations of all available data. ULAs were only calculated for a limited number of parameters since baseline data is sparse, and as concentrations for many parameters are below the detectable limit. Duplicates were omitted from the calculations as to not over-represent results from one well in the ULA calculation. ULAs were only calculated for parameters with three or more data points of detectable concentrations. Tables D-7 to D-9 in **Appendix D** summarize the available historical groundwater data and the calculated ULAs (where available) from the BluMetric Year 5 Report (BluMetric, 2021b).

In the 2020 Year 5 LTM report, BluMetric used background data from 2014 and Years 1 and 3 so that ULA criteria could be calculated for total and dissolved metals and some inorganic parameters. There is currently insufficient historical or baseline data to calculate ULAs for the remaining parameters (e.g., PHCs and PCBs).

## 3.2 Surface Water

Due to the absence of appropriate surface water criteria, the analytical data for surface water should be compared to available historical data from the Site. According to the AMSRP, if the analytical results are within +/- three (3) standard deviations, the landfill is deemed acceptable and performing as expected. If the analytical results do not meet these criteria, further measures are recommended ranging from increased monitoring frequency to development of a new remedial plan.

No baseline surface water samples exist for the Site. Given the absence of appropriate reference guidelines or baseline reference data, the Canadian Council of Ministers of the Environment (CCME) guidelines for Protection of Aquatic Life are used purely as a point of reference and are not meant to be interpreted as criteria. The CCME guidelines are a conservative reference as the closest permanent body of water is approximately 315 m from the NHWL.

## 3.3 Soil

It is understood baseline soil samples were collected during remediation activities in 2014 and 2015, results of which are presented in the Final Remediation Report by Stantec Consulting Ltd.; however, AECOM was not provided this report. Soil samples have yet to be collected during the monitoring programs as no seepage or staining has been observed. Should samples be collected in future programs, analytical results will be compared to the background results with calculated ULAs as the guideline per the AMSRP.

# 4. 2022 Monitoring Program Methodologies

The Site investigation for the 2022 Ennadai Lake Long-Term Monitoring Program was completed on August 11, 2022, by AECOM personnel David Bugden and Alysha Selinger, accompanied by CIRNAC representative Melanie Netser, wildlife monitor Noah Alookie, and field technician Max Dubeau with Nunatta Environmental. The Site was accessed by Twin-Otter aircraft provided by Kenn Borek Air Ltd. and the field team staged out of Rankin Inlet. A summary of the activities and field notes can be found in **Appendix C**.

## 4.1 Health and Safety Plan

In preparation for the field program, a site-specific HASP was produced and previously submitted to CIRNAC under a separate cover. The HASP identified risks and suspected hazards associated with work on the Site. The document specifically addressed any known or suspected hazards providing mitigative measures including protocols for COVID-19. Included in the HASP were emergency contacts and procedures for medical, mechanical, or weather emergencies. Prior to the start of work, a review of the HASP was completed with all personnel involved in the field program.

## 4.2 Geotechnical Monitoring and Visual Inspection

The physical integrity of the NHWL was inspected at the Site during the 2022 long-term monitoring event. The visual inspection looked for evidence of:

- Erosion, ponding, frost action, settlement, and lateral movement;
- Animal burrows, vegetation, vegetation stresses; and
- Staining or seepage.

These observations were documented via the visual monitoring checklist and through Site photographs. Site features noted and summarized in the 2020 Year 5 event by BluMetric were monitored for any observed changes and new features observed during the 2022 visual monitoring were documented.

## 4.3 Groundwater Sampling Methodology

The following outlines the methodology prepared for this program. Water level and depth to bottom were recorded, and an approximate well volume calculated. Samples were collected from groundwater wells using a peristaltic pump and dedicated disposable polyethylene tubing to purge and sample using low-flow methodology. The following recordings were taken prior to sampling; water level below top of well casing, total depth of well, height of well casing above ground surface to top of casing (stick-up) presence of hydrocarbons, and hydrocarbon thickness (if applicable). Prior to the collection of representative groundwater samples, the monitoring wells were purged until water quality parameters stabilized, including dissolved oxygen (DO), oxidative-reduction potential (ORP), temperature, pH, conductivity, and turbidity using a YSI 6920 V2 probe. All field parameters were recorded prior to sampling. Parameter readings during the purging process were recorded every 3-5 minutes, aiming for three consecutive readings within 5% prior to sampling. If stabilization could not be achieved before depletion of the water column, purging would stop, and sample collection would begin. Laboratory supplied containers were filled, stored in coolers, and shipped with ice to CALA accredited ALS Environmental Laboratories (ALS) in Edmonton, AB, for analysis.

Samples were analyzed for:

- PHC Fraction F1 and F2;
- Total and dissolved metals;
- Major ions, hardness, total dissolved solids, total suspended solids; and
- pH, conductivity.

## 4.4 Surface Water Sampling Methodology

The following outlines the methodology prepared for this program in the event surface water was identified on site.

Following the collection of each water sample, temperature, pH, dissolved oxygen, and conductivity were to be recorded. Observations such as turbidity, evidence of groundwater indicators (surface sheen, vegetation), presence or evidence of aquatic life, and human and/or animals on site were also to be noted.

All collected surface water samples were to be placed in appropriate laboratory-supplied clean sample bottles, placed in insulated coolers (provided by ALS Laboratory), and maintained between 0 and 10ºC for shipment to the laboratory under a Chain of Custody. Global Positioning System (GPS) UTM coordinates were to be documented for surface water sampling locations.

Samples were to be analyzed for:

- PHC Fractions F1 and F2 (C6-C16);
- Total and dissolved metals;
- PCBs; and
- Total suspended solids, total dissolved solids, and routine parameters including major ions and hardness.

## 4.5 Soil Sampling Methodology

In the event visual inspection identified staining, samples were to be collected with a small trowel decontaminated with a laboratory-grade biodegradable cleaner (Alconox®) and rinsed between sampling locations. Soil samples were to be collected to a maximum depth of 30 cm and packed into laboratory-supplied jars with minimal to no headspace. Samples were to be kept cool and packed on ice for shipment to ALS laboratories.

The following parameters were to be analysed:

• PCBs;

• PHC Fractions F1-F4; and

• Metals.

## 4.6 Quality Assurance and Quality Control

A Quality Assurance/Quality Control (QA/QC) program was followed when sampling occurred to verify sampling and analytical data collected are interpretable, defensible, and comparable. This involved following QA/QC measures in both the collection and analysis of environmental samples.

Quality Control (QC) measures used in the collection, preservation, shipment, and analysis of samples include the following:

- Sampling techniques performed in accordance with standard written AECOM protocols.
- Thorough field notes recorded during the Site visit.
- All samples collected in laboratory provided sample containers and kept cool until arrival at the laboratory.
- Samples assigned unique sample control numbers and transported under Chain of Custody procedures.
- The selected analytical laboratory has proficiency certification issued by CALA.

Quality Assurance (QA) measures established for the investigation include collection of field duplicate samples at a rate of at least 20%. A blind duplicate sample consists of a second aliquot of an individual sample submitted to the analytical laboratory under a separate label such that the analytical laboratory has no prior knowledge that it is a duplicate.

The relative percent difference (RPD) between duplicate results was used to assess overall sampling precision. The RPD is a measure of the variability between two duplicate analyses and is calculated by the following equation:

$$RPD = 100 \times ((2 \times (x_1 - x_2))/(x_1 + x_2))$$

*Where $x_1$ is the primary results and $x_2$ is the blind duplicate result.*

Acceptable RPD values vary on the analytical parameters, the sample matrix, and the concentrations of analytes in the sample. For metals in soils acceptable RPD values are 35%, and 50% for organics in soils (PHCs and PCBs). Only when concentrations are at least 10 times the method detection limit are RPD calculations considered valid.

# 5. Results

This section provides a summary of the analytical results and observations collected during the 2022 Year 7 monitoring activities. Drawings, with inspection feature markups, are provided on figures in **Appendix A**. Photographs of the Site taken during the Site monitoring program are presented in **Appendix B**. The Visual Inspection Checklist can be found in **Appendix C.**

## 5.1 Non-Hazardous Waste Landfill

### 5.1.1 Geotechnical Monitoring and Visual Inspection

The following subsections describe the results of the geotechnical monitoring and visual inspections completed at the landfill and immediate surrounding area. During the geotechnical inspection, the perimeter and cover surface of the landfill were walked. Any defects found on the top cap, slopes, and extending area from the base of the landfill were recorded.

#### 5.1.1.1 Settlement

One area of settlement was observed during the 2022 monitoring event that was not previously reported in Years 3 or 5. A small circular depression was identified in the northwest corner of the NHWL on the transition between cover and slope (see Photograph 15 in **Appendix B**). A previously observed area of settlement was still present on the midpoint of the south portion of landfill cover (see Photograph 7 in **Appendix B**). The feature does not appear to have changed significantly since 2020.

#### 5.1.1.2 Erosion

An area of erosion and washout was noted on the west portion of the Site at the intersection of the access road with the NHWL area, previously observed (see Photographs 18 and 20 in **Appendix B**). The washout area shows notable establishment of vegetation changing the condition of the feature from 2020. Various sections of erosion, circular depressions, and differential settlement were observed throughout the access road (see Photograph 19 in **Appendix B**). The southwestern erosion feature was not thoroughly inspected during the ground inspection but was observed during the aerial approach (see Figure 3 in **Appendix A**).

#### 5.1.1.3 Wildlife Presence

No animal burrows were noted during the investigation, circular features on the access road were deemed to be erosion and/or settlement features. Various caribou tracks were noted on the slopes of the landfill, along the access road northeast of the NHWL, and throughout the Site (see Photographs 4, 8, and 17 in **Appendix B**). A herd of caribou were observed during the aerial approach to site, and a single caribou was observed on a ridge across from the airstrip while the field team was on Site (see Natural Environment Checklist in **Appendix C**).

#### 5.1.1.4 Debris

Exposed debris was not observed at the landfill; however, some scattered debris, including tin cans and broken glass, was observed around Site (see Photograph 16 **Appendix B**). Aviation fuel drums are located in a drum cache east of the landfill and airstrip area (see Figure 2 in **Appendix A**); no evidence of spills or leaks were identified, but the containment tray is partially filled with sand therefore reducing the volume available for spill containment (see Photographs 21 through 23 in **Appendix B**).

#### 5.1.1.5 Staining

During the inspection, no observations of staining were observed.

#### 5.1.1.6 Vegetation Stress

Sparse areas of revegetation and tuffs of grass were noted on the NHWL slopes and cover but did not appear to be under stress (see Photographs 4 and 6 in **Appendix B**).

#### 5.1.1.7 Seepage and Ponding

During the inspection, no indication of seepage or active seepage points were observed.

#### 5.1.1.8 Monitoring Instruments

All three (3) monitoring wells installed around the perimeter of the NHWL, MWLF-1, MWLF-2, and MWLF-3, were found to be in good condition.

### 5.1.2 Groundwater Monitoring

During the Site activities, all three groundwater monitoring wells were visually inspected but only one of the wells, MWLF-3, could be sampled. At the time of assessment, there was no evidence of wildlife damage to the groundwater wells. Well locations are provided in **Table 5-1** and are shown in Figure 3 of **Appendix A**.

**Table 5-1: Ennadai Lake Groundwater Monitoring Locations**

| Monitoring Well | UTM83-14 Northing (m) | UTM83-14 Easting (m) |
|---|---|---|
| MWLF-1 | 6778995 | 398563 |
| MWLF-2 | 6778998 | 398504 |
| MWLF-3 | 6779038 | 398557 |

The field crew collected one groundwater sample during the 2022 monitoring event from MWLF-3 along with a duplicate at this location. When inspecting the wells, it was determined MWLF-02 was frozen, evident through ice formation on the bottom of the water level tape, and MWLF-01 was dry within the active layer (no presence of ice crystals on the water level tape).

The AMSRP recommends analytical results are to be compared to previous data, and if the groundwater concentrations are within range of the average +/- three standard deviations, the landfill is performing acceptably. The average + three standard deviations of all available historical data form the Upper Level of Acceptability (ULA) which is applied to the present data as reference criteria.

Field parameters for the groundwater monitoring wells are summarized in Table D-1 in **Appendix D**. Analytical results from the Year 7 monitoring event can found in Tables D-2 to D-5 of **Appendix D**. Tabulation of all historical groundwater results collected since 2014 are presented in Tables D-6 to D-9 of **Appendix D** for trend evaluation.

**Table 5-2** summarizes the exceedance of calculated ULAs for groundwater samples analyzed during the 2022 monitoring event.

**Table 5-2: Summary of ULA Exceedances in Groundwater at the NHWL**

| Parameter | Result | ULA |
|---|---|---|
| **MWLF-3** | | |
| Metals | | |
| Lead, Dissolved | 0.000145 mg/L | 0.00011 mg/L |

The above ULA exceedance in monitoring well MWLF-3 was not observed in successive sampling events (2016, 2018, 2020), therefore the ULA exceedance reported in 2022 appear anomalous to historical data (see Table D-7 in **Appendix D** for historical data). Dissolved lead is a contaminant of concern (COC) outlined in the AMSRP; therefore, further monitoring is required to determine if a trend develops.

All PHCs reported concentrations below the laboratory detection limit, consistent with previous monitoring years. There was one historical detection of PHCs on Site in Year 1 (2016), however, Years 2 through 7 have reported non-detect for PHCs.

The complete groundwater data set available for the Site since long-term monitoring began in 2016 is limited to samples collected at MWLF-3, as MWLF-1 and MWLF-2 are routinely dry in the active layer or frozen (one partial sample of purge water was collected from MWLF-1 in 2020; see BluMetric, 2021b). Based on proximity to Ennadai

Lake, it is presumed MWLF-3 is upgradient of the landfill; therefore, providing limited insight into contaminant trends with little to no downgradient data for reference. The extent of the data limitations is presented in Table 5-3. A previous recommendation was made to increase sampling frequency to compensate for the limited groundwater data set (BluMetric, 2021a; BluMetric, 2021b). Given increased sampling frequency is unlikely to mitigate dry/frozen well conditions, AECOM recommends discontinuation of groundwater sampling and replacement with routine soil sampling, which will circumvent problematic groundwater collection entirely. Soil sampling will provide improved detection of PCBs, which will bolster the available data to evaluate prior to actioning previous recommendations to discontinue PCB sampling, and provide further information as to whether PHC sampling could also be discontinued.

**Table 5-3 Available Groundwater Data**

| | MWLF-1 | MWLF-2 | MWLF-3 |
|---|---|---|---|
| **Location** | **Crossgradient *** | **Downgradient *** | **Upgradient *** |
| **Phase I of LTM** | | | |
| **Year 1 – 2016** | X | X | ✓ |
| **Year 3 – 2018** | X | X | ✓ |
| **Year 5 – 2020** | ✓ ** | X | ✓ |
| **Phase II of LTM** | | | |
| **Year 7 – 2022** | X | X | ✓ |

** - Gradient presumed based on proximity/orientation to Ennadai Lake*

*** - Sample consisted of purge water and was of limited volume (see BluMetric, 2021b)*

### 5.1.3 Surface Water Monitoring

Surface water ponding or seepage was not observed; this is consistent with baseline and previous monitoring events. No samples were collected during the 2022 monitoring event.

### 5.1.4 Soil Monitoring

No soil samples were collected at the time of the 2022 long-term monitoring event as there was no evidence of seepage or staining.

### 5.1.5 Landfill Performance

The overall performance condition of the NHWL is rated as acceptable in 2022 based on the severity ratings presented in AMSRP Volume II (INAC, 2009). This is consistent with the previous condition documented in Year 5 (BluMetric, 2021b). Settlement features identified on Site do not appear to be notably changing or affecting the stability or performance of the landfill. The landfill condition combined with the lack of cause for surface water or soil samples indicates little to no risk associated with contaminant migration from the landfill. As indicated in Section 5.1.2, further monitoring is required to interpret the ULA exceedance of lead in monitoring well MWLF-3.

## 5.2 QA/QC Discussion

Field procedures were implemented to minimize the potential of cross contamination between sampling locations. Sample handling protocols were established to track and maintain the integrity of the samples. Field handling of samples was minimized by transferring samples directly into containers, when possible. Where handling is required, disposable nitrile gloves were used at all times and changed between samples. All monitoring equipment was decontaminated prior to initial use and between each sample location. During groundwater sampling, disposable low-density polyethylene (LDPE) and master flex tubing was dedicated to the individual wells and during all sampling activities, a new pair of disposable nitrile gloves was used between each sample. Photographs were taken of all areas of interest; location and directional viewpoint was recorded.

### 5.2.1 Duplicate Samples

A duplicate sample is a sequential sample that is taken immediately following the collection of a regular sample. The duplicate samples were collected for 100% of the samples collected as part of the QA/QC sampling program. Duplicates samples provide a rough estimate of the overall variability of the field technique and laboratory analysis.

### 5.2.2 Relative Percent Difference

The relative percent difference (RPD) is the absolute difference between the duplicate analysis values, divided by the mean and is used to evaluate the sample result variability. Where the concentration of a parameter is less than five times the laboratory reportable detection limit (RDL), the results are less precise and the RPD is not calculated. The guidance manual for Environmental Site Characterization in Support of Human Health Risk Assessment, Volume I (CCME, 2016) acknowledges added variability introduced by matrix variability and/or sampling and handling procedures, therefore quantifying acceptable precision is a matter of judgement. Given the Site considerations and literature, a RPD of 50% for parameters of duplicate groundwater samples was selected for this assessment. The guide also recommends that RPDs for laboratory duplicates not exceed 20%. Should either of these limits be exceeded, a potential problem may be indicated such as compromised sample collection, equipment malfunction, or handling errors.

### 5.2.3 Analytical QA/QC

Both samples, MWLF-3 and MWLF-3 DUP, were analyzed by ALS Environmental Laboratories which is CALA accredited for the parameters proposed for analysis and uses recognized methods to conduct laboratory analyses. As conveyed by the laboratory, method blanks, certified reference materials, method spikes, duplicates, surrogates, and laboratory control samples are routinely analyzed as part of their QA/QC programs. Analytical QA/QC was completed by ALS laboratories by way of analytical method blanks, analytical control spikes and analytical duplicates.

Hold times for pH, total suspended solids (TSS), total dissolved solids (TDS), alkalinity, nitrate, and nitrite were exceeded. The hold time exceedances were in part due to the logistical constraints of shipment from the Site to the southern ALS laboratory in Edmonton, AB, for analysis. As stated in ALS laboratories guidance document “Hold Times: General Information of Exceedances (2017), hold times are established and intended as best-practice to protect the integrity of the test samples and minimize the potential for significant changes to samples prior to analysis” (ALS, 2017). If exceeded, it is common practice to apply professional judgement to assess whether the results may still be useable and fit-for-purpose. It was expected that the hold time for pH would exceed, and as a standard procedure, field measurements were collected to represent conditions at the time of sampling (**Appendix D**). Based on recommendations from ALS, test results with hold time exceedances less than 50% of the recommended hold time may be considered valid and defensible, with the caveat that the measurement uncertainty associated with those tests may be higher than usual. This would be applicable to Alkalinity which was 7% over its recommended hold time.

For significant hold time exceedances such as samples for TDS, TSS, Nitrate, and Nitrite, the environmental stability characteristics for the specific sample should be considered prior to determining whether the test results are fit-for-purpose. ALS recommends that the consistency with historical or expected results or with available test results from related or similar samples be considered. Results for TSS were below historical levels and TDS was within its expected range, not exceeding reference criteria. Nitrite results were below the detectable limit and there were no ULA criteria to compare the nitrate values to, however the results were higher than previous years.

Logistical challenges were expected working in remote locations, and some hold time exceedances were anticipated. For future monitoring programs, implementing methods to expedite sample delivery would help to reduce uncertainty related to the results.

The complete analytical quality control report can be found as part of the certificate of analyses in **Appendix E**.

# 6. Conclusion and Recommendations

Based on the results of the 2022 Year 7 activities, the remediation strategy for Ennadai Lake appears to be meeting the objectives expected for this phase of the LTMP. Geotechnical monitoring and visual inspection rate the NHWL as acceptable per the severity ratings presented in AMSRP Volume II, consistent with Year 5 results. Settlement features identified on Site do not appear to be notably changing or affecting the stability or performance of the landfill. The landfill condition combined with the lack of cause for surface water or soil samples indicates little to no risk associated with contaminant migration from the landfill. Further monitoring is required to interpret the ULA exceedance of lead, an AMSRP COC, at MWLF-3.

Groundwater collection continues to be problematic at the Site and the available data collected from monitoring wells downgradient of the landfill is too small to evaluate contaminant trends. Collection of soil samples, beyond the current LTMP specification of seepage and staining, could provide a data source to supplement the lack of groundwater data and is recommended in place of further groundwater collection. This approach was used for landfill monitoring by the DND at their Distant Early Warning (DEW) Line sites. Groundwater samples collected from the one sampled well in 2022 did exhibit a ULA exceedance, however, are not cause for concern at this time. At the NHWL, the exceedance was not successive with previous years and appears anomalous to historical data. Further monitoring is required to determine if any potential trends are established. Collection of soil samples would provide further data to assess the previous recommendation to discontinue PCB sampling (BluMetric, 2021a; BluMetric, 2021b) and consideration for discontinuation of PHC sampling, which has also returned non-detect results over three consecutive monitoring events.

Groundwater wells were locked with Fortress locks and additional key sets were left with a CIRNAC representative. It is recommended keys are provided for the next monitoring event to avoid cutting and replacement of locks on site. Further, it is recommended additional locks are brought to site during the future visits in the event locks are found missing or damaged.

# 7. References

BluMetric Environmental Inc. (BluMetric). 2021a. Evaluation of Phase I Long Term Monitoring – Ennadai Lake. March 31, 2021.

BluMetric. 2021b. Ennadai Lake Long Term Monitoring Event 2020 Long Term Monitoring Report. March 12, 2021.

Indigenous and Northern Affairs Canada (INAC). 2016. Ennadai Lake Long Term Monitoring Plan. January 22, 2016.

INAC. 2009. Abandoned Military Site Remediation Protocol (AMSRP).

SLR Consulting Canada Ltd. (SLR). 2018. Ennadai Lake Long Term Monitoring Event Kivalliq Region, Nunavut. December 2018.

# Appendix A

## Figures


NOTES:
1. IMAGERY FROM ARCGIS DATAMAP.

**Issue Status: FINAL**

**2022 Nunavut Sites Long-Term Monitoring**
**Ennadai Lake (Year 7)**
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

**ENNADAI LAKE**
**LOCATION PLAN**

AECOM

**Figure 1**


NOTES:
1. IMAGERY FROM ARCGIS DATAMAP.

**Issue Status: FINAL**

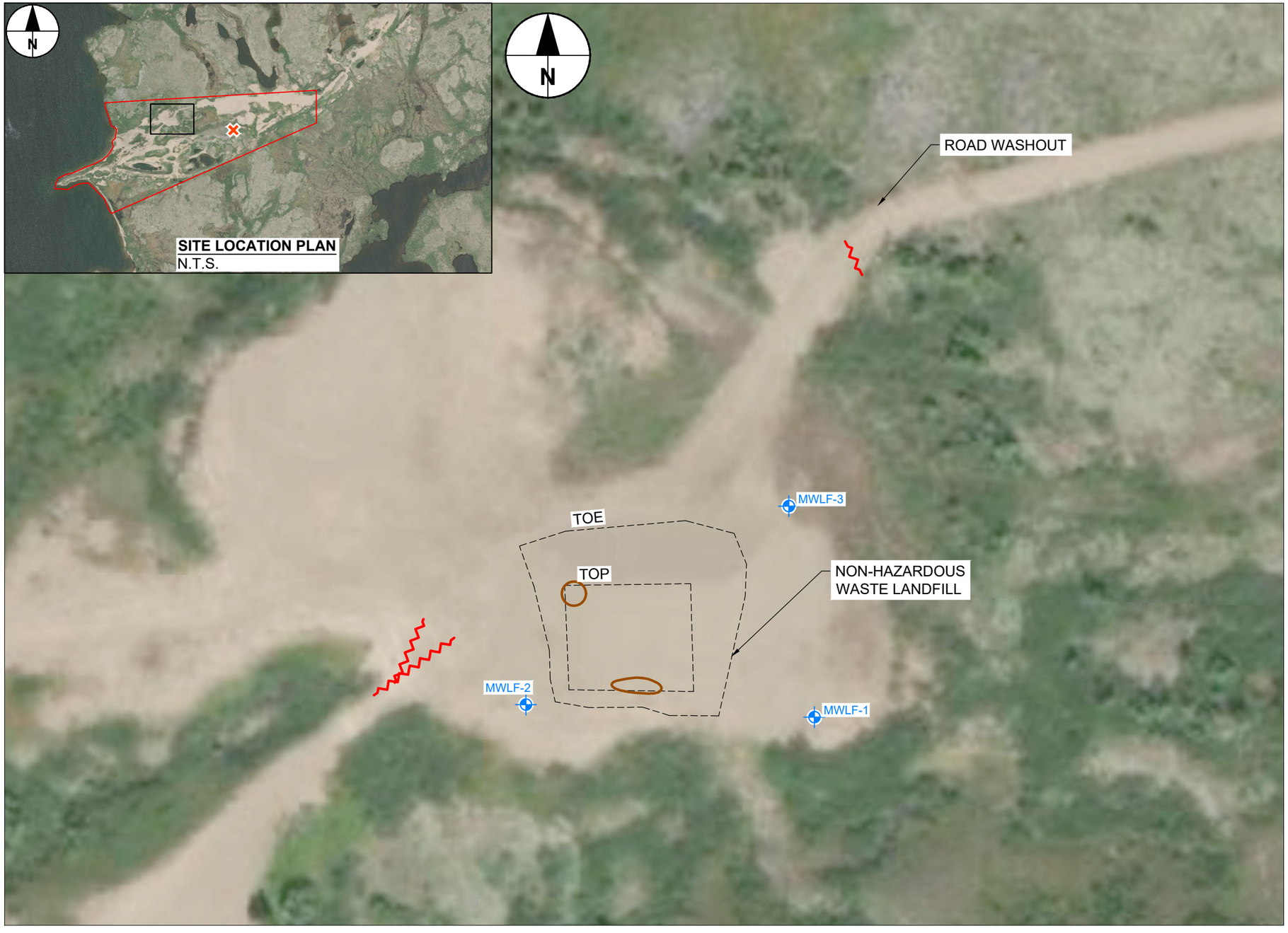
**2022 Nunavut Sites Long-Term Monitoring**
**Ennadai Lake (Year 7)**
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

**ENNADAI LAKE**
**SITE LAYOUT PLAN**

AECOM

**Figure 2**

**SITE LOCATION PLAN**
N.T.S.




## LEGEND

- WILDLIFE SIGHTING
- MW — MONITORING WELL
- EROSION
- SETTLEMENT
- SITE EXTENTS

NOTES:.
1. IMAGERY FROM ARCGIS DATAMAP.

0 18.75 37.5 m
1:750

**Issue Status: FINAL**

**2022 Nunavut Sites Long-Term Monitoring**
**Ennadai Lake (Year 7)**
Crown-Indigenous Relations and Northern Affairs Canada
Project No.: 60686962 Date: 2023-01-11

**NON-HAZARDOUS WASTE LANDFILL**
**VISUAL INSPECTION**

AECOM

**Figure 3**

# Appendix B

## Photographic Record

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 1 | 8/11/2022 |

**Direction Photo Taken:** South

**Area:** NHWL

**Description:** Aerial view of NHWL. Unmanned Weather Station in background (circled).

| Photo No. | Date |
|---|---|
| 2 | 8/11/2022 |

**Direction Photo Taken:** South

**Area:** NHWL

**Description:** North slope of NHWL in good condition.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 3 | 8/11/2022 |

**Direction Photo Taken:** Southwest

**Area:** NHWL

**Description:** Northeast corner of NHWL in good condition.

| Photo No. | Date |
|---|---|
| 4 | 8/11/2022 |

**Direction Photo Taken:** Southwest

**Area:** NHWL

**Description:** East slope of NHWL in good condition. Evidence of wildlife - caribou tracks on slope (circled). Some sparse revegetation.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 5 | 8/11/2022 |

**Direction Photo Taken:** West

**Area:** NHWL

**Description:** Southeast corner of NHWL in good condition.

| Photo No. | Date |
|---|---|
| 6 | 8/11/2022 |

**Direction Photo Taken:** West

**Area:** NHWL

**Description:** South slope of NHWL in good condition. Some evidence of revegetation.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 7 | 8/11/2022 |

**Direction Photo Taken:** West

**Area:** NHWL

**Description:** Area of settlement on NHWL south slope from previously ponded water. Approximately centred on top of south slope (circled).

| Photo No. | Date |
|---|---|
| 8 | 8/11/2022 |

**Direction Photo Taken:** East

**Area:** NHWL

**Description:** South slope of NHWL, viewed from MWLF-2. Evidence of wildlife - caribou tracks on slope (circled).

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 9 | 8/11/2022 |

**Direction Photo Taken**

Northeast

**Area**

NHWL

**Description**

Southwest corner of NHWL near MWLF-2 in good condition.

| Photo No. | Date |
|---|---|
| 10 | 8/11/2022 |

**Direction Photo Taken**

Southeast

**Area**

NHWL

**Description**

West slope of NHWL in good condition. Unmanned Weather Station in background (circled).

AECOM

# PHOTOGRAPHIC LOG

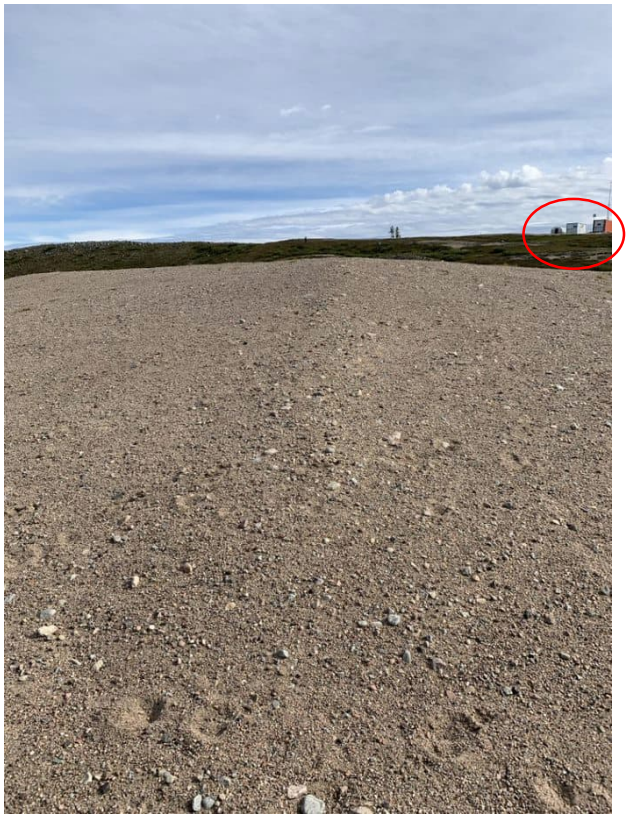
| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 11 | 8/11/2022 |

**Direction Photo Taken:** Southeast

**Area:** NHWL

**Description:** Northwest corner of NHWL in good condition. Unmanned Weather Station in background (circled).



| Photo No. | Date |
|---|---|
| 12 | 8/11/2022 |

**Direction Photo Taken:** East

**Area:** NHWL

**Description:** North slope of NHWL in good condition, MWLF-3 visible (circled).

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 13 | 8/11/2022 |

**Direction Photo Taken**

East

**Area**

NHWL

**Description**

Northern portion of NHWL cover in good condition.

| Photo No. | Date |
|---|---|
| 14 | 8/11/2022 |

**Direction Photo Taken**

Southeast

**Area**

NHWL

**Description**

Southern portion of NHWL cover in good condition. Unmanned Weather Station in background (circled).

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 15 | 8/11/2022 |

**Direction Photo Taken:** Northeast

**Area:** NHWL

**Description:** Area of settlement in northwest corner of NHWL on transition between cap and slope, approximately 0.3 m deep and 0.3 m in diameter (circled).

| Photo No. | Date |
|---|---|
| 16 | 8/11/2022 |

**Direction Photo Taken:** Northeast

**Area:** Access Road

**Description:** Surface debris - rusted tin cans and broken glass (circled) scattered on access road.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 17 | 8/11/2022 |

**Direction Photo Taken**

Northeast

**Area**

Access Road

**Description**

Evidence of wildlife along access road - caribou scat (circled) and tracks.

| Photo No. | Date |
|---|---|
| 18 | 8/11/2022 |

**Direction Photo Taken**

East

**Area**

Access Road

**Description**

Washout/erosion on access road with evidence of re-vegetation.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 19 | 8/11/2022 |

**Direction Photo Taken:** Southeast

**Area:** Access Road

**Description:** Differential settlement along access road. No animal borrows noted.

| Photo No. | Date |
|---|---|
| 20 | 8/11/2022 |

**Direction Photo Taken:** Southwest

**Area:** Access Road

**Description:** Erosion and differential settlement on access road.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 21 | 8/11/2022 |

**Direction Photo Taken**

Northwest

**Area**

Drum Cache

**Description**

Fuel drum in secondary containment. Sealed and appeared to be full.

| Photo No. | Date |
|---|---|
| 22 | 8/11/2022 |

**Direction Photo Taken**

West

**Area**

Drum Cache

**Description**

Fuel drum approximately 1/3 full. Outside secondary containment.

AECOM

# PHOTOGRAPHIC LOG

| Site Name: | Site Location | Project No. |
|---|---|---|
| Ennadai Lake Long-Term Monitoring – Year 7 | Ennadai Lake, NU | 60686962 |

| Photo No. | Date |
|---|---|
| 23 | 8/11/2022 |

**Direction Photo Taken**

Northeast

**Area**

Drum Cache

**Description**

Aviation fuel drums. Most drums empty, one contained approximately 5 gallons. Scattered debris. No evidence of spills or leaks. Secondary containment area partially visible in background (circled).

# Appendix C

## Monitoring Checklists and Daily Field Report

## Groundwater Sampling
## Field Data

**Ennadai Lake**

**Year 7 2022**

AECOM

| Aquatics Monitoring | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Time** | **Temperature (°C)** | **Conductivity (µS/cm)** | **pH** | **ORP (mV)** | **NTU** | **ODO (mg/L)** | **Water Level (mTOC)** |
| **MWLF-1** | | | | | | | |
| *Dry* | | | | | | | |
| **MWLF-2** | | | | | | | |
| *Frozen* | | | | | | | |
| **MWLF-3** | | | | | | | |
| 1:19 | 5.4 | 184 | 5.15 | 230.0 | 3.3 | 4.07 | 1.455 |
| 1:22 | 5.14 | 139 | 5.29 | 224.5 | 2.5 | 3.53 | 1.460 |
| 1:25 | 5.07 | 133 | 5.18 | 222.0 | 2.0 | 3.48 | 1.460 |
| 1:28 | 4.89 | 129 | 5.32 | 218.8 | 1.6 | 3.23 | 1.460 |
| 1:31 | 4.89 | 126 | 5.36 | 215.3 | 1.1 | 3.06 | 1.455 |
| 1:34 | 4.92 | 125 | 5.43 | 212.7 | 1.1 | 3.03 | - |
| 1:37 | 5.18 | 124 | 5.48 | 209.1 | 1.0 | 2.94 | 1.455 |
| 1:40 | 5.25 | 122 | 5.54 | 206.7 | 1.0 | 2.99 | 1.455 |

**Notes:**
ORP - Oxidative-Reduction Potential
NTU - Nephelometric Turbidity Units
ODO - Optical Dissolved Oxygen
mTOC - Distance (metres) from top of casing (TOC) down into well

| **Depth to Water (mTOC)** | **Depth to Bottom (mTOC)** | **Stick Up (mTOC)** |
|---|---|---|
| **MWLF-1** | | |
| 3.430 | - | 0.38 |
| **MWLF-2** | | |
| 3.645 | - | 0.64 |
| **MWLF-3** | | |
| 1.440 | 2.42 | 0.49 |

**Notes:**
mTOC - Distance (metres) from top of casing (TOC) down into well
Depth to Water - Depth from top of casing to top of water surface
Depth to Bottom - Depth from top of casing to bottom of well
Stick Up - Height of well casing from ground surface to top of casing

## VISUAL MONITORING CHECKLIST

| ITEM | PRESENCE / ABSENCE | EXTENT | DESCRIPTION / PHOTOGRAPHIC REFERENCE |
|---|---|---|---|
| **Settlement** | Yes | Settling on access road to NHWL | • Small area of settlement / previous standing water on top of south side [Photograph 7 in Appendix B].<br>• Small settlement area, circular depression, near northwest corner [Photograph 15 in Appendix B]. |
| **Erosion** | Yes | Erosion on access road to NHWL | • Erosion and differential settlement on access road [Photograph 20 in Appendix B].<br>• Sections of erosion and circular depression across access road [Photograph 19 in Appendix B]. |
| **Frost Action** | No | - | - |
| **Animal Burrows** | No | - | - |
| **Vegetation** | Yes | Minimal grass tufts | • Sparse vegetation [Photographs 4, 6-8 in Appendix B]. |
| **Staining** | No | - | - |
| **Vegetation Stress** | No | - | - |
| **Seepage Points** | No | - | - |
| **Exposed Debris** | No | - | - |
| **Condition of Monitoring Instruments** | N/A | Wells all in good condition | - |
| **Other Features of Note** | N/A | - | - |

## NATURAL ENVIRONMENT CHECKLIST

| ITEM | PRESENCE / ABSENCE | EXTENT | DESCRIPTION / PHOTOGRAPHIC REFERENCE |
|---|---|---|---|
| **Wildlife Sightings** | Yes | • Herd of caribou prior to landing<br>• Single caribou on ridge before darting across airstrip | No photos. |
| **Evidence of Wildlife** | Yes | • Tracks<br>• Scat | • Caribou tracks throughout entire Site including airstrip, access road, landfill slopes and cover [Photographs 4, 8, 17 in Appendix B].<br>• Caribou scat on access road [Photograph 17 in Appendix B]. |
| **Wildlife Activity** | Yes | Movement of herd through site and surrounding area. | No photos. |
| **Relative Number** | N/A | Approx. 10 viewed from air, only one observed while on Site. | No photos. |
| **Evidence of Revegetation** | Yes | • Sparce revegetation on NHWL<br>• Revegetation of washout on access road | • NHWL revegetation [Photographs 4 and 6 in Appendix B].<br>• Road washout revegetation [Photograph 18 in Appendix B]. |

| Project Daily Report | | | |
|---|---|---|---|
| **Client:** | CIRNAC | **Date:** | 11-Aug-22 |
| **Project:** | Nunavut Sites LTM | **Weather:** | 12°C on site |
| **Project No.:** | 60686962 | | |
| **Location:** | Rankin Inlet / Ennadai Lake | **Number of Personnel On-Site :** | 7 |
| **Departure Time:** | 10:45 PM MST | **Return Time:** | 6:30 PM MST |
| **Company** | | | **Total # Workers** |
| AECOM | David Bugden | Alysha Selinger | 2 |
| CIRNAC | Melanie Netser | | 1 |
| Nunatta | Max Dubeau | Noah Alookie | 2 |
| Kenn Borek | Brian Good | Travis Fawcett | 2 |
| **Total** | | | **7** |

## Health and Safety

### Observations/Near Misses/Incidents/H&S Issues

Areas of settlement on the road between the airstrip and the NHWL required careful footing.

## Technical Scope

### Geotechnical Inspection

The inspection found the NHWL to be in good condition. However, the road connecting the airstrip to the landfill was found to have significant areas of settlement.

### Aquatic Monitoring

Three wells are located around the NHWL. MWLF-3 was low-flow sampled successfully, but MWLF-2 was dry and MWLF-1 was frozen and therefore they could not be sampled.

### Temperature Monitoring

N/A

### Communications or Deviation from Work Plan

Samples from MWLF-3 will be shipped out via Canadian North cargo tomorrow.

The abandoned drums were inspected. No spills or signs of leakage were found. All for two drums appeared to be empty.

## Other:

Cloudy conditions, light rain, and some cross winds were encountered during the flight, but weather was favourable once on site and for the return flight.

## Project Daily Photo Record

**Photograph 1: Settlement Holes in Road between Airstrip and NHWL**

*One drum may have approx. 5 gallons inside, the rest are empty.*

**Photograph 2: No Spills or Signs of Leakage Around Abandoned Drums (almost all appear to be emptry)**


*Jet - A1*
*GN 154 031*
*2014 DOE - Carnivore*
*Arviat, Nunavut*
*1-877-317-3835*

**Photograph 3: Drum Information**

# Appendix D

## Groundwater Tables

# TABLE D-1

**Ennadai Lake**
**Year 7 2022**

## In-situ Field Parameters from Groundwater Monitoring Wells

| Parameter | Units | MWLF-1 | MWLF-2 | MWLF-3 |
|---|---|---|---|---|
| | | 11-Aug-2022 | 11-Aug-2022 | 11-Aug-2022 |
| | | Year 7 | Year 7 | Year 7 |
| Depth to Water | mTOC | 3.430 | 3.645 | 1.440 |
| Depth to Bottom | mTOC | - | - | 2.42 |
| Stick Up | mTOC | 0.38 | 0.64 | 0.49 |
| Temperature * | ºC | - | - | 5.25 |
| Conductivity * | µS/cm | - | - | 122 |
| pH * | - | - | - | 5.54 |
| ORP * | mV | - | - | 206.7 |
| Turbidity * | NTU | - | - | 1 |
| Dissolved Oxygen * | mg/L | - | - | 2.99 |
| Water Level * | mTOC | - | - | 1.455 |

**Notes:**

*MWLF-1 well dry*

*MWLF-2 well frozen (ice crystals on water tape)*

mTOC - Distance (metres) from top of casing (TOC) down into well

Depth to Water - Depth from top of casing to top of water surface

Depth to Bottom - Depth from top of casing to bottom of well

Stick Up - Height of well casing from ground surface to top of casing

* - Last recorded YSI probe flow-through cell parameters prior to sampling

# TABLE D-2

**Ennadai Lake**

**Year 7 2022**

## General Chemistry of Groundwater Monitoring Wells

| Parameter | Units | Reported Detection Limit | Reference Criteria (ULA) | MWLF-3 | MWLF-3 - DUP |
|---|---|---|---|---|---|
| | | | | 11-Aug-2022 | 11-Aug-2022 |
| **General Chemistry** | | | | Year 7 | Year 7 |
| **Physical Tests** | | | | | |
| Conductivity | µS/cm | 2 | 483 | 114 | 114 |
| Hardness (as CaCO3), dissolved | mg/L | 0.5 | 266 | 53 | 52.2 |
| pH | pH units | 0.1 | 7.4 | 7.19 | 7.23 |
| Total Suspended Solids (TSS) | mg/L | 3.0 | 244 | <3.0 | <3.0 |
| Total Dissolved Solids (TDS) | mg/L | 10 | 327 | 80 | 80 |
| Total Dissolved Solids (TDS), calculated | mg/L | 1 | - | 73.5 | 73.7 |
| **Anions and Nutrients** | | | | | |
| Chloride | mg/L | 0.50 | 15 | <0.50 | <0.50 |
| Fluoride | mg/L | 0.02 | - | 0.058 | 0.048 |
| Nitrate (as N) | mg/L | 0.02 | - | 0.202 | 0.194 |
| Nitrate + Nitrite (as N) | mg/L | 0.05 | - | 0.202 | 0.194 |
| Nitrite (as N) | mg/L | 0.010 | - | <0.010 | <0.010 |
| Sulfate (as SO4) | mg/L | 0.30 | 25 | 0.37 | <0.30 |
| **Alkalinity** | | | | | |
| Bicarbonate (as HCO3) | mg/L | 1.0 | - | 68.8 | 70.4 |
| Carbonate (as CO3) | mg/L | 1.0 | - | <1.0 | <1.0 |
| Hydroxide (as OH) | mg/L | 1.0 | - | <1.0 | <1.0 |
| Total (as CaCO3) | mg/L | 2.0 | - | 56.4 | 57.7 |
| **Ion Balance** | | | | | |
| Anion Sum | meq/L | 0.1 | - | 1.15 | 1.17 |
| Cation Sum | meq/L | 0.1 | - | 1.22 | 1.20 |
| Ion Balance (APHA) | % | 0.01 | - | 2.95 | 1.26 |
| Ion Balance (cations/anions) | % | 0.01 | - | 106.00 | 102.00 |

**Notes:**

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

| |
|---|
| Exceeds Reference Criteria |
| Detection Limit Exceeds Reference Criteria |

# TABLE D-3

**Ennadai Lake**
**Year 7 2022**

AECOM

## Total and Dissolved Metals of Groundwater Wells

| Parameter | Units | Reported Detection Limit | Reference Criteria (ULA) | MWLF-3 | MWLF-3 - DUP |
|---|---|---|---|---|---|
| | | | | 11-Aug-2022 | 11-Aug-2022 |
| Metals | | | | Year 7 | Year 7 |
| **Total Metals** | | | | | |
| Aluminum, Total | mg/L | 0.003 | 24.072 | 0.116 | 0.125 |
| Antimony, Total | mg/L | 0.0001 | - | <0.00010 | 0.00021 |
| Arsenic, Total | mg/L | 0.0001 | 0.004 | 0.00027 | 0.00027 |
| Barium, Total | mg/L | 0.0001 | 0.183 | 0.0775 | 0.0746 |
| Beryllium, Total | mg/L | 0.00002 | - | 0.000037 | 0.00003 |
| Bismuth, Total | mg/L | 0.00005 | - | <0.000050 | <0.000050 |
| Boron, Total | mg/L | 0.01 | 0.027 | 0.022 | 0.026 |
| Cadmium, Total | mg/L | 0.000005 | 0.00040 | 0.0000572 | 0.00006 |
| Calcium, Total | mg/L | 0.05 | 45.606 | 13.5 | 13.7 |
| Cesium, Total | mg/L | 0.00001 | 0.00001 | <0.000010 | <0.000010 |
| Chromium, Total | mg/L | 0.0005 | 0.039 | 0.00098 | 0.00089 |
| Cobalt, Total | mg/L | 0.0001 | 0.025 | 0.00433 | 0.00452 |
| Copper, Total | mg/L | 0.0005 | 0.054 | 0.00946 | 0.00972 |
| Iron, Total | mg/L | 0.01 | 21.260 | 0.046 | 0.046 |
| Lead, Total | mg/L | 0.00005 | 0.025 | <0.000050 | <0.000050 |
| Lithium, Total | mg/L | 0.001 | 0.004 | 0.0021 | 0.0026 |
| Magnesium, Total | mg/L | 0.005 | 15.498 | 4.82 | 4.72 |
| Manganese, Total | mg/L | 0.0001 | 3.686 | 0.765 | 0.792 |
| Molybdenum, Total | mg/L | 0.00005 | 0.00041 | 0.000177 | 0.000172 |
| Nickel, Total | mg/L | 0.0005 | 0.113 | 0.0122 | 0.0123 |
| Phosphorus, Total | mg/L | 0.05 | - | <0.050 | <0.050 |
| Potassium, Total | mg/L | 0.05 | 8.298 | 2.72 | 2.8 |
| Rubidium, Total | mg/L | 0.0002 | 0.005 | 0.00226 | 0.00238 |
| Selenium, Total | mg/L | 0.00005 | 0.00034 | <0.000050 | <0.000050 |
| Silicon, Total | mg/L | 0.1 | 11.074 | 6.14 | 6.19 |
| Silver, Total | mg/L | 0.00001 | 0.00028 | <0.000010 | 0.00002 |
| Sodium, Total | mg/L | 0.05 | 7.590 | 0.942 | 1.02 |
| Strontium, Total | mg/L | 0.0002 | 0.425 | 0.128 | 0.124 |
| Sulfur, Total | mg/L | 0.5 | 2.819 | 0.54 | 0.78 |
| Tellurium, Total | mg/L | 0.0002 | - | <0.00020 | <0.00020 |
| Thallium, Total | mg/L | 0.00001 | 0.00002 | 0.000011 | 0.000014 |
| Thorium, Total | mg/L | 0.0001 | 0.00086 | <0.00010 | 0.00016 |
| Tin, Total | mg/L | 0.0001 | - | <0.00010 | <0.00010 |
| Titanium, Total | mg/L | 0.0003 | 0.012 | 0.00148 | 0.00154 |
| Tungsten, Total | mg/L | 0.0001 | - | <0.00010 | <0.00010 |
| Uranium, Total | mg/L | 0.00001 | 0.003 | 0.000674 | 0.00066 |
| Vanadium, Total | mg/L | 0.0005 | 0.002 | 0.00052 | 0.00077 |
| Zinc, Total | mg/L | 0.003 | 0.070 | 0.0033 | <0.0030 |
| Zirconium, Total | mg/L | 0.0002 | 0.006 | 0.00073 | 0.00073 |

# TABLE D-3

**Ennadai Lake**
**Year 7 2022**

AECOM

## Total and Dissolved Metals of Groundwater Wells

| Parameter | Units | Reported Detection Limit | Reference Criteria (ULA) | MWLF-3 | MWLF-3 - DUP |
|---|---|---|---|---|---|
| | | | | 11-Aug-2022 | 11-Aug-2022 |
| **Metals** | | | | Year 7 | Year 7 |
| **Dissolved Metals** | | | | | |
| Aluminum, Dissolved | mg/L | 0.001 | 0.627 | 0.102 | 0.104 |
| Antimony, Dissolved | mg/L | 0.0001 | - | <0.00010 | <0.00010 |
| Arsenic, Dissolved | mg/L | 0.0001 | 0.001 | 0.00022 | 0.00022 |
| Barium, Dissolved | mg/L | 0.0001 | 0.146 | 0.0812 | 0.0787 |
| Beryllium, Dissolved | mg/L | 0.00002 | - | 0.000026 | 0.000037 |
| Bismuth, Dissolved | mg/L | 0.00005 | - | <0.000050 | <0.000050 |
| Boron, Dissolved | mg/L | 0.01 | 0.018 | 0.018 | 0.018 |
| Cadmium, Dissolved | mg/L | 0.000005 | 0.00014 | 0.0000619 | 0.0000553 |
| Calcium, Dissolved | mg/L | 0.05 | 23.786 | 12.9 | 12.7 |
| Cesium, Dissolved | mg/L | 0.00001 | - | <0.000010 | <0.000010 |
| Chromium, Dissolved | mg/L | 0.0005 | 0.002 | 0.0007 | 0.00068 |
| Cobalt, Dissolved | mg/L | 0.0001 | 0.022 | 0.00464 | 0.00468 |
| Copper, Dissolved | mg/L | 0.0002 | 0.051 | 0.014 | 0.00979 |
| Iron, Dissolved | mg/L | 0.03 | 0.191 | 0.034 | <0.030 |
| Lead, Dissolved | mg/L | 0.00005 | 0.00011 | 0.000145 | <0.000050 |
| Lithium, Dissolved | mg/L | 0.001 | - | 0.0021 | 0.0021 |
| Magnesium, Dissolved | mg/L | 0.005 | 11.138 | 5.04 | 4.98 |
| Manganese, Dissolved | mg/L | 0.005 | 1.092 | 0.8 | 0.826 |
| Molybdenum, Dissolved | mg/L | 0.00005 | 0.00033 | 0.000214 | 0.000141 |
| Nickel, Dissolved | mg/L | 0.0005 | 0.034 | 0.0126 | 0.0124 |
| Phosphorus, Dissolved | mg/L | 0.05 | - | <0.050 | <0.050 |
| Potassium, Dissolved | mg/L | 0.05 | 85.954 | 2.86 | 2.86 |
| Rubidium, Dissolved | mg/L | 0.0002 | 0.005 | 0.00226 | 0.00234 |
| Selenium, Dissolved | mg/L | 0.00005 | 0.00025 | <0.000050 | 0.000052 |
| Silicon, Dissolved | mg/L | 0.05 | 7.242 | 5.78 | 5.8 |
| Silver, Dissolved | mg/L | 0.00001 | 0.000052 | <0.000010 | <0.000010 |
| Sodium, Dissolved | mg/L | 0.05 | 4.132 | 0.97 | 0.961 |
| Strontium, Dissolved | mg/L | 0.0002 | 0.295 | 0.127 | 0.123 |
| Sulfur, Dissolved | mg/L | 0.5 | 0.797 | <0.50 | <0.50 |
| Tellurium, Dissolved | mg/L | 0.0002 | - | <0.00020 | <0.00020 |
| Thallium, Dissolved | mg/L | 0.00001 | 0.00003 | <0.000010 | <0.000010 |
| Thorium, Dissolved | mg/L | 0.0001 | 0.001 | 0.00012 | 0.00012 |
| Tin, Dissolved | mg/L | 0.0001 | - | <0.00010 | <0.00010 |
| Titanium, Dissolved | mg/L | 0.0003 | 0.007 | 0.0006 | 0.00049 |
| Tungsten, Dissolved | mg/L | 0.0001 | - | <0.00010 | <0.00010 |
| Uranium, Dissolved | mg/L | 0.00001 | 0.002 | 0.000498 | 0.000492 |
| Vanadium, Dissolved | mg/L | 0.0005 | 0.003 | <0.00050 | <0.00050 |
| Zinc, Dissolved | mg/L | 0.001 | 0.006 | 0.0039 | 0.0014 |
| Zirconium, Dissolved | mg/L | 0.0002 | 0.003 | 0.00075 | 0.00071 |

**Note:**

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)
ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable
RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria

Detection Limit Exceeds Reference Criteria

# TABLE D-4

**Ennadai Lake**
**Year 7 2022**

AECOM

## Petroleum Hydrocarbons of Groundwater Wells

| Parameter | Units | Reported Detection Limit | Reference Criteria (ULA) | MWLF-3 | MWLF-3 - DUP |
|---|---|---|---|---|---|
| | | | | 11-Aug-2022 | 11-Aug-2022 |
| **Petroleum Hydrocarbons (PHCs)** | | | | Year 7 | Year 7 |
| **Volatile Organic Compounds (VOCs) - BTEX** | | | | | |
| Benzene | µg/L | 0.50 | All < RDL | <0.50 | <0.50 |
| Ethylbenzene | µg/L | 0.50 | All < RDL | <0.50 | <0.50 |
| Toluene | µg/L | 0.50 | All < RDL | <0.50 | <0.50 |
| Xylene, m+p- | µg/L | 0.50 | - | <0.50 | <0.50 |
| Xylene, o- | µg/L | 0.50 | - | <0.50 | <0.50 |
| Xylenes, total | µg/L | 0.75 | All < RDL | <0.75 | <0.75 |
| BTEX, total | µg/L | 1.2 | - | <1.2 | <1.2 |
| **Hydrocarbons** | | | | | |
| F1 (C6-C10) | µg/L | 100 | NC | <100 | <100 |
| F1-BTEX | µg/L | 100 | NC | <100 | <100 |
| F2 (C10-C16) | µg/L | 100 | All < RDL | <100 | <100 |
| F3 (C16-C34) | µg/L | 250 | All < RDL | <250 | <250 |
| F4 (C34-C50) | µg/L | 250 | All < RDL | <250 | <250 |
| Hydrocarbons, total (C6-C50) | µg/L | 400 | - | <400 | <400 |

**Notes:**

Reference criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

NC - Not Calculated

RDL - Reported Detection Limit, which may vary between sample locations and events

| |
|---|
| Exceeds Reference Criteria |
| Detection Limit Exceeds Reference Criteria |

# TABLE D-5

## QA/QC of Groundwater Wells

**Ennadai Lake**
**Year 7 2022**

| Parameter | Units | Reported Detection Limit | MWLF-3 | MWLF-3 - DUP | RPD |
|---|---|---|---|---|---|
| | | | 11-Aug-2022 | 11-Aug-2022 | |
| QA/QC | | | Year 7 | Year 7 | |
| **General Chemistry** | | | | | |
| **Physical Tests** | | | | | |
| Conductivity | µS/cm | 2 | 114 | 114 | 0.00% |
| Hardness (as CaCO3), dissolved | mg/L | 0.5 | 53 | 52.2 | 1.52% |
| pH | pH units | 0.1 | 7.19 | 7.23 | 0.55% |
| Total Suspended Solids (TSS) | mg/L | 3 | <3.0 | <3.0 | N/A |
| Total Dissolved Solids (TDS) | mg/L | 10 | 80 | 80 | 0.00% |
| Total Dissolved Solids (TDS), calculated | mg/L | 1 | 73.5 | 73.7 | 0.27% |
| **Anions and Nutrients** | | | | | |
| Chloride | mg/L | 0.5 | <0.50 | <0.50 | N/A |
| Fluoride | mg/L | 0.02 | 0.058 | 0.048 | 18.87% |
| Nitrate (as N) | mg/L | 0.02 | 0.202 | 0.194 | 4.04% |
| Nitrate + Nitrite (as N) | mg/L | 0.05 | 0.202 | 0.194 | 4.04% |
| Nitrite (as N) | mg/L | 0.01 | <0.010 | <0.010 | N/A |
| Sulfate (as SO4) | mg/L | 0.3 | 0.37 | <0.30 | N/A |
| **Alkalinity** | | | | | |
| Bicarbonate (as HCO3) | mg/L | 1 | 68.8 | 70.4 | 2.30% |
| Carbonate (as CO3) | mg/L | 1 | <1.0 | <1.0 | N/A |
| Hydroxide (as OH) | mg/L | 1 | <1.0 | <1.0 | N/A |
| Total (as CaCO3) | mg/L | 2 | 56.4 | 57.7 | 2.28% |
| **Ion Balance** | | | | | |
| Anion Sum | meq/L | 0.1 | 1.15 | 1.17 | 1.72% |
| Cation Sum | meq/L | 0.1 | 1.22 | 1.20 | 1.65% |
| Ion Balance (APHA) | % | 0.01 | 2.95 | 1.26 | N/A |
| Ion Balance (cations/anions) | % | 0.01 | 106.00 | 102.00 | N/A |

# TABLE D-5

## QA/QC of Groundwater Wells

**Ennadai Lake**
**Year 7 2022**

AECOM

| Parameter | Units | Reported Detection Limit | MWLF-3 | MWLF-3 - DUP | RPD |
|---|---|---|---|---|---|
| | | | 11-Aug-2022 | 11-Aug-2022 | |
| QA/QC | | | Year 7 | Year 7 | |
| **Metals** | | | | | |
| **Total Metals** | | | | | |
| aluminum, total | mg/L | 0.003 | 0.116 | 0.125 | 7.47% |
| antimony, total | mg/L | 0.0001 | <0.00010 | 0.00021 | N/A |
| arsenic, total | mg/L | 0.0001 | 0.00027 | 0.00027 | 0.00% |
| barium, total | mg/L | 0.0001 | 0.0775 | 0.0746 | 3.81% |
| beryllium, total | mg/L | 0.00002 | 0.000037 | 0.00003 | 20.90% |
| bismuth, total | mg/L | 0.00005 | <0.000050 | <0.000050 | N/A |
| boron, total | mg/L | 0.01 | 0.022 | 0.026 | 16.67% |
| cadmium, total | mg/L | 0.000005 | 0.0000572 | 0.00006 | 4.78% |
| calcium, total | mg/L | 0.05 | 13.5 | 13.7 | 1.47% |
| cesium, total | mg/L | 0.00001 | <0.000010 | <0.000010 | N/A |
| chromium, total | mg/L | 0.0005 | 0.00098 | 0.00089 | 9.63% |
| cobalt, total | mg/L | 0.0001 | 0.00433 | 0.00452 | 4.29% |
| copper, total | mg/L | 0.0005 | 0.00946 | 0.00972 | 2.71% |
| iron, total | mg/L | 0.01 | 0.046 | 0.046 | 0.00% |
| lead, total | mg/L | 0.00005 | <0.000050 | <0.000050 | N/A |
| lithium, total | mg/L | 0.001 | 0.0021 | 0.0026 | 21.28% |
| magnesium, total | mg/L | 0.005 | 4.82 | 4.72 | 2.10% |
| manganese, total | mg/L | 0.0001 | 0.765 | 0.792 | 3.47% |
| molybdenum, total | mg/L | 0.00005 | 0.000177 | 0.000172 | 2.87% |
| nickel, total | mg/L | 0.0005 | 0.0122 | 0.0123 | 0.82% |
| phosphorus, total | mg/L | 0.05 | <0.050 | <0.050 | N/A |
| potassium, total | mg/L | 0.05 | 2.72 | 2.8 | 2.90% |
| rubidium, total | mg/L | 0.0002 | 0.00226 | 0.00238 | 5.17% |
| selenium, total | mg/L | 0.00005 | <0.000050 | <0.000050 | N/A |
| silicon, total | mg/L | 0.1 | 6.14 | 6.19 | 0.81% |
| silver, total | mg/L | 0.00001 | <0.000010 | 0.00002 | N/A |
| sodium, total | mg/L | 0.05 | 0.942 | 1.02 | 7.95% |
| strontium, total | mg/L | 0.0002 | 0.128 | 0.124 | 3.17% |
| sulfur, total | mg/L | 0.5 | 0.54 | 0.78 | 36.36% |
| tellurium, total | mg/L | 0.0002 | <0.00020 | <0.00020 | N/A |
| thallium, total | mg/L | 0.00001 | 0.000011 | 0.000014 | 24.00% |
| thorium, total | mg/L | 0.0001 | <0.00010 | 0.00016 | N/A |
| tin, total | mg/L | 0.0001 | <0.00010 | <0.00010 | N/A |
| titanium, total | mg/L | 0.0003 | 0.00148 | 0.00154 | 3.97% |
| tungsten, total | mg/L | 0.0001 | <0.00010 | <0.00010 | N/A |
| uranium, total | mg/L | 0.00001 | 0.000674 | 0.00066 | 2.10% |
| vanadium, total | mg/L | 0.0005 | 0.00052 | 0.00077 | 38.76% |
| zinc, total | mg/L | 0.003 | 0.0033 | <0.0030 | N/A |
| zirconium, total | mg/L | 0.0002 | 0.00073 | 0.00073 | 0.00% |

# TABLE D-5

## QA/QC of Groundwater Wells

**Ennadai Lake**
**Year 7 2022**

AECOM

| Parameter | Units | Reported Detection Limit | MWLF-3 | MWLF-3 - DUP | RPD |
|---|---|---|---|---|---|
| | | | 11-Aug-2022 | 11-Aug-2022 | |
| QA/QC | | | Year 7 | Year 7 | |
| **Dissolved Metals** | | | | | |
| aluminum, dissolved | mg/L | 0.001 | 0.102 | 0.104 | 1.94% |
| antimony, dissolved | mg/L | 0.0001 | <0.00010 | <0.00010 | N/A |
| arsenic, dissolved | mg/L | 0.0001 | 0.00022 | 0.00022 | 0.00% |
| barium, dissolved | mg/L | 0.0001 | 0.0812 | 0.0787 | 3.13% |
| beryllium, dissolved | mg/L | 0.00002 | 0.000026 | 0.000037 | 34.92% |
| bismuth, dissolved | mg/L | 0.00005 | <0.000050 | <0.000050 | N/A |
| boron, dissolved | mg/L | 0.01 | 0.018 | 0.018 | 0.00% |
| cadmium, dissolved | mg/L | 0.000005 | 0.0000619 | 0.0000553 | 11.26% |
| calcium, dissolved | mg/L | 0.05 | 12.9 | 12.7 | 1.56% |
| cesium, dissolved | mg/L | 0.00001 | <0.000010 | <0.000010 | N/A |
| chromium, dissolved | mg/L | 0.0005 | 0.0007 | 0.00068 | 2.90% |
| cobalt, dissolved | mg/L | 0.0001 | 0.00464 | 0.00468 | 0.86% |
| copper, dissolved | mg/L | 0.0002 | 0.014 | 0.00979 | 35.39% |
| iron, dissolved | mg/L | 0.03 | 0.034 | <0.030 | N/A |
| lead, dissolved | mg/L | 0.00005 | 0.000145 | <0.000050 | N/A |
| lithium, dissolved | mg/L | 0.001 | 0.0021 | 0.0021 | 0.00% |
| magnesium, dissolved | mg/L | 0.005 | 5.04 | 4.98 | 1.20% |
| manganese, dissolved | mg/L | 0.005 | 0.8 | 0.826 | 3.20% |
| molybdenum, dissolved | mg/L | 0.00005 | 0.000214 | 0.000141 | 41.13% |
| nickel, dissolved | mg/L | 0.0005 | 0.0126 | 0.0124 | 1.60% |
| phosphorus, dissolved | mg/L | 0.05 | <0.050 | <0.050 | N/A |
| potassium, dissolved | mg/L | 0.05 | 2.86 | 2.86 | 0.00% |
| rubidium, dissolved | mg/L | 0.0002 | 0.00226 | 0.00234 | 3.48% |
| selenium, dissolved | mg/L | 0.00005 | <0.000050 | 0.000052 | N/A |
| silicon, dissolved | mg/L | 0.05 | 5.78 | 5.8 | 0.35% |
| silver, dissolved | mg/L | 0.00001 | <0.000010 | <0.000010 | N/A |
| sodium, dissolved | mg/L | 0.05 | 0.97 | 0.961 | 0.93% |
| strontium, dissolved | mg/L | 0.0002 | 0.127 | 0.123 | 3.20% |
| sulfur, dissolved | mg/L | 0.5 | <0.50 | <0.50 | N/A |
| tellurium, dissolved | mg/L | 0.0002 | <0.00020 | <0.00020 | N/A |
| thallium, dissolved | mg/L | 0.00001 | <0.000010 | <0.000010 | N/A |
| thorium, dissolved | mg/L | 0.0001 | 0.00012 | 0.00012 | 0.00% |
| tin, dissolved | mg/L | 0.0001 | <0.00010 | <0.00010 | N/A |
| titanium, dissolved | mg/L | 0.0003 | 0.0006 | 0.00049 | 20.18% |
| tungsten, dissolved | mg/L | 0.0001 | <0.00010 | <0.00010 | N/A |
| uranium, dissolved | mg/L | 0.00001 | 0.000498 | 0.000492 | 1.21% |
| vanadium, dissolved | mg/L | 0.0005 | <0.00050 | <0.00050 | N/A |
| zinc, dissolved | mg/L | 0.001 | 0.0039 | 0.0014 | 94.34% |
| zirconium, dissolved | mg/L | 0.0002 | 0.00075 | 0.00071 | 5.48% |

# TABLE D-5

## QA/QC of Groundwater Wells

**Ennadai Lake**
**Year 7 2022**

| Parameter | Units | Reported Detection Limit | MWLF-3 | MWLF-3 - DUP | RPD |
|---|---|---|---|---|---|
| | | | 11-Aug-2022 | 11-Aug-2022 | |
| QA/QC | | | Year 7 | Year 7 | |
| **PHCs** | | | | | |
| **Volatile Organic Compounds (VOCs) - BTEX** | | | | | |
| Benzene | µg/L | 0.5 | <0.50 | <0.50 | N/A |
| Ethylbenzene | µg/L | 0.50 | <0.50 | <0.50 | N/A |
| Toluene | µg/L | 0.5 | <0.50 | <0.50 | N/A |
| Xylene, m+p- | µg/L | 0.50 | <0.50 | <0.50 | N/A |
| Xylene, o- | µg/L | 0.5 | <0.50 | <0.50 | N/A |
| Xylenes, total | µg/L | 0.75 | <0.75 | <0.75 | N/A |
| BTEX, total | µg/L | 1.2 | <1.2 | <1.2 | N/A |
| **Volatile Organic Compounds (VOCs) - Surrogates** | | | | | |
| Bromofluorobenzene, 4- | % | 1.00 | 85.9 | 83.1 | 3.31% |
| Difluorobenzene, 1,4- | % | 1.00 | 94.50 | 94.00 | 0.53% |
| **Hydrocarbons** | | | | | |
| F1 (C6-C10) | µg/L | 100 | <100 | <100 | N/A |
| F2 (C10-C16) | µg/L | 100 | <100 | <100 | N/A |
| F3 (C16-C34) | µg/L | 100 | <100 | <100 | N/A |
| F4 (C34-C50) | µg/L | 250 | <250 | <250 | N/A |
| F1-BTEX | µg/L | 250 | <250 | <250 | N/A |
| Hydrocarbons, total (C6-C50) | µg/L | 400 | <400 | <400 | N/A |
| **Hydrocarbons - Surrogates** | | | | | |
| Bromobenzotrifluoride, 2- (F2-F4 surr) | % | 1.0 | 103 | 99.7 | 3.26% |
| Dichlorotoluene, 3,4- | % | 1.0 | 111.00 | 111.00 | 0.00% |

RPD > 50%

# TABLE D-6

## Historical General Chemistry of Groundwater Wells

Ennadai Lake
Year 7 2022

| Parameter | Units | RDL | MW13-2 | LF3-WS-01 | MW-LF3-WS-02 | MWLF-3 | MWLF-3 D | MWLF-3 | MWLF-3 D | MWLF-1 | MWLF-3 | MWLF-3 D | Average | Standard Deviation | ULA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stantec | Stantec | Stantec | Arcadis | Arcadis | SLR | SLR | BluMetric | BluMetric | BluMetric | | | |
| | | | 2014 | 2014 | 2014 | 2016 | 2016 | 2018 | 2018 | 2020 | 2020 | 2020 | | | |
| **Historical General Chemistry** | | | | | | | | | | | | | | | |
| Conductivity | uS/cm | 2 | 23 | 99 | 79 | 330 | 320 | 190 | 190 | | 175 | 183 | 177 | 102 | 483 |
| Hardness (as CaCO3) | mg/L | 0.5 | | | | 170 | 170 | 87 | 86 | 12 | 92.7 | 86.4 | 101 | 55.0 | 266 |
| pH | pH | 0.1 | 6.22 | 6.66 | 6.68 | 6.42 | 6.39 | 6.01 | 6.24 | 5.25* | 6.22 | 6.2 | 6 | 0.4 | 7.44 |
| Total Suspended Solids | mg/L | 3 | | | | 110 | 110 | 1.3 | 1.3 | | <3.0 | <3.0 | 56 | 62.8 | 244 |
| Total Dissolved Solids | mg/L | 13 | 12.5 | 58.9 | 54.5 | 220 | 200 | 93 | 92 | | 154 | 156 | 116 | 71 | 327 |
| Bromide (Br) | mg/L | 0.05 | | | | | | | | | 0.112 | 0.111 | - | - | - |
| Chloride (Cl) | mg/L | 0.5 | 9.2 | 4.8 | 9.8 | 4.2 | 4.2 | 1.2 | 1.2 | | 0.6 | 0.6 | 4 | 3.5 | 15 |
| Fluoride (F) | mg/L | 0.02 | | | | | | | | | 0.09 | 0.088 | - | - | - |
| Nitrate (as N) | mg/L | 0.005 | <0.5 | <0.5 | <0.5 | <0.010 | <0.010 | <0.10 | <0.10 | | 0.0342 | 0.0318 | - | - | - |
| Nitrite (as N) | mg/L | 0.001 | <0.050 | 0.06 | 0.089 | <0.010 | <0.010 | <0.10 | <0.10 | | <0.0010 | <0.0010 | - | - | - |
| Sulfate (SO4) | mg/L | 0.3 | <3.0 | 15 | 3.1 | <1.0 | <1.0 | <0.10 | <0.10 | | 1.58 | 1.6 | 5 | 6.5 | 25 |

**Notes:**
Reference Criteria Site-specific Upper Limit of Acceptability (ULA)
RDL - Refers to laboratory detection limit which may vary between sample locations and event
ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.
* - Field pH used due to lack of water volume

| |
|---|
| Exceeds Reference Criteria |
| Detection Limit Exceeds Reference Criteria |

# TABLE D-7

## Historical Metal Concentrations of Groundwater Wells

Ennadai Lake
Year 7 2022

AECOM

| Parameter | Units | RDL | LF3-WS-01 | MW-LF3-WS-02 | MWLF-3 | MWLF-3 D | MWLF-3 | MWLF-3 D | MWLF-1 | MWLF-2 | MWLF-3 | Average | Standard Deviation | ULA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stantec | Stantec | Arcadis | Arcadis | SLR | SLR | BluMetric | BluMetric | BluMetric | | | |
| Historical Metals | | | 2014 | 2014 | 2016 | 2016 | 2018 | 2018 | 2020 | 2020 | 2020 | | | |
| **Total Metals** | | | | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | 0.003 | 21.4 | 1.78 | 3.1 | 3.9 | 0.21 | 0.2 | 0.171 | 0.365 | 0.335 | 3.49567 | 6.859 | 24.072 |
| Antimony (Sb)-Total | mg/L | 0.0001 | | | | | <0.0006 | <0.0006 | 0.00019 | <0.00010 | <0.00010 | - | - | - |
| Arsenic (As)-Total | mg/L | 0.0001 | 0.00381 | 0.0005 | 0.00094 | 0.0012 | 0.00057 | 0.00040 | 0.00015 | 0.00062 | 0.00058 | 0.00097 | 0.001 | 0.004 |
| Barium (Ba)-Total | mg/L | 0.0001 | | | | | 0.12 | 0.12 | 0.0614 | 0.118 | 0.113 | 0.10648 | 0.025 | 0.183 |
| Beryllium (Be)-Total | mg/L | 0.0001 | | | | | <0.001 | <0.001 | <0.00010 | <0.00010 | <0.00010 | - | - | - |
| Bismuth (Bi)-Total | mg/L | 0.00005 | | | | | | | <0.000050 | <0.000050 | <0.000050 | - | - | - |
| Boron (B)-Total | mg/L | 0.01 | | | | | <0.020 | <0.020 | 0.014 | 0.020 | 0.019 | 0.01767 | 0.003 | 0.027 |
| Cadmium (Cd)-Total | mg/L | 0.000005 | 0.000113 | 0.000035 | 0.00015 | 0.00015 | 0.000097 | 0.00011 | 0.00035 | 0.0000761 | 0.0000715 | 0.00013 | 0.00009 | 0.00040 |
| Calcium (Ca)-Total | mg/L | 0.05 | | | | | 23 | 23 | 2.89 | 22.2 | 23.1 | 18.83800 | 8.923 | 45.606 |
| Cesium (Cs)-Total | mg/L | 0.00001 | | | | | | | 0.000010 | 0.000011 | <0.000010 | 0.00001 | 0.000001 | 0.000013 |
| Chromium (Cr)-Total | mg/L | 0.0001 | 0.0321 | 0.00276 | 0.012 | 0.014 | 0.0024 | 0.0023 | 0.00174 | 0.00197 | 0.00189 | 0.00791 | 0.010 | 0.039 |
| Cobalt (Co)-Total | mg/L | 0.0001 | 0.0122 | 0.0051 | 0.015 | 0.016 | 0.014 | 0.014 | 0.00278 | 0.00685 | 0.00626 | 0.01024 | 0.005 | 0.025 |
| Copper (Cu)-Total | mg/L | 0.0005 | 0.0442 | 0.00605 | 0.015 | 0.016 | 0.018 | 0.019 | 0.0195 | 0.0282 | 0.0279 | 0.02154 | 0.011 | 0.054 |
| Iron (Fe)-Total | mg/L | 0.01 | 18.2 | 1.6 | 4.8 | 5.6 | 0.13 | 0.12 | 0.088 | 0.144 | 0.132 | 3.42378 | 5.945 | 21.260 |
| Lead (Pb)-Total | mg/L | 0.00005 | 0.0194 | 0.0023 | 0.0026 | 0.0033 | <0.0002 | <0.0002 | 0.000364 | 0.000103 | 0.000084 | 0.00402 | 0.007 | 0.025 |
| Lithium (Li)-Total | mg/L | 0.001 | | | | | <0.02 | <0.02 | <0.0010 | 0.0028 | 0.0033 | 0.00305 | 0.000 | 0.004 |
| Magnesium (Mg)-Total | mg/L | 0.005 | | | | | 7.8 | 7.9 | 1.04 | 7.73 | 7.73 | 6.44000 | 3.019 | 15.498 |
| Manganese (Mn)-Total | mg/L | 0.0001 | | | | | 2 | 2 | 0.0437 | 0.838 | 0.798 | 1.13594 | 0.850 | 3.686 |
| Mercury (Hg)-Total | mg/L | 0.000005 | <0.00010 | 0.00004 | 0.000014 | 0.000014 | | | 0.000005 | 0.0000131 | 0.0000143 | 0.00002 | 0.000012 | 0.000053 |
| Molybdenum (Mo)-Total | mg/L | 0.00005 | | | | | 0.00031 | 0.00029 | 0.000182 | 0.000272 | 0.000266 | 0.00026 | 0.000049 | 0.000411 |
| Nickel (Ni)-Total | mg/L | 0.0005 | 0.0247 | 0.00339 | 0.028 | 0.03 | 0.027 | 0.027 | 0.101 | 0.0269 | 0.0266 | 0.03273 | 0.027 | 0.113 |
| Phosphorus (P)-Total | mg/L | 0.05 | | | | | <0.10 | <0.10 | <0.050 | <0.050 | <0.050 | - | - | - |
| Potassium (K)-Total | mg/L | 0.05 | | | | | 4.3 | 4.3 | 0.855 | 4.34 | 4.38 | 3.63500 | 1.554 | 8.298 |
| Rubidium (Rb)-Total | mg/L | 0.0002 | | | | | | | 0.00299 | 0.00349 | 0.00371 | 0.00340 | 0.000 | 0.005 |
| Selenium (Se)-Total | mg/L | 0.00005 | | | | | 0.00028 | 0.00021 | <0.000050 | 0.000198 | 0.000206 | 0.00022 | 0.000038 | 0.000337 |
| Silicon (Si)-Total | mg/L | 0.1 | | | | | 7 | 7 | 3.18 | 6.73 | 6.7 | 6.12200 | 1.651 | 11.074 |
| Silver (Ag)-Total | mg/L | 0.00001 | 0.000208 | <0.000020 | <0.00010 | 0.00011 | 0.0001 | 0.00011 | 0.000019 | 0.000049 | 0.000053 | 0.00009 | 0.000062 | 0.000278 |
| Sodium (Na)-Total | mg/L | 0.05 | | | | | 1.2 | 1.2 | 5.37 | 2.27 | 2.21 | 2.45000 | 1.713 | 7.590 |
| Strontium (Sr)-Total | mg/L | 0.0002 | | | | | 0.21 | 0.21 | 0.0301 | 0.215 | 0.222 | 0.17742 | 0.083 | 0.425 |
| Sulfur (S)-Total | mg/L | 0.5 | | | | | 0.6 | 0.66 | 1.88 | <0.50 | 1.06 | 1.05000 | 0.590 | 2.819 |
| Tellurium (Te)-Total | mg/L | 0.0002 | | | | | | | <0.00020 | <0.00020 | <0.00020 | - | - | - |
| Thallium (Tl)-Total | mg/L | 0.00001 | | | | | <0.0002 | <0.0002 | 0.000013 | 0.000012 | 0.000016 | 0.00001 | 0.000002 | 0.00002 |
| Thorium (Th)-Total | mg/L | 0.0001 | | | | | | | 0.00012 | 0.00043 | 0.00043 | 0.00033 | 0.000179 | 0.00086 |
| Tin (Sn) -Total | mg/L | 0.0001 | | | | | <0.001 | <0.001 | <0.00010 | <0.00010 | <0.00010 | - | - | - |
| Titanium (Ti)-Total | mg/L | 0.0003 | | | | | 0.0077 | 0.0071 | 0.0018 | 0.00438 | 0.00434 | 0.00506 | 0.002 | 0.012 |
| Tungsten (W) -Total | mg/L | 0.0001 | | | | | | | 0.00021 | <0.00010 | <0.00010 | - | - | - |
| Uranium (U)-Total | mg/L | 0.00001 | | | | | 0.0012 | 0.0012 | 0.000129 | 0.00146 | 0.00153 | 0.00110 | 0.001 | 0.003 |
| Vanadium (V)-Total | mg/L | 0.0005 | | | | | 0.0013 | 0.0013 | <0.00050 | 0.00083 | 0.0008 | 0.00106 | 0.000 | 0.002 |
| Zinc (Zn)-Total | mg/L | 0.003 | 0.0373 | 0.0059 | 0.016 | 0.018 | 0.0041 | 0.0042 | 0.0498 | 0.0036 | <0.0030 | 0.01736 | 0.017 | 0.070 |
| Zirconium (Zr)-Total | mg/L | 0.0002 | | | | | | | 0.00035 | 0.00239 | 0.00267 | 0.00180 | 0.001 | 0.006 |

# TABLE D-7

## Historical Metal Concentrations of Groundwater Wells

Ennadai Lake
Year 7 2022

AECOM

| Parameter | Units | RDL | LF3-WS-01 | MW-LF3-WS-02 | MWLF-3 | MWLF-3 D | MWLF-3 | MWLF-3 D | MWLF-1 | MWLF-2 | MWLF-3 | Average | Standard Deviation | ULA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stantec | Stantec | Arcadis | Arcadis | SLR | SLR | BluMetric | BluMetric | BluMetric | | | |
| Historical Metals | | | 2014 | 2014 | 2016 | 2016 | 2018 | 2018 | 2020 | 2020 | 2020 | | | |
| **Dissolved Metals** | | | | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | 0.001 | | | 0.1 | 0.092 | 0.17 | 0.16 | 0.179 | 0.405 | 0.341 | 0.207 | 0.120 | 0.566 |
| Antimony (Sb)-Dissolved | mg/L | 0.0001 | | | | | <0.0006 | <0.0006 | 0.00021 | <0.00010 | <0.00010 | - | - | - |
| Arsenic (As)-Dissolved | mg/L | 0.0001 | | | 0.00044 | 0.00051 | <0.00035 | 0.00048 | 0.00019 | 0.00072 | 0.00064 | 0.000 | 0.000 | 0.001 |
| Barium (Ba)-Dissolved | mg/L | 0.0001 | | | | | <0.120 | <0.120 | 0.0602 | 0.12 | 0.104 | 0.095 | 0.031 | 0.188 |
| Beryllium (Be)-Dissolved | mg/L | 0.0001 | | | | | <0.001 | <0.001 | <0.00010 | <0.00010 | <0.00010 | - | - | - |
| Bismuth (Bi)-Dissolved | mg/L | 0.00005 | | | | | | | <0.000050 | <0.000050 | <0.000050 | - | - | - |
| Boron (B)-Dissolved | mg/L | 0.01 | | | | | <0.020 | <0.020 | 0.014 | 0.018 | 0.018 | 0.017 | 0.002 | 0.024 |
| Cadmium (Cd)-Dissolved | mg/L | 0.000005 | | | 0.00012 | 0.00012 | 0.000082 | 0.000082 | 0.000361 | 0.0000773 | 0.0000721 | 0.00013 | 0.00010 | 0.00044 |
| Calcium (Ca)-Dissolved | mg/L | 0.05 | | | | | 22 | 22 | 2.99 | 22.8 | 22.8 | 18.518 | 8.690 | 44.587 |
| Cesium (Cs)-Dissolved | mg/L | 0.00001 | | | | | | | <0.000010 | 0.00001 | <0.000010 | - | - | - |
| Chromium (Cr)-Dissolved | mg/L | 0.0001 | | | <0.0010 | <0.0010 | 0.0018 | 0.0019 | 0.00174 | 0.00197 | 0.00187 | 0.002 | 0.000 | 0.002 |
| Cobalt (Co)-Dissolved | mg/L | 0.0001 | | | 0.014 | 0.013 | 0.013 | 0.014 | 0.00299 | 0.0068 | 0.00645 | 0.010 | 0.005 | 0.024 |
| Copper (Cu)-Dissolved | mg/L | 0.0002 | | | 0.0065 | 0.0059 | 0.016 | 0.017 | 0.0213 | 0.0316 | 0.0289 | 0.018 | 0.010 | 0.048 |
| Iron (Fe)-Dissolved | mg/L | 0.01 | | | 0.088 | 0.095 | 0.075 | 0.078 | 0.083 | 0.133 | 0.135 | 0.098 | 0.025 | 0.174 |
| Lead (Pb)-Dissolved | mg/L | 0.00005 | | | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.000418 | 0.000103 | 0.000097 | 0.000 | 0.000 | 0.001 |
| Lithium (Li)-Dissolved | mg/L | 0.001 | | | | | | | <0.0010 | 0.0031 | 0.0029 | 0.003 | 0.000 | 0.0034 |
| Magnesium (Mg)-Dissolved | mg/L | 0.005 | | | | | | | 1.09 | 8.69 | 7.18 | 5.653 | 4.023 | 17.724 |
| Manganese (Mn)-Dissolved | mg/L | 0.0001 | | | | | | | 0.0475 | 0.902 | 0.785 | 0.578 | 0.463 | 1.968 |
| Mercury (Hg)-Dissolved | mg/L | 0.000005 | | | 0.0000067 | 0.0000067 | | | <0.0000050 | 0.0000149 | 0.0000144 | 0.000011 | 0.000005 | 0.000024 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.00005 | | | | | 0.00022 | 0.00022 | 0.000189 | 0.000271 | 0.000271 | 0.000234 | 0.000036 | 0.000342 |
| Nickel (Ni)-Dissolved | mg/L | 0.0005 | | | 0.022 | 0.02 | 0.026 | 0.026 | 0.107 | 0.0295 | 0.0275 | 0.037 | 0.031 | 0.130 |
| Phosphorus (P)-Dissolved | mg/L | 0.05 | | | | | <0.100 | <0.100 | <0.050 | <0.050 | <0.050 | - | - | - |
| Potassium (K.)-Dissolved | mg/L | 0.05 | | | | | 41 | 41 | 0.961 | 4.73 | 4.3 | 18.398 | 20.684 | 80.450 |
| Rubidium (Rb)-Dissolved | mg/L | 0.0002 | | | | | | | 0.00351 | 0.00424 | 0.00355 | 0.004 | 0.000410 | 0.005 |
| Selenium (Se)-Dissolved | mg/L | 0.00005 | | | | | 0.00023 | 0.00022 | <0.000050 | 0.000202 | 0.000223 | 0.000219 | 0.000012 | 0.000255 |
| Silicon (Si)-Dissolved | mg/L | 0.05 | | | | | 6.9 | 6.9 | 3.23 | 6.96 | 6.67 | 6.132 | 1.626 | 11.010 |
| Silver (Ag)-Dissolved | mg/L | 0.00001 | | | <0.00010 | <0.00010 | <0.0001 | <0.0001 | 0.000022 | 0.000047 | 0.000044 | 0.000038 | 0.000014 | 0.000079 |
| Sodium (Na)-Dissolved | mg/L | 0.05 | | | | | 1.2 | 1.2 | 6.11 | 2.59 | 2.43 | 2.706 | 2.013 | 8.746 |
| Strontium (Sr)-Dissolved | mg/L | 0.0002 | | | | | | | 0.0356 | 0.235 | 0.198 | 0.156 | 0.106 | 0.474 |
| Sulfur (S)-Dissolved | mg/L | 0.5 | | | | | 0.63 | 0.62 | 1.82 | 0.61 | 0.72 | 0.880 | 0.527 | 2.462 |
| Tellurium (Te)-Dissolved | mg/L | 0.0002 | | | | | | | <0.00020 | <0.00020 | <0.00020 | - | - | - |
| Thallium (Tl)-Dissolved | mg/L | 0.00001 | | | | | <0.0002 | <0.0002 | 0.000013 | 0.000015 | 0.000020 | 0.000016 | 0.000004 | 0.000027 |
| Thorium (Th)-Dissolved | mg/L | 0.0001 | | | | | | | 0.00017 | 0.00054 | 0.00041 | 0.000373 | 0.000188 | 0.001 |
| Tin (Sn)-Dissolved | mg/L | 0.0001 | | | | | <0.001 | <0.001 | 0.00011 | <0.00010 | <0.00010 | - | - | - |
| Titanium (Ti)-Dissolved | mg/L | 0.0003 | | | | | 0.0037 | 0.0025 | 0.00247 | 0.00512 | 0.0043 | 0.004 | 0.001 | 0.007 |
| Tungsten (W)-Dissolved | mg/L | 0.0001 | | | | | | | 0.00024 | <0.00010 | <0.00010 | - | - | - |
| Uranium (U)-Dissolved | mg/L | 0.00001 | | | | | 0.0011 | 0.00099 | 0.000137 | 0.00176 | 0.0015 | 0.001 | 0.001 | 0.003 |
| Vanadium (V)-Dissolved | mg/L | 0.0005 | | | | | 0.0015 | 0.0016 | <0.00050 | 0.00072 | 0.00063 | 0.001 | 0.001 | 0.003 |
| Zinc (Zn)-Dissolved | mg/L | 0.001 | | | 0.004 | <0.0030 | <0.003 | 0.0045 | 0.0588 | 0.0034 | 0.0028 | 0.015 | 0.025 | 0.089 |
| Zirconium (Zr)-Dissolved | mg/L | 0.0002 | | | | | | | 0.00035 | 0.0026 | 0.00243 | 0.002 | 0.001 | 0.006 |

**Notes:**

Reference Criteria - Site-specific Upper Limit of Acceptability (ULA)

ULA - Upper Limit of Acceptability; calculated using the average + three times (x3) standard deviations of all available data & only calculated for parameters that had three or more data points with detectable concentrations.

RDL - Reported Detection Limit, which may vary between sample locations and events

| |
|---|
| Exceeds Reference Criteria |
| Detection Limit Exceeds Reference Criteria |

# TABLE D-8

## Historical PHC and Volatile Concentrations of Groundwater Wells

Ennadai Lake
Year 7 2022

| Parameter | Units | RDL | MW13-2 | LF3-WS-01 | MW-LF3-WS-02 | MWLF-3 | MWLF-3 D | MWLF-3 | MWLF-3 D | MWLF-3 | MWLF-3 D | ULA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stantec | Stantec | Stantec | Arcadis | Arcadis | SLR | SLR | BluMetric | BluMetric | |
| | | | 2014 | 2014 | 2014 | 2016 | 2016 | 2018 | 2018 | 2020 | 2020 | |
| **Historical PHCs and VOCs** | | | | | | | | | | | | |
| FI (C6-C10) | mg/L | 0.1 | <0.20 | <0.20 | <0.20 | 0.26 | 0.34 | <0.10 | <0.10 | <0.10 | <0.10 | Not calculated |
| FI-BTEX | mg/L | 0.1 | - | - | - | 0.26 | 0.34 | <0.10 | <0.10 | <0.10 | <0.10 | Not calculated |
| F2 (C10-C16) | mg/L | 0.3 | <0.20 | <0.20 | <0.40 | <0.10 | <0.10 | <0.10 | <0.30 | <0.30 | <0.30 | All < RDL |
| F3 (C16-C34) | mg/L | 0.3 | <0.30 | <0.30 | - | <0.20 | <0.20 | - | - | <0.30 | <0.30 | All < RDL |
| F4 (C34-C50) | mg/L | 0.3 | <0.30 | <0.30 | - | <0.20 | <0.20 | - | - | <0.30 | <0.30 | All < RDL |
| Benzene | mg/L | 0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0004 | <0.0004 | - | - | <0.00050 | <0.00050 | All < RDL |
| Ethylbenzene | mg/L | 0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0004 | <0.0004 | - | - | <0.00050 | <0.00050 | All < RDL |
| Toluene | mg/L | 0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0004 | <0.0004 | - | - | <0.00045 | <0.00045 | All < RDL |
| Xylenes | mg/L | 0.0008 | <0.002 | <0.002 | <0.002 | <0.0008 | <0.0008 | <0.0009 | <0.0009 | <0.00075 | <0.00075 | All < RDL |

**Notes:**
Reference Criteria - Site-specific Upper Limit of Acceptability (ULA)
RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria

Detection Limit Exceeds Reference Criteria

# TABLE D-9

## Historical PCB Concentrations of Groundwater Wells

Ennadai Lake
Year 7 2022

| Parameter | Units | RDL | LF3-WS-01 - 2014 | MW-LF3-WS-02 | MWLF-3 - 2016 | MWLF-3 D | MWLF-3 | MWLF-3 D | MWLF-1 | MWLF-3 | MWLF-3 D | ULA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stantec | Stantec | Arcadis | Arcadis | SLR | SLR | BluMetric | BluMetric | BluMetric | |
| | | | 2014 | 2014 | 2016 | 2016 | 2018 | 2018 | 2020 | 2020 | 2020 | |
| **Historical PCBs** | | | | | | | | | | | | |
| Total PCBs | mg/L | 0.00004 | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.000040 | <0.000040 | <0.000040 | All < RDL |
| Aroclor 1242 | mg/L | 0.00002 | - | - | - | - | - | - | <0.000020 | <0.000020 | <0.000020 | All < RDL |
| Aroclor 1248 | mg/L | 0.00002 | - | - | - | - | - | - | <0.000020 | <0.000020 | <0.000020 | All < RDL |
| Aroclor 1254 | mg/L | 0.00002 | - | - | - | - | - | - | <0.000020 | <0.000020 | <0.000020 | All < RDL |
| Aroclor 1260 | mg/L | 0.00002 | - | - | - | - | - | - | <0.000020 | <0.000020 | <0.000020 | All < RDL |

**Notes:**
Reference Criteria - Site-specific Upper Limit of Acceptability (ULA)
RDL - Reported Detection Limit, which may vary between sample locations and events

Exceeds Reference Criteria

Detection Limit Exceeds Reference Criteria

# Appendix E

## Laboratory Certificate of Analysis

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **EO2206889** | Page | : 1 of 7 |
| Client | : **AECOM Canada Ltd.** | Laboratory | : Edmonton - Environmental |
| Contact | : Jessica Stepney | Account Manager | : Pamela Toledo |
| Address | : 101 - 18817 Stony Plain Rd. NW<br>Edmonton AB Canada T5S 0C2 | Address | : 9450 - 17 Avenue NW<br>Edmonton AB Canada T6N 1M9 |
| Telephone | : 780-486-5921 | Telephone | : +1 780 413 5227 |
| Project | : 60686962 | Date Samples Received | : 24-Aug-2022 13:40 |
| PO | : ---- | Date Analysis Commenced | : 25-Aug-2022 |
| C-O-C number | : 20-1009656 | Issue Date | : 30-Aug-2022 18:51 |
| Sampler | : ---- | | |
| Site | : 2022 Price List - Prairies | | |
| Quote number | : 2022 Price List - Prairies | | |
| No. of samples received | : 2 | | |
| No. of samples analysed | : 2 | | |

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

## Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

| *Signatories* | *Position* | *Laboratory Department* |
|---|---|---|
| Alex Drake | Lab Analyst | Inorganics, Edmonton, Alberta |
| Austin Wasylyshyn | Lab Analyst | Metals, Edmonton, Alberta |
| Daniel Nguyen | Lab Assistant | Inorganics, Edmonton, Alberta |
| Jessica Maitland | Lab Assistant | Inorganics, Edmonton, Alberta |
| Kari Mulroy | Lab Supervisor - Environmental | Organics, Edmonton, Alberta |
| Ping Yeung | Team Leader - Inorganics | Inorganics, Edmonton, Alberta |
| Ping Yeung | Team Leader - Inorganics | Metals, Edmonton, Alberta |
| Sobhithan Pillay | | Inorganics, Edmonton, Alberta |
| Yan Zhang | Lab Analyst | Organics, Edmonton, Alberta |

## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

| *Unit* | *Description* |
|---|---|
| - | No Unit |
| % | percent |
| µg/L | micrograms per litre |
| µS/cm | Microsiemens per centimetre |
| meq/L | milliequivalents per litre |
| mg/L | milligrams per litre |
| pH units | pH units |

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Qualifiers

| *Qualifier* | *Description* |
|---|---|
| *DTC* | *Dissolved concentration exceeds total. Results were confirmed by re-analysis.* |
| *RRV* | *Reported result verified by repeat analysis.* |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID | MWLF-3 | QA/QC | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 11-Aug-2022 12:00 | 11-Aug-2022 12:00 | ---- | ---- | ---- |
| | | | | | | EO2206889-001 | EO2206889-002 | -------- | -------- | -------- |
| | | | | | | Result | Result | ---- | ---- | ---- |
| **Physical Tests** | | | | | | | | | | |
| **hardness (as CaCO3), dissolved** | ---- | EC100 | 0.50 | mg/L | | 53.0 | 52.2 | ---- | ---- | ---- |
| **solids, total dissolved [TDS]** | ---- | E162 | 10 | mg/L | | 80 | 80 | ---- | ---- | ---- |
| **solids, total suspended [TSS]** | ---- | E160 | 3.0 | mg/L | | <3.0 | <3.0 | ---- | ---- | ---- |
| **conductivity** | ---- | E100 | 2.0 | µS/cm | | 114 | 114 | ---- | ---- | ---- |
| **pH** | ---- | E108 | 0.10 | pH units | | 7.19 | 7.23 | ---- | ---- | ---- |
| **alkalinity, bicarbonate (as HCO3)** | 71-52-3 | E290 | 1.0 | mg/L | | 68.8 | 70.4 | ---- | ---- | ---- |
| **alkalinity, carbonate (as CO3)** | 3812-32-6 | E290 | 1.0 | mg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| **alkalinity, hydroxide (as OH)** | 14280-30-9 | E290 | 1.0 | mg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| **alkalinity, total (as CaCO3)** | ---- | E290 | 2.0 | mg/L | | 56.4 | 57.7 | ---- | ---- | ---- |
| **solids, total dissolved [TDS], calculated** | ---- | EC103 | 1.0 | mg/L | | 73.5 | 73.7 | ---- | ---- | ---- |
| **Anions and Nutrients** | | | | | | | | | | |
| **chloride** | 16887-00-6 | E235.Cl | 0.50 | mg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| **fluoride** | 16984-48-8 | E235.F | 0.020 | mg/L | | 0.058 | 0.048 | ---- | ---- | ---- |
| **nitrate (as N)** | 14797-55-8 | E235.NO3 | 0.020 | mg/L | | 0.202 | 0.194 | ---- | ---- | ---- |
| **nitrite (as N)** | 14797-65-0 | E235.NO2 | 0.010 | mg/L | | <0.010 | <0.010 | ---- | ---- | ---- |
| **sulfate (as SO4)** | 14808-79-8 | E235.SO4 | 0.30 | mg/L | | 0.37 | <0.30 | ---- | ---- | ---- |
| **nitrate + nitrite (as N)** | ---- | EC235.N+N | 0.0500 | mg/L | | 0.202 | 0.194 | ---- | ---- | ---- |
| **Ion Balance** | | | | | | | | | | |
| **anion sum** | ---- | EC101 | 0.10 | meq/L | | 1.15 | 1.17 | ---- | ---- | ---- |
| **cation sum** | ---- | EC101 | 0.10 | meq/L | | 1.22 | 1.20 | ---- | ---- | ---- |
| **ion balance (APHA)** | ---- | EC101 | 0.010 | % | | 2.95 | 1.26 | ---- | ---- | ---- |
| **ion balance (cations/anions)** | ---- | EC101 | 0.010 | % | | 106 | 102 | ---- | ---- | ---- |
| **Total Metals** | | | | | | | | | | |
| **aluminum, total** | 7429-90-5 | E420 | 0.0030 | mg/L | | 0.116 | 0.125 | ---- | ---- | ---- |
| **antimony, total** | 7440-36-0 | E420 | 0.00010 | mg/L | | <0.00010 | 0.00021 | ---- | ---- | ---- |
| **arsenic, total** | 7440-38-2 | E420 | 0.00010 | mg/L | | 0.00027 | 0.00027 | ---- | ---- | ---- |
| **barium, total** | 7440-39-3 | E420 | 0.00010 | mg/L | | 0.0775 | 0.0746 | ---- | ---- | ---- |
| **beryllium, total** | 7440-41-7 | E420 | 0.000020 | mg/L | | 0.000037 | 0.000030 | ---- | ---- | ---- |
| **bismuth, total** | 7440-69-9 | E420 | 0.000050 | mg/L | | <0.000050 | <0.000050 | ---- | ---- | ---- |
| **boron, total** | 7440-42-8 | E420 | 0.010 | mg/L | | 0.022 | 0.026 | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID: MWLF-3 | QA/QC | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time: 11-Aug-2022 12:00 | 11-Aug-2022 12:00 | ---- | ---- | ---- |
| | | | | | EO2206889-001 | EO2206889-002 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **Total Metals** | | | | | | | | | |
| **cadmium, total** | 7440-43-9 | E420 | 0.0000050 | mg/L | 0.0000572 | 0.0000600 | ---- | ---- | ---- |
| **calcium, total** | 7440-70-2 | E420 | 0.050 | mg/L | 13.5 | 13.7 | ---- | ---- | ---- |
| **cesium, total** | 7440-46-2 | E420 | 0.000010 | mg/L | <0.000010 | <0.000010 | ---- | ---- | ---- |
| **chromium, total** | 7440-47-3 | E420 | 0.00050 | mg/L | 0.00098 | 0.00089 | ---- | ---- | ---- |
| **cobalt, total** | 7440-48-4 | E420 | 0.00010 | mg/L | 0.00433 | 0.00452 | ---- | ---- | ---- |
| **copper, total** | 7440-50-8 | E420 | 0.00050 | mg/L | 0.00946 RRV | 0.00972 | ---- | ---- | ---- |
| **iron, total** | 7439-89-6 | E420 | 0.010 | mg/L | 0.046 | 0.046 | ---- | ---- | ---- |
| **lead, total** | 7439-92-1 | E420 | 0.000050 | mg/L | <0.000050 RRV | <0.000050 | ---- | ---- | ---- |
| **lithium, total** | 7439-93-2 | E420 | 0.0010 | mg/L | 0.0021 | 0.0026 | ---- | ---- | ---- |
| **magnesium, total** | 7439-95-4 | E420 | 0.0050 | mg/L | 4.82 | 4.72 | ---- | ---- | ---- |
| **manganese, total** | 7439-96-5 | E420 | 0.00010 | mg/L | 0.765 | 0.792 | ---- | ---- | ---- |
| **molybdenum, total** | 7439-98-7 | E420 | 0.000050 | mg/L | 0.000177 | 0.000172 | ---- | ---- | ---- |
| **nickel, total** | 7440-02-0 | E420 | 0.00050 | mg/L | 0.0122 | 0.0123 | ---- | ---- | ---- |
| **phosphorus, total** | 7723-14-0 | E420 | 0.050 | mg/L | <0.050 | <0.050 | ---- | ---- | ---- |
| **potassium, total** | 7440-09-7 | E420 | 0.050 | mg/L | 2.72 | 2.80 | ---- | ---- | ---- |
| **rubidium, total** | 7440-17-7 | E420 | 0.00020 | mg/L | 0.00226 | 0.00238 | ---- | ---- | ---- |
| **selenium, total** | 7782-49-2 | E420 | 0.000050 | mg/L | <0.000050 | <0.000050 | ---- | ---- | ---- |
| **silicon, total** | 7440-21-3 | E420 | 0.10 | mg/L | 6.14 | 6.19 | ---- | ---- | ---- |
| **silver, total** | 7440-22-4 | E420 | 0.000010 | mg/L | <0.000010 | 0.000020 | ---- | ---- | ---- |
| **sodium, total** | 7440-23-5 | E420 | 0.050 | mg/L | 0.942 | 1.02 | ---- | ---- | ---- |
| **strontium, total** | 7440-24-6 | E420 | 0.00020 | mg/L | 0.128 | 0.124 | ---- | ---- | ---- |
| **sulfur, total** | 7704-34-9 | E420 | 0.50 | mg/L | 0.54 | 0.78 | ---- | ---- | ---- |
| **tellurium, total** | 13494-80-9 | E420 | 0.00020 | mg/L | <0.00020 | <0.00020 | ---- | ---- | ---- |
| **thallium, total** | 7440-28-0 | E420 | 0.000010 | mg/L | 0.000011 | 0.000014 | ---- | ---- | ---- |
| **thorium, total** | 7440-29-1 | E420 | 0.00010 | mg/L | <0.00010 | 0.00016 | ---- | ---- | ---- |
| **tin, total** | 7440-31-5 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | ---- | ---- | ---- |
| **titanium, total** | 7440-32-6 | E420 | 0.00030 | mg/L | 0.00148 | 0.00154 | ---- | ---- | ---- |
| **tungsten, total** | 7440-33-7 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | ---- | ---- | ---- |
| **uranium, total** | 7440-61-1 | E420 | 0.000010 | mg/L | 0.000674 | 0.000660 | ---- | ---- | ---- |
| **vanadium, total** | 7440-62-2 | E420 | 0.00050 | mg/L | 0.00052 | 0.00077 | ---- | ---- | ---- |
| **zinc, total** | 7440-66-6 | E420 | 0.0030 | mg/L | 0.0033 | <0.0030 | ---- | ---- | ---- |

## Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

| Analyte | CAS Number | Method | LOR | Unit | Client sample ID | MWLF-3 | QA/QC | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 11-Aug-2022 12:00 | 11-Aug-2022 12:00 | ---- | ---- | ---- |
| | | | | | | EO2206889-001 | EO2206889-002 | -------- | -------- | -------- |
| | | | | | | Result | Result | ---- | ---- | ---- |
| **Total Metals** | | | | | | | | | | |
| **zirconium, total** | 7440-67-7 | E420 | 0.00020 | mg/L | | 0.00073 | 0.00073 | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | | |
| **aluminum, dissolved** | 7429-90-5 | E421 | 0.0010 | mg/L | | 0.102 | 0.104 | ---- | ---- | ---- |
| **antimony, dissolved** | 7440-36-0 | E421 | 0.00010 | mg/L | | <0.00010 | <0.00010 | ---- | ---- | ---- |
| **arsenic, dissolved** | 7440-38-2 | E421 | 0.00010 | mg/L | | 0.00022 | 0.00022 | ---- | ---- | ---- |
| **barium, dissolved** | 7440-39-3 | E421 | 0.00010 | mg/L | | 0.0812 | 0.0787 | ---- | ---- | ---- |
| **beryllium, dissolved** | 7440-41-7 | E421 | 0.000020 | mg/L | | 0.000026 | 0.000037 | ---- | ---- | ---- |
| **bismuth, dissolved** | 7440-69-9 | E421 | 0.000050 | mg/L | | <0.000050 | <0.000050 | ---- | ---- | ---- |
| **boron, dissolved** | 7440-42-8 | E421 | 0.010 | mg/L | | 0.018 | 0.018 | ---- | ---- | ---- |
| **cadmium, dissolved** | 7440-43-9 | E421 | 0.0000050 | mg/L | | 0.0000619 | 0.0000553 | ---- | ---- | ---- |
| **calcium, dissolved** | 7440-70-2 | E421 | 0.050 | mg/L | | 12.9 | 12.7 | ---- | ---- | ---- |
| **cesium, dissolved** | 7440-46-2 | E421 | 0.000010 | mg/L | | <0.000010 | <0.000010 | ---- | ---- | ---- |
| **chromium, dissolved** | 7440-47-3 | E421 | 0.00050 | mg/L | | 0.00070 | 0.00068 | ---- | ---- | ---- |
| **cobalt, dissolved** | 7440-48-4 | E421 | 0.00010 | mg/L | | 0.00464 | 0.00468 | ---- | ---- | ---- |
| **copper, dissolved** | 7440-50-8 | E421 | 0.00020 | mg/L | | 0.0140 DTC | 0.00979 | ---- | ---- | ---- |
| **iron, dissolved** | 7439-89-6 | E421 | 0.030 | mg/L | | 0.034 | <0.030 | ---- | ---- | ---- |
| **lead, dissolved** | 7439-92-1 | E421 | 0.000050 | mg/L | | 0.000145 DTC | <0.000050 | ---- | ---- | ---- |
| **lithium, dissolved** | 7439-93-2 | E421 | 0.0010 | mg/L | | 0.0021 | 0.0021 | ---- | ---- | ---- |
| **magnesium, dissolved** | 7439-95-4 | E421 | 0.0050 | mg/L | | 5.04 | 4.98 | ---- | ---- | ---- |
| **manganese, dissolved** | 7439-96-5 | E421 | 0.00500 | mg/L | | 0.800 | 0.826 | ---- | ---- | ---- |
| **molybdenum, dissolved** | 7439-98-7 | E421 | 0.000050 | mg/L | | 0.000214 | 0.000141 | ---- | ---- | ---- |
| **nickel, dissolved** | 7440-02-0 | E421 | 0.00050 | mg/L | | 0.0126 | 0.0124 | ---- | ---- | ---- |
| **phosphorus, dissolved** | 7723-14-0 | E421 | 0.050 | mg/L | | <0.050 | <0.050 | ---- | ---- | ---- |
| **potassium, dissolved** | 7440-09-7 | E421 | 0.050 | mg/L | | 2.86 | 2.86 | ---- | ---- | ---- |
| **rubidium, dissolved** | 7440-17-7 | E421 | 0.00020 | mg/L | | 0.00226 | 0.00234 | ---- | ---- | ---- |
| **selenium, dissolved** | 7782-49-2 | E421 | 0.000050 | mg/L | | <0.000050 | 0.000052 | ---- | ---- | ---- |
| **silicon, dissolved** | 7440-21-3 | E421 | 0.050 | mg/L | | 5.78 | 5.80 | ---- | ---- | ---- |
| **silver, dissolved** | 7440-22-4 | E421 | 0.000010 | mg/L | | <0.000010 | <0.000010 | ---- | ---- | ---- |
| **sodium, dissolved** | 7440-23-5 | E421 | 0.050 | mg/L | | 0.970 | 0.961 | ---- | ---- | ---- |
| **strontium, dissolved** | 7440-24-6 | E421 | 0.00020 | mg/L | | 0.127 | 0.123 | ---- | ---- | ---- |
| **sulfur, dissolved** | 7704-34-9 | E421 | 0.50 | mg/L | | <0.50 | <0.50 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: Water (Matrix: Water) | | | | | Client sample ID | MWLF-3 | QA/QC | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 11-Aug-2022 12:00 | 11-Aug-2022 12:00 | ---- | ---- | ---- |
| Analyte | CAS Number | Method | LOR | Unit | | EO2206889-001 | EO2206889-002 | -------- | -------- | -------- |
| | | | | | | Result | Result | ---- | ---- | ---- |
| **Dissolved Metals** | | | | | | | | | | |
| tellurium, dissolved | 13494-80-9 | E421 | 0.00020 | mg/L | | <0.00020 | <0.00020 | ---- | ---- | ---- |
| thallium, dissolved | 7440-28-0 | E421 | 0.000010 | mg/L | | <0.000010 | <0.000010 | ---- | ---- | ---- |
| thorium, dissolved | 7440-29-1 | E421 | 0.00010 | mg/L | | 0.00012 | 0.00012 | ---- | ---- | ---- |
| tin, dissolved | 7440-31-5 | E421 | 0.00010 | mg/L | | <0.00010 | <0.00010 | ---- | ---- | ---- |
| titanium, dissolved | 7440-32-6 | E421 | 0.00030 | mg/L | | 0.00060 | 0.00049 | ---- | ---- | ---- |
| tungsten, dissolved | 7440-33-7 | E421 | 0.00010 | mg/L | | <0.00010 | <0.00010 | ---- | ---- | ---- |
| uranium, dissolved | 7440-61-1 | E421 | 0.000010 | mg/L | | 0.000498 | 0.000492 | ---- | ---- | ---- |
| vanadium, dissolved | 7440-62-2 | E421 | 0.00050 | mg/L | | <0.00050 | <0.00050 | ---- | ---- | ---- |
| zinc, dissolved | 7440-66-6 | E421 | 0.0010 | mg/L | | 0.0039 | 0.0014 | ---- | ---- | ---- |
| zirconium, dissolved | 7440-67-7 | E421 | 0.00020 | mg/L | | 0.00075 | 0.00071 | ---- | ---- | ---- |
| dissolved metals filtration location | ---- | EP421 | - | - | | Field | Field | ---- | ---- | ---- |
| **Volatile Organic Compounds [BTEXS+MTBE]** | | | | | | | | | | |
| benzene | 71-43-2 | E611A | 0.50 | µg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| ethylbenzene | 100-41-4 | E611A | 0.50 | µg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| toluene | 108-88-3 | E611A | 0.50 | µg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| xylene, m+p- | 179601-23-1 | E611A | 0.50 | µg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| xylene, o- | 95-47-6 | E611A | 0.50 | µg/L | | <0.50 | <0.50 | ---- | ---- | ---- |
| xylenes, total | 1330-20-7 | E611A | 0.75 | µg/L | | <0.75 | <0.75 | ---- | ---- | ---- |
| BTEX, total | ---- | E611A | 1.2 | µg/L | | <1.2 | <1.2 | ---- | ---- | ---- |
| **Volatile Organic Compounds Surrogates** | | | | | | | | | | |
| bromofluorobenzene, 4- | 460-00-4 | E611A | 1.0 | % | | 82.3 | 84.3 | ---- | ---- | ---- |
| difluorobenzene, 1,4- | 540-36-3 | E611A | 1.0 | % | | 103 | 105 | ---- | ---- | ---- |
| **Hydrocarbons** | | | | | | | | | | |
| F1 (C6-C10) | ---- | E581.F1 | 100 | µg/L | | <100 | <100 | ---- | ---- | ---- |
| F1-BTEX | ---- | EC580 | 100 | µg/L | | <100 | <100 | ---- | ---- | ---- |
| F2 (C10-C16) | ---- | E601 | 100 | µg/L | | <100 | <100 | ---- | ---- | ---- |
| F3 (C16-C34) | ---- | E601 | 250 | µg/L | | <250 | <250 | ---- | ---- | ---- |
| F4 (C34-C50) | ---- | E601 | 250 | µg/L | | <250 | <250 | ---- | ---- | ---- |
| hydrocarbons, total (C6-C50) | ---- | EC581 | 400 | µg/L | | <400 | <400 | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | | |
| bromobenzotrifluoride, 2- (F2-F4 surr) | 392-83-6 | E601 | 1.0 | % | | 103 | 99.7 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: **Water** (Matrix: **Water**) | | | | | Client sample ID | **MWLF-3** | **QA/QC** | **----** | **----** | **----** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Client sampling date / time | 11-Aug-2022 12:00 | 11-Aug-2022 12:00 | ---- | ---- | ---- |
| *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | | **EO2206889-001** | **EO2206889-002** | **--------** | **--------** | **--------** |
| | | | | | | Result | Result | ---- | ---- | ---- |
| **Hydrocarbons Surrogates** | | | | | | | | | | |
| **dichlorotoluene, 3,4-** | 97-75-0 | E581.F1 | 1.0 | % | | 111 | 111 | ---- | ---- | ---- |

Please refer to the General Comments section for an explanation of any qualifiers detected.

# QUALITY CONTROL INTERPRETIVE REPORT

| | | | |
|---|---|---|---|
| **Work Order** | : **EO2206889** | Page | : 1 of 11 |
| Client | : **AECOM Canada Ltd.** | Laboratory | : Edmonton - Environmental |
| Contact | : Jessica Stepney | Account Manager | : Pamela Toledo |
| Address | : 101 - 18817 Stony Plain Rd. NW<br>Edmonton AB Canada T5S 0C2 | Address | : 9450 - 17 Avenue NW<br>Edmonton, Alberta Canada T6N 1M9 |
| Telephone | : 780-486-5921 | Telephone | : +1 780 413 5227 |
| Project | : 60686962 | Date Samples Received | : 24-Aug-2022 13:40 |
| PO | : ---- | Issue Date | : 30-Aug-2022 18:51 |
| C-O-C number | : 20-1009656 | | |
| Sampler | : ---- | | |
| Site | : 2022 Price List - Prairies | | |
| Quote number | : 2022 Price List - Prairies | | |
| No. of samples received | : 2 | | |
| No. of samples analysed | : 2 | | |

**This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.**

**Key**

**Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.**
**CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.**
**DQO: Data Quality Objective.**
**LOR: Limit of Reporting (detection limit).**
**RPD: Relative Percent Difference.**

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Summary of Outliers

### Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

### Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

### Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

# Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

| Analyte Group / Container / Client Sample ID(s) | Method | Sampling Date | Extraction / Preparation | | | | Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preparation Date | Holding Times Rec | Holding Times Actual | Eval | Analysis Date | Holding Times Rec | Holding Times Actual | Eval |
| **Anions and Nutrients : Chloride in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| MWLF-3 | E235.Cl | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Anions and Nutrients : Chloride in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| QA/QC | E235.Cl | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Anions and Nutrients : Fluoride in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| MWLF-3 | E235.F | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Anions and Nutrients : Fluoride in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| QA/QC | E235.F | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Anions and Nutrients : Nitrate in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| MWLF-3 | E235.NO3 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 3 days | 14 days | × EHTR-FM |
| **Anions and Nutrients : Nitrate in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| QA/QC | E235.NO3 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 3 days | 14 days | × EHTR-FM |
| **Anions and Nutrients : Nitrite in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| MWLF-3 | E235.NO2 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 3 days | 14 days | × EHTR-FM |

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

| Analyte Group / Container / Client Sample ID(s) | Method | Sampling Date | Extraction / Preparation | | | | Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preparation Date | Holding Times Rec | Holding Times Actual | Eval | Analysis Date | Holding Times Rec | Holding Times Actual | Eval |
| **Anions and Nutrients : Nitrite in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| QA/QC | E235.NO2 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 3 days | 14 days | × EHTR-FM |
| **Anions and Nutrients : Sulfate in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| MWLF-3 | E235.SO4 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Anions and Nutrients : Sulfate in Water by IC** | | | | | | | | | | |
| **HDPE** | | | | | | | | | | |
| QA/QC | E235.SO4 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 28 days | 14 days | ✓ |
| **Dissolved Metals : Dissolved Metals in Water by CRC ICPMS** | | | | | | | | | | |
| **HDPE dissolved (nitric acid)** | | | | | | | | | | |
| MWLF-3 | E421 | 11-Aug-2022 | 28-Aug-2022 | ---- | ---- | | 28-Aug-2022 | 180 days | 17 days | ✓ |
| **Dissolved Metals : Dissolved Metals in Water by CRC ICPMS** | | | | | | | | | | |
| **HDPE dissolved (nitric acid)** | | | | | | | | | | |
| QA/QC | E421 | 11-Aug-2022 | 28-Aug-2022 | ---- | ---- | | 28-Aug-2022 | 180 days | 17 days | ✓ |
| **Hydrocarbons : CCME PHC - F1 by Headspace GC-FID** | | | | | | | | | | |
| **Glass vial (sodium bisulfate)** | | | | | | | | | | |
| MWLF-3 | E581.F1 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 14 days | 14 days | ✓ |
| **Hydrocarbons : CCME PHC - F1 by Headspace GC-FID** | | | | | | | | | | |
| **Glass vial (sodium bisulfate)** | | | | | | | | | | |
| QA/QC | E581.F1 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 14 days | 14 days | ✓ |
| **Hydrocarbons : CCME PHCs - F2-F4 by GC-FID** | | | | | | | | | | |
| **Amber glass/Teflon lined cap (sodium bisulfate)** | | | | | | | | | | |
| MWLF-3 | E601 | 11-Aug-2022 | 25-Aug-2022 | 14 days | 14 days | ✓ | 26-Aug-2022 | 40 days | 1 days | ✓ |
| **Hydrocarbons : CCME PHCs - F2-F4 by GC-FID** | | | | | | | | | | |
| **Amber glass/Teflon lined cap (sodium bisulfate)** | | | | | | | | | | |
| QA/QC | E601 | 11-Aug-2022 | 25-Aug-2022 | 14 days | 14 days | ✓ | 26-Aug-2022 | 40 days | 1 days | ✓ |

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

| Analyte Group / Container / Client Sample ID(s) | Method | Sampling Date | Extraction / Preparation | | | | Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preparation Date | Holding Times Rec | Holding Times Actual | Eval | Analysis Date | Holding Times Rec | Holding Times Actual | Eval |
| **Physical Tests : Alkalinity Species by Titration** | | | | | | | | | | |
| **HDPE** MWLF-3 | E290 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 14 days | 15 days | × EHT |
| **Physical Tests : Alkalinity Species by Titration** | | | | | | | | | | |
| **HDPE** QA/QC | E290 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 14 days | 15 days | × EHT |
| **Physical Tests : Conductivity in Water** | | | | | | | | | | |
| **HDPE** MWLF-3 | E100 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 28 days | 15 days | ✓ |
| **Physical Tests : Conductivity in Water** | | | | | | | | | | |
| **HDPE** QA/QC | E100 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 28 days | 15 days | ✓ |
| **Physical Tests : pH by Meter** | | | | | | | | | | |
| **HDPE** MWLF-3 | E108 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 0.25 hrs | 24.25 hrs | × EHTR-FM |
| **Physical Tests : pH by Meter** | | | | | | | | | | |
| **HDPE** QA/QC | E108 | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 26-Aug-2022 | 0.25 hrs | 24.25 hrs | × EHTR-FM |
| **Physical Tests : TDS by Gravimetry** | | | | | | | | | | |
| **HDPE** MWLF-3 | E162 | 11-Aug-2022 | ---- | ---- | ---- | | 25-Aug-2022 | 7 days | 14 days | × EHTR |
| **Physical Tests : TDS by Gravimetry** | | | | | | | | | | |
| **HDPE** QA/QC | E162 | 11-Aug-2022 | ---- | ---- | ---- | | 25-Aug-2022 | 7 days | 14 days | × EHTR |
| **Physical Tests : TSS by Gravimetry** | | | | | | | | | | |
| **HDPE** MWLF-3 | E160 | 11-Aug-2022 | ---- | ---- | ---- | | 25-Aug-2022 | 7 days | 14 days | × EHTR |

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

| Analyte Group / Container / Client Sample ID(s) | Method | Sampling Date | Extraction / Preparation | | | | Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preparation Date | Holding Times Rec | Holding Times Actual | Eval | Analysis Date | Holding Times Rec | Holding Times Actual | Eval |
| **Physical Tests : TSS by Gravimetry** | | | | | | | | | | |
| **HDPE** QA/QC | E160 | 11-Aug-2022 | ---- | ---- | ---- | | 25-Aug-2022 | 7 days | 14 days | ✖ EHTR |
| **Total Metals : Total Metals in Water by CRC ICPMS** | | | | | | | | | | |
| **HDPE total (nitric acid)** MWLF-3 | E420 | 11-Aug-2022 | 29-Aug-2022 | ---- | ---- | | 29-Aug-2022 | 180 days | 18 days | ✓ |
| **Total Metals : Total Metals in Water by CRC ICPMS** | | | | | | | | | | |
| **HDPE total (nitric acid)** QA/QC | E420 | 11-Aug-2022 | 29-Aug-2022 | ---- | ---- | | 29-Aug-2022 | 180 days | 18 days | ✓ |
| **Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS** | | | | | | | | | | |
| **Glass vial (sodium bisulfate)** MWLF-3 | E611A | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 14 days | 14 days | ✓ |
| **Volatile Organic Compounds [BTEXS+MTBE] : BTEX by Headspace GC-MS** | | | | | | | | | | |
| **Glass vial (sodium bisulfate)** QA/QC | E611A | 11-Aug-2022 | 25-Aug-2022 | ---- | ---- | | 25-Aug-2022 | 14 days | 14 days | ✓ |

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

# Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

| Quality Control Sample Type | | | Count | | Frequency (%) | | |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC Lot #* | *QC* | *Regular* | *Actual* | *Expected* | *Evaluation* |
| **Laboratory Duplicates (DUP)** | | | | | | | |
| Alkalinity Species by Titration | E290 | 619364 | 1 | 18 | 5.5 | 5.0 | ✓ |
| BTEX by Headspace GC-MS | E611A | 618781 | 1 | 7 | 14.2 | 5.0 | ✓ |
| CCME PHC - F1 by Headspace GC-FID | E581.F1 | 618780 | 1 | 7 | 14.2 | 5.0 | ✓ |
| Chloride in Water by IC | E235.Cl | 618648 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Conductivity in Water | E100 | 619363 | 1 | 18 | 5.5 | 5.0 | ✓ |
| Dissolved Metals in Water by CRC ICPMS | E421 | 622493 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Fluoride in Water by IC | E235.F | 618645 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Nitrate in Water by IC | E235.NO3 | 618646 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Nitrite in Water by IC | E235.NO2 | 618649 | 1 | 20 | 5.0 | 5.0 | ✓ |
| pH by Meter | E108 | 619362 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Sulfate in Water by IC | E235.SO4 | 618647 | 1 | 19 | 5.2 | 5.0 | ✓ |
| TDS by Gravimetry | E162 | 618710 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Total Metals in Water by CRC ICPMS | E420 | 623074 | 2 | 40 | 5.0 | 5.0 | ✓ |
| TSS by Gravimetry | E160 | 619064 | 1 | 19 | 5.2 | 5.0 | ✓ |
| **Laboratory Control Samples (LCS)** | | | | | | | |
| Alkalinity Species by Titration | E290 | 619364 | 1 | 18 | 5.5 | 5.0 | ✓ |
| BTEX by Headspace GC-MS | E611A | 618781 | 1 | 7 | 14.2 | 5.0 | ✓ |
| CCME PHC - F1 by Headspace GC-FID | E581.F1 | 618780 | 1 | 7 | 14.2 | 5.0 | ✓ |
| CCME PHCs - F2-F4 by GC-FID | E601 | 619233 | 1 | 7 | 14.2 | 5.0 | ✓ |
| Chloride in Water by IC | E235.Cl | 618648 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Conductivity in Water | E100 | 619363 | 1 | 18 | 5.5 | 5.0 | ✓ |
| Dissolved Metals in Water by CRC ICPMS | E421 | 622493 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Fluoride in Water by IC | E235.F | 618645 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Nitrate in Water by IC | E235.NO3 | 618646 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Nitrite in Water by IC | E235.NO2 | 618649 | 1 | 20 | 5.0 | 5.0 | ✓ |
| pH by Meter | E108 | 619362 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Sulfate in Water by IC | E235.SO4 | 618647 | 1 | 19 | 5.2 | 5.0 | ✓ |
| TDS by Gravimetry | E162 | 618710 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Total Metals in Water by CRC ICPMS | E420 | 623074 | 2 | 40 | 5.0 | 5.0 | ✓ |
| TSS by Gravimetry | E160 | 619064 | 1 | 19 | 5.2 | 5.0 | ✓ |
| **Method Blanks (MB)** | | | | | | | |
| Alkalinity Species by Titration | E290 | 619364 | 1 | 18 | 5.5 | 5.0 | ✓ |
| BTEX by Headspace GC-MS | E611A | 618781 | 1 | 7 | 14.2 | 5.0 | ✓ |
| CCME PHC - F1 by Headspace GC-FID | E581.F1 | 618780 | 1 | 7 | 14.2 | 5.0 | ✓ |
| CCME PHCs - F2-F4 by GC-FID | E601 | 619233 | 1 | 7 | 14.2 | 5.0 | ✓ |
| Chloride in Water by IC | E235.Cl | 618648 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Conductivity in Water | E100 | 619363 | 1 | 18 | 5.5 | 5.0 | ✓ |

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

| Quality Control Sample Type | | | Count | | Frequency (%) | | |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC Lot #* | *QC* | *Regular* | *Actual* | *Expected* | *Evaluation* |
| Method Blanks (MB) - Continued | | | | | | | |
| Dissolved Metals in Water by CRC ICPMS | E421 | 622493 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Fluoride in Water by IC | E235.F | 618645 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Nitrate in Water by IC | E235.NO3 | 618646 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Nitrite in Water by IC | E235.NO2 | 618649 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Sulfate in Water by IC | E235.SO4 | 618647 | 1 | 19 | 5.2 | 5.0 | ✓ |
| TDS by Gravimetry | E162 | 618710 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Total Metals in Water by CRC ICPMS | E420 | 623074 | 2 | 40 | 5.0 | 5.0 | ✓ |
| TSS by Gravimetry | E160 | 619064 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Matrix Spikes (MS) | | | | | | | |
| BTEX by Headspace GC-MS | E611A | 618781 | 1 | 7 | 14.2 | 5.0 | ✓ |
| Chloride in Water by IC | E235.Cl | 618648 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Dissolved Metals in Water by CRC ICPMS | E421 | 622493 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Fluoride in Water by IC | E235.F | 618645 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Nitrate in Water by IC | E235.NO3 | 618646 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Nitrite in Water by IC | E235.NO2 | 618649 | 1 | 20 | 5.0 | 5.0 | ✓ |
| Sulfate in Water by IC | E235.SO4 | 618647 | 1 | 19 | 5.2 | 5.0 | ✓ |
| Total Metals in Water by CRC ICPMS | E420 | 623074 | 2 | 40 | 5.0 | 5.0 | ✓ |

## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

| Analytical Methods | Method / Lab | Matrix | Method Reference | Method Descriptions |
|---|---|---|---|---|
| Conductivity in Water | E100<br>Edmonton - Environmental | Water | APHA 2510 (mod) | Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C. |
| pH by Meter | E108<br>Edmonton - Environmental | Water | APHA 4500-H (mod) | pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time. |
| TSS by Gravimetry | E160<br>Edmonton - Environmental | Water | APHA 2540 D (mod) | Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. |
| TDS by Gravimetry | E162<br>Edmonton - Environmental | Water | APHA 2540 C (mod) | Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue. |
| Chloride in Water by IC | E235.Cl<br>Edmonton - Environmental | Water | EPA 300.1 (mod) | Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. |
| Fluoride in Water by IC | E235.F<br>Edmonton - Environmental | Water | EPA 300.1 (mod) | Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. |
| Nitrite in Water by IC | E235.NO2<br>Edmonton - Environmental | Water | EPA 300.1 (mod) | Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. |
| Nitrate in Water by IC | E235.NO3<br>Edmonton - Environmental | Water | EPA 300.1 (mod) | Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. |
| Sulfate in Water by IC | E235.SO4<br>Edmonton - Environmental | Water | EPA 300.1 (mod) | Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. |
| Alkalinity Species by Titration | E290<br>Edmonton - Environmental | Water | APHA 2320 B (mod) | Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values. |

| Analytical Methods | Method / Lab | Matrix | Method Reference | Method Descriptions |
|---|---|---|---|---|
| Total Metals in Water by CRC ICPMS | E420<br><br>Edmonton - Environmental | Water | EPA 200.2/6020B (mod) | Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.<br><br>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. |
| Dissolved Metals in Water by CRC ICPMS | E421<br><br>Edmonton - Environmental | Water | APHA 3030B/EPA 6020B (mod) | Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.<br><br>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. |
| CCME PHC - F1 by Headspace GC-FID | E581.F1<br><br>Edmonton - Environmental | Water | CCME PHC in Soil - Tier 1 | CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law. |
| CCME PHCs - F2-F4 by GC-FID | E601<br><br>Edmonton - Environmental | Water | CCME PHC in Soil - Tier 1 | Sample extracts are analyzed by GC-FID for CCME hydrocarbon fractions (F2-F4). |
| BTEX by Headspace GC-MS | E611A<br><br>Edmonton - Environmental | Water | EPA 8260D (mod) | Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law. |
| Dissolved Hardness (Calculated) | EC100<br><br>Edmonton - Environmental | Water | APHA 2340B | "Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. |
| Ion Balance using Dissolved Metals | EC101<br><br>Edmonton - Environmental | Water | APHA 1030E | Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.<br>Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC). |
| TDS in Water (Calculation) | EC103<br><br>Edmonton - Environmental | Water | APHA 1030E (mod) | Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. |
| Nitrate and Nitrite (as N) (Calculation) | EC235.N+N<br><br>Edmonton - Environmental | Water | EPA 300.0 | Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N). |
| F1-BTEX | EC580<br><br>Edmonton - Environmental | Water | CCME PHC in Soil - Tier 1 | F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX). |

| Analytical Methods | Method / Lab | Matrix | Method Reference | Method Descriptions |
|---|---|---|---|---|
| Sum F1 to F4 (C6-C50) | EC581<br><br>Edmonton - Environmental | Water | CCME PHC in Soil - Tier 1 | Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions. |

| Preparation Methods | Method / Lab | Matrix | Method Reference | Method Descriptions |
|---|---|---|---|---|
| Dissolved Metals Water Filtration | EP421<br><br>Edmonton - Environmental | Water | APHA 3030B | Water samples are filtered (0.45 um), and preserved with HNO3. |
| VOCs Preparation for Headspace Analysis | EP581<br><br>Edmonton - Environmental | Water | EPA 5021A (mod) | Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system. |
| PHCs and PAHs Hexane Extraction | EP601<br><br>Edmonton - Environmental | Water | EPA 3511 (mod) | Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction. |

ALS Environmental

# QUALITY CONTROL REPORT

| | | | |
|---|---|---|---|
| **Work Order** | : **EO2206889** | Page | : 1 of 22 |
| Client | : AECOM Canada Ltd. | Laboratory | : Edmonton - Environmental |
| Contact | : Jessica Stepney | Account Manager | : Pamela Toledo |
| Address | : 101 - 18817 Stony Plain Rd. NW<br>Edmonton AB Canada T5S 0C2 | Address | : 9450 - 17 Avenue NW<br>Edmonton, Alberta Canada T6N 1M9 |
| Telephone | : 780-486-5921 | Telephone | : +1 780 413 5227 |
| Project | : 60686962 | Date Samples Received | : 24-Aug-2022 13:40 |
| PO | : ---- | Date Analysis Commenced | : 25-Aug-2022 |
| C-O-C number | : 20-1009656 | Issue Date | : 30-Aug-2022 18:51 |
| Sampler | : ---- | | |
| Site | : 2022 Price List - Prairies | | |
| Quote number | : 2022 Price List - Prairies | | |
| No. of samples received | : 2 | | |
| No. of samples analysed | : 2 | | |

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

| *Signatories* | *Position* | *Laboratory Department* |
|---|---|---|
| Alex Drake | Lab Analyst | Edmonton Inorganics, Edmonton, Alberta |
| Austin Wasylyshyn | Lab Analyst | Edmonton Metals, Edmonton, Alberta |
| Daniel Nguyen | Lab Assistant | Edmonton Inorganics, Edmonton, Alberta |
| Jessica Maitland | Lab Assistant | Edmonton Inorganics, Edmonton, Alberta |
| Kari Mulroy | Lab Supervisor - Environmental | Edmonton Organics, Edmonton, Alberta |
| Ping Yeung | Team Leader - Inorganics | Edmonton Inorganics, Edmonton, Alberta |
| Ping Yeung | Team Leader - Inorganics | Edmonton Metals, Edmonton, Alberta |
| Sobhithan Pillay | | Edmonton Inorganics, Edmonton, Alberta |
| Yan Zhang | Lab Analyst | Edmonton Organics, Edmonton, Alberta |

## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

## Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

| | | | | | Laboratory Duplicate (DUP) Report | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD(%) or Difference* | *Duplicate Limits* | *Qualifier* |
| **Physical Tests (QC Lot: 618710)** | | | | | | | | | | | |
| EO2206880-005 | Anonymous | solids, total dissolved [TDS] | ---- | E162 | 20 | mg/L | 824 | 786 | 4.78% | 20% | ---- |
| **Physical Tests (QC Lot: 619064)** | | | | | | | | | | | |
| EO2206870-001 | Anonymous | solids, total suspended [TSS] | ---- | E160 | 3.0 | mg/L | 15.8 | 17.2 | 1.4 | Diff <2x LOR | ---- |
| **Physical Tests (QC Lot: 619362)** | | | | | | | | | | | |
| EO2206888-005 | Anonymous | pH | ---- | E108 | 0.10 | pH units | 7.40 | 7.38 | 0.271% | 3% | ---- |
| **Physical Tests (QC Lot: 619363)** | | | | | | | | | | | |
| EO2206888-005 | Anonymous | conductivity | ---- | E100 | 2.0 | µS/cm | 39.9 | 39.6 | 0.3 | Diff <2x LOR | ---- |
| **Physical Tests (QC Lot: 619364)** | | | | | | | | | | | |
| EO2206888-005 | Anonymous | alkalinity, total (as CaCO3) | ---- | E290 | 2.0 | mg/L | 16.3 | 15.8 | 0.5 | Diff <2x LOR | ---- |
| **Anions and Nutrients (QC Lot: 618645)** | | | | | | | | | | | |
| EO2206884-002 | Anonymous | fluoride | 16984-48-8 | E235.F | 0.020 | mg/L | 0.159 | 0.166 | 0.007 | Diff <2x LOR | ---- |
| **Anions and Nutrients (QC Lot: 618646)** | | | | | | | | | | | |
| EO2206884-002 | Anonymous | nitrate (as N) | 14797-55-8 | E235.NO3 | 0.020 | mg/L | 0.235 | 0.232 | 1.24% | 20% | ---- |
| **Anions and Nutrients (QC Lot: 618647)** | | | | | | | | | | | |
| EO2206884-002 | Anonymous | sulfate (as SO4) | 14808-79-8 | E235.SO4 | 0.30 | mg/L | 49.6 | 50.3 | 1.48% | 20% | ---- |
| **Anions and Nutrients (QC Lot: 618648)** | | | | | | | | | | | |
| EO2206884-002 | Anonymous | chloride | 16887-00-6 | E235.Cl | 0.50 | mg/L | 23.3 | 23.7 | 1.68% | 20% | ---- |
| **Anions and Nutrients (QC Lot: 618649)** | | | | | | | | | | | |
| EO2206884-002 | Anonymous | nitrite (as N) | 14797-65-0 | E235.NO2 | 0.010 | mg/L | 0.093 | 0.100 | 0.006 | Diff <2x LOR | ---- |
| **Total Metals (QC Lot: 623074)** | | | | | | | | | | | |
| EO2204640-008 | Anonymous | aluminum, total | 7429-90-5 | E420 | 0.0030 | mg/L | 0.119 | 0.124 | 4.46% | 20% | ---- |
| | | antimony, total | 7440-36-0 | E420 | 0.00010 | mg/L | 0.00038 | 0.00039 | 0.000007 | Diff <2x LOR | ---- |
| | | arsenic, total | 7440-38-2 | E420 | 0.00010 | mg/L | 0.00351 | 0.00372 | 5.86% | 20% | ---- |
| | | barium, total | 7440-39-3 | E420 | 0.00010 | mg/L | 0.214 | 0.222 | 3.86% | 20% | ---- |
| | | beryllium, total | 7440-41-7 | E420 | 0.000020 | mg/L | <0.000020 | <0.000020 | 0 | Diff <2x LOR | ---- |
| | | bismuth, total | 7440-69-9 | E420 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | boron, total | 7440-42-8 | E420 | 0.010 | mg/L | 0.201 | 0.202 | 0.444% | 20% | ---- |
| | | cadmium, total | 7440-43-9 | E420 | 0.0000050 | mg/L | 0.0000947 | 0.000106 | 11.3% | 20% | ---- |
| | | calcium, total | 7440-70-2 | E420 | 0.050 | mg/L | 76.3 | 76.9 | 0.774% | 20% | ---- |
| | | cesium, total | 7440-46-2 | E420 | 0.000010 | mg/L | 0.000023 | 0.000028 | 0.000005 | Diff <2x LOR | ---- |
| | | chromium, total | 7440-47-3 | E420 | 0.00050 | mg/L | <0.00050 | <0.00050 | 0 | Diff <2x LOR | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Duplicate (DUP) Report | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD(%) or Difference* | *Duplicate Limits* | *Qualifier* |
| **Total Metals (QC Lot: 623074) - continued** | | | | | | | | | | | |
| EO2204640-008 | Anonymous | cobalt, total | 7440-48-4 | E420 | 0.00010 | mg/L | 0.00105 | 0.00116 | 9.61% | 20% | ---- |
| | | copper, total | 7440-50-8 | E420 | 0.00050 | mg/L | 0.00159 | 0.00173 | 0.00014 | Diff <2x LOR | ---- |
| | | iron, total | 7439-89-6 | E420 | 0.010 | mg/L | 3.52 | 3.92 | 10.8% | 20% | ---- |
| | | lead, total | 7439-92-1 | E420 | 0.000050 | mg/L | 0.000999 | 0.00100 | 0.340% | 20% | ---- |
| | | lithium, total | 7439-93-2 | E420 | 0.0010 | mg/L | 0.0093 | 0.0092 | 0.00002 | Diff <2x LOR | ---- |
| | | magnesium, total | 7439-95-4 | E420 | 0.0050 | mg/L | 18.9 | 18.2 | 3.87% | 20% | ---- |
| | | manganese, total | 7439-96-5 | E420 | 0.00010 | mg/L | 0.400 | 0.441 | 9.78% | 20% | ---- |
| | | molybdenum, total | 7439-98-7 | E420 | 0.000050 | mg/L | 0.00621 | 0.00636 | 2.51% | 20% | ---- |
| | | nickel, total | 7440-02-0 | E420 | 0.00050 | mg/L | 0.00299 | 0.00319 | 0.00020 | Diff <2x LOR | ---- |
| | | phosphorus, total | 7723-14-0 | E420 | 0.050 | mg/L | 0.122 | 0.114 | 0.008 | Diff <2x LOR | ---- |
| | | potassium, total | 7440-09-7 | E420 | 0.050 | mg/L | 7.92 | 7.81 | 1.41% | 20% | ---- |
| | | rubidium, total | 7440-17-7 | E420 | 0.00020 | mg/L | 0.00101 | 0.00101 | 0.000004 | Diff <2x LOR | ---- |
| | | selenium, total | 7782-49-2 | E420 | 0.000050 | mg/L | 0.000193 | 0.000205 | 0.000012 | Diff <2x LOR | ---- |
| | | silicon, total | 7440-21-3 | E420 | 0.10 | mg/L | 2.04 | 2.01 | 1.64% | 20% | ---- |
| | | silver, total | 7440-22-4 | E420 | 0.000010 | mg/L | 0.000010 | <0.000010 | 0.0000005 | Diff <2x LOR | ---- |
| | | sodium, total | 7440-23-5 | E420 | 0.050 | mg/L | 4.94 | 4.86 | 1.66% | 20% | ---- |
| | | strontium, total | 7440-24-6 | E420 | 0.00020 | mg/L | 0.247 | 0.248 | 0.0674% | 20% | ---- |
| | | sulfur, total | 7704-34-9 | E420 | 0.50 | mg/L | 1.75 | 1.58 | 0.17 | Diff <2x LOR | ---- |
| | | tellurium, total | 13494-80-9 | E420 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| | | thallium, total | 7440-28-0 | E420 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |
| | | thorium, total | 7440-29-1 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | tin, total | 7440-31-5 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | titanium, total | 7440-32-6 | E420 | 0.00030 | mg/L | 0.00201 | 0.00217 | 0.00016 | Diff <2x LOR | ---- |
| | | tungsten, total | 7440-33-7 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | uranium, total | 7440-61-1 | E420 | 0.000010 | mg/L | 0.000922 | 0.000924 | 0.178% | 20% | ---- |
| | | vanadium, total | 7440-62-2 | E420 | 0.00050 | mg/L | 0.00080 | 0.00084 | 0.00003 | Diff <2x LOR | ---- |
| | | zinc, total | 7440-66-6 | E420 | 0.0030 | mg/L | 0.0256 | 0.0302 | 0.0046 | Diff <2x LOR | ---- |
| | | zirconium, total | 7440-67-7 | E420 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| **Total Metals (QC Lot: 623226)** | | | | | | | | | | | |
| EO2206889-002 | QA/QC | aluminum, total | 7429-90-5 | E420 | 0.0030 | mg/L | 0.125 | 0.124 | 0.941% | 20% | ---- |
| | | antimony, total | 7440-36-0 | E420 | 0.00010 | mg/L | 0.00021 | 0.00013 | 0.00008 | Diff <2x LOR | ---- |
| | | arsenic, total | 7440-38-2 | E420 | 0.00010 | mg/L | 0.00027 | 0.00027 | 0.000001 | Diff <2x LOR | ---- |
| | | barium, total | 7440-39-3 | E420 | 0.00010 | mg/L | 0.0746 | 0.0754 | 1.02% | 20% | ---- |
| | | beryllium, total | 7440-41-7 | E420 | 0.000020 | mg/L | 0.000030 | 0.000031 | 0.0000007 | Diff <2x LOR | ---- |
| | | bismuth, total | 7440-69-9 | E420 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Duplicate (DUP) Report | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD(%) or Difference* | *Duplicate Limits* | *Qualifier* |
| **Total Metals (QC Lot: 623226) - continued** | | | | | | | | | | | |
| EO2206889-002 | QA/QC | boron, total | 7440-42-8 | E420 | 0.010 | mg/L | 0.026 | 0.024 | 0.003 | Diff <2x LOR | ---- |
| | | cadmium, total | 7440-43-9 | E420 | 0.0000050 | mg/L | 0.0000600 | 0.0000645 | 7.22% | 20% | ---- |
| | | calcium, total | 7440-70-2 | E420 | 0.050 | mg/L | 13.7 | 13.5 | 1.14% | 20% | ---- |
| | | cesium, total | 7440-46-2 | E420 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |
| | | chromium, total | 7440-47-3 | E420 | 0.00050 | mg/L | 0.00089 | 0.00090 | 0.00001 | Diff <2x LOR | ---- |
| | | cobalt, total | 7440-48-4 | E420 | 0.00010 | mg/L | 0.00452 | 0.00443 | 1.98% | 20% | ---- |
| | | copper, total | 7440-50-8 | E420 | 0.00050 | mg/L | 0.00972 | 0.00953 | 1.97% | 20% | ---- |
| | | iron, total | 7439-89-6 | E420 | 0.010 | mg/L | 0.046 | 0.044 | 0.002 | Diff <2x LOR | ---- |
| | | lead, total | 7439-92-1 | E420 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | lithium, total | 7439-93-2 | E420 | 0.0010 | mg/L | 0.0026 | 0.0023 | 0.0003 | Diff <2x LOR | ---- |
| | | magnesium, total | 7439-95-4 | E420 | 0.0050 | mg/L | 4.72 | 4.63 | 1.83% | 20% | ---- |
| | | manganese, total | 7439-96-5 | E420 | 0.00010 | mg/L | 0.792 | 0.780 | 1.53% | 20% | ---- |
| | | molybdenum, total | 7439-98-7 | E420 | 0.000050 | mg/L | 0.000172 | 0.000166 | 0.000006 | Diff <2x LOR | ---- |
| | | nickel, total | 7440-02-0 | E420 | 0.00050 | mg/L | 0.0123 | 0.0123 | 0.247% | 20% | ---- |
| | | phosphorus, total | 7723-14-0 | E420 | 0.050 | mg/L | <0.050 | <0.050 | 0 | Diff <2x LOR | ---- |
| | | potassium, total | 7440-09-7 | E420 | 0.050 | mg/L | 2.80 | 2.72 | 2.68% | 20% | ---- |
| | | rubidium, total | 7440-17-7 | E420 | 0.00020 | mg/L | 0.00238 | 0.00230 | 3.44% | 20% | ---- |
| | | selenium, total | 7782-49-2 | E420 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | silicon, total | 7440-21-3 | E420 | 0.10 | mg/L | 6.19 | 6.02 | 2.79% | 20% | ---- |
| | | silver, total | 7440-22-4 | E420 | 0.000010 | mg/L | 0.000020 | 0.000018 | 0.000002 | Diff <2x LOR | ---- |
| | | sodium, total | 7440-23-5 | E420 | 0.050 | mg/L | 1.02 | 0.958 | 6.26% | 20% | ---- |
| | | strontium, total | 7440-24-6 | E420 | 0.00020 | mg/L | 0.124 | 0.125 | 0.638% | 20% | ---- |
| | | sulfur, total | 7704-34-9 | E420 | 0.50 | mg/L | 0.78 | 0.68 | 0.09 | Diff <2x LOR | ---- |
| | | tellurium, total | 13494-80-9 | E420 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| | | thallium, total | 7440-28-0 | E420 | 0.000010 | mg/L | 0.000014 | 0.000010 | 0.000003 | Diff <2x LOR | ---- |
| | | thorium, total | 7440-29-1 | E420 | 0.00010 | mg/L | 0.00016 | 0.00027 | 0.00010 | Diff <2x LOR | ---- |
| | | tin, total | 7440-31-5 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | titanium, total | 7440-32-6 | E420 | 0.00030 | mg/L | 0.00154 | 0.00138 | 0.00016 | Diff <2x LOR | ---- |
| | | tungsten, total | 7440-33-7 | E420 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | uranium, total | 7440-61-1 | E420 | 0.000010 | mg/L | 0.000660 | 0.000655 | 0.687% | 20% | ---- |
| | | vanadium, total | 7440-62-2 | E420 | 0.00050 | mg/L | 0.00077 | 0.00062 | 0.00016 | Diff <2x LOR | ---- |
| | | zinc, total | 7440-66-6 | E420 | 0.0030 | mg/L | <0.0030 | <0.0030 | 0 | Diff <2x LOR | ---- |
| | | zirconium, total | 7440-67-7 | E420 | 0.00020 | mg/L | 0.00073 | 0.00072 | 0.00002 | Diff <2x LOR | ---- |
| **Dissolved Metals (QC Lot: 622493)** | | | | | | | | | | | |
| EO2206852-009 | Anonymous | aluminum, dissolved | 7429-90-5 | E421 | 0.0010 | mg/L | <0.0010 | <0.0010 | 0 | Diff <2x LOR | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Duplicate (DUP) Report | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD(%) or Difference* | *Duplicate Limits* | *Qualifier* |
| **Dissolved Metals (QC Lot: 622493) - continued** | | | | | | | | | | | |
| EO2206852-009 | Anonymous | antimony, dissolved | 7440-36-0 | E421 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | arsenic, dissolved | 7440-38-2 | E421 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | barium, dissolved | 7440-39-3 | E421 | 0.00010 | mg/L | 0.00025 | 0.00023 | 0.00002 | Diff <2x LOR | ---- |
| | | beryllium, dissolved | 7440-41-7 | E421 | 0.000020 | mg/L | <0.000020 | <0.000020 | 0 | Diff <2x LOR | ---- |
| | | bismuth, dissolved | 7440-69-9 | E421 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | boron, dissolved | 7440-42-8 | E421 | 0.010 | mg/L | 0.029 | 0.029 | 0.0002 | Diff <2x LOR | ---- |
| | | cadmium, dissolved | 7440-43-9 | E421 | 0.0000050 | mg/L | <0.0000050 | <0.0000050 | 0 | Diff <2x LOR | ---- |
| | | calcium, dissolved | 7440-70-2 | E421 | 0.050 | mg/L | <0.050 | <0.050 | 0 | Diff <2x LOR | ---- |
| | | cesium, dissolved | 7440-46-2 | E421 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |
| | | chromium, dissolved | 7440-47-3 | E421 | 0.00050 | mg/L | <0.00050 | <0.00050 | 0 | Diff <2x LOR | ---- |
| | | cobalt, dissolved | 7440-48-4 | E421 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | copper, dissolved | 7440-50-8 | E421 | 0.00020 | mg/L | 0.00052 | 0.00054 | 0.00002 | Diff <2x LOR | ---- |
| | | iron, dissolved | 7439-89-6 | E421 | 0.030 | mg/L | <0.030 | <0.030 | 0 | Diff <2x LOR | ---- |
| | | lead, dissolved | 7439-92-1 | E421 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | lithium, dissolved | 7439-93-2 | E421 | 0.0010 | mg/L | <0.0010 | <0.0010 | 0 | Diff <2x LOR | ---- |
| | | magnesium, dissolved | 7439-95-4 | E421 | 0.0050 | mg/L | <0.0050 | <0.0050 | 0 | Diff <2x LOR | ---- |
| | | manganese, dissolved | 7439-96-5 | E421 | 0.00500 | mg/L | <0.00500 | <0.00500 | 0 | Diff <2x LOR | ---- |
| | | molybdenum, dissolved | 7439-98-7 | E421 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | nickel, dissolved | 7440-02-0 | E421 | 0.00050 | mg/L | <0.00050 | <0.00050 | 0 | Diff <2x LOR | ---- |
| | | phosphorus, dissolved | 7723-14-0 | E421 | 0.050 | mg/L | <0.050 | <0.050 | 0 | Diff <2x LOR | ---- |
| | | potassium, dissolved | 7440-09-7 | E421 | 0.050 | mg/L | <0.050 | <0.050 | 0 | Diff <2x LOR | ---- |
| | | rubidium, dissolved | 7440-17-7 | E421 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| | | selenium, dissolved | 7782-49-2 | E421 | 0.000050 | mg/L | <0.000050 | <0.000050 | 0 | Diff <2x LOR | ---- |
| | | silicon, dissolved | 7440-21-3 | E421 | 0.050 | mg/L | 2.16 | 2.13 | 1.72% | 20% | ---- |
| | | silver, dissolved | 7440-22-4 | E421 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |
| | | sodium, dissolved | 7440-23-5 | E421 | 0.050 | mg/L | 0.182 | 0.181 | 0.0002 | Diff <2x LOR | ---- |
| | | strontium, dissolved | 7440-24-6 | E421 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| | | sulfur, dissolved | 7704-34-9 | E421 | 0.50 | mg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| | | tellurium, dissolved | 13494-80-9 | E421 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| | | thallium, dissolved | 7440-28-0 | E421 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |
| | | thorium, dissolved | 7440-29-1 | E421 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | tin, dissolved | 7440-31-5 | E421 | 0.00010 | mg/L | 0.00011 | 0.00010 | 0.000005 | Diff <2x LOR | ---- |
| | | titanium, dissolved | 7440-32-6 | E421 | 0.00030 | mg/L | <0.00030 | <0.00030 | 0 | Diff <2x LOR | ---- |
| | | tungsten, dissolved | 7440-33-7 | E421 | 0.00010 | mg/L | <0.00010 | <0.00010 | 0 | Diff <2x LOR | ---- |
| | | uranium, dissolved | 7440-61-1 | E421 | 0.000010 | mg/L | <0.000010 | <0.000010 | 0 | Diff <2x LOR | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Duplicate (DUP) Report | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Analyte* | *CAS Number* | *Method* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD(%) or Difference* | *Duplicate Limits* | *Qualifier* |
| **Dissolved Metals (QC Lot: 622493) - continued** | | | | | | | | | | | |
| EO2206852-009 | Anonymous | vanadium, dissolved | 7440-62-2 | E421 | 0.00050 | mg/L | <0.00050 | <0.00050 | 0 | Diff <2x LOR | ---- |
| | | zinc, dissolved | 7440-66-6 | E421 | 0.0010 | mg/L | <0.0010 | <0.0010 | 0 | Diff <2x LOR | ---- |
| | | zirconium, dissolved | 7440-67-7 | E421 | 0.00020 | mg/L | <0.00020 | <0.00020 | 0 | Diff <2x LOR | ---- |
| **Volatile Organic Compounds (QC Lot: 618781)** | | | | | | | | | | | |
| EO2206888-001 | Anonymous | benzene | 71-43-2 | E611A | 0.50 | µg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| | | ethylbenzene | 100-41-4 | E611A | 0.50 | µg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| | | toluene | 108-88-3 | E611A | 0.50 | µg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| | | xylene, m+p- | 179601-23-1 | E611A | 0.50 | µg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| | | xylene, o- | 95-47-6 | E611A | 0.50 | µg/L | <0.50 | <0.50 | 0 | Diff <2x LOR | ---- |
| **Hydrocarbons (QC Lot: 618780)** | | | | | | | | | | | |
| EO2206888-001 | Anonymous | F1 (C6-C10) | ---- | E581.F1 | 100 | µg/L | <100 | <100 | 0 | Diff <2x LOR | ---- |

## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Result | Qualifier |
|---|---|---|---|---|---|---|
| **Physical Tests (QCLot: 618710)** | | | | | | |
| solids, total dissolved [TDS] | ---- | E162 | 10 | mg/L | <10 | ---- |
| **Physical Tests (QCLot: 619064)** | | | | | | |
| solids, total suspended [TSS] | ---- | E160 | 3 | mg/L | <3.0 | ---- |
| **Physical Tests (QCLot: 619363)** | | | | | | |
| conductivity | ---- | E100 | 1 | µS/cm | <1.0 | ---- |
| **Physical Tests (QCLot: 619364)** | | | | | | |
| alkalinity, total (as CaCO3) | ---- | E290 | 1 | mg/L | <1.0 | ---- |
| **Anions and Nutrients (QCLot: 618645)** | | | | | | |
| fluoride | 16984-48-8 | E235.F | 0.02 | mg/L | <0.020 | ---- |
| **Anions and Nutrients (QCLot: 618646)** | | | | | | |
| nitrate (as N) | 14797-55-8 | E235.NO3 | 0.02 | mg/L | <0.020 | ---- |
| **Anions and Nutrients (QCLot: 618647)** | | | | | | |
| sulfate (as SO4) | 14808-79-8 | E235.SO4 | 0.3 | mg/L | <0.30 | ---- |
| **Anions and Nutrients (QCLot: 618648)** | | | | | | |
| chloride | 16887-00-6 | E235.Cl | 0.5 | mg/L | <0.50 | ---- |
| **Anions and Nutrients (QCLot: 618649)** | | | | | | |
| nitrite (as N) | 14797-65-0 | E235.NO2 | 0.01 | mg/L | <0.010 | ---- |
| **Total Metals (QCLot: 623074)** | | | | | | |
| aluminum, total | 7429-90-5 | E420 | 0.003 | mg/L | <0.0030 | ---- |
| antimony, total | 7440-36-0 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| arsenic, total | 7440-38-2 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| barium, total | 7440-39-3 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| beryllium, total | 7440-41-7 | E420 | 0.00002 | mg/L | <0.000020 | ---- |
| bismuth, total | 7440-69-9 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| boron, total | 7440-42-8 | E420 | 0.01 | mg/L | <0.010 | ---- |
| cadmium, total | 7440-43-9 | E420 | 0.000005 | mg/L | <0.0000050 | ---- |
| calcium, total | 7440-70-2 | E420 | 0.05 | mg/L | <0.050 | ---- |
| cesium, total | 7440-46-2 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| chromium, total | 7440-47-3 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| cobalt, total | 7440-48-4 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| copper, total | 7440-50-8 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| iron, total | 7439-89-6 | E420 | 0.01 | mg/L | <0.010 | ---- |
| lead, total | 7439-92-1 | E420 | 0.00005 | mg/L | <0.000050 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Result | Qualifier |
|---|---|---|---|---|---|---|
| **Total Metals (QCLot: 623074) - continued** | | | | | | |
| lithium, total | 7439-93-2 | E420 | 0.001 | mg/L | <0.0010 | ---- |
| magnesium, total | 7439-95-4 | E420 | 0.005 | mg/L | <0.0050 | ---- |
| manganese, total | 7439-96-5 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| molybdenum, total | 7439-98-7 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| nickel, total | 7440-02-0 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| phosphorus, total | 7723-14-0 | E420 | 0.05 | mg/L | <0.050 | ---- |
| potassium, total | 7440-09-7 | E420 | 0.05 | mg/L | <0.050 | ---- |
| rubidium, total | 7440-17-7 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| selenium, total | 7782-49-2 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| silicon, total | 7440-21-3 | E420 | 0.1 | mg/L | <0.10 | ---- |
| silver, total | 7440-22-4 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| sodium, total | 7440-23-5 | E420 | 0.05 | mg/L | <0.050 | ---- |
| strontium, total | 7440-24-6 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| sulfur, total | 7704-34-9 | E420 | 0.5 | mg/L | <0.50 | ---- |
| tellurium, total | 13494-80-9 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| thallium, total | 7440-28-0 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| thorium, total | 7440-29-1 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| tin, total | 7440-31-5 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| titanium, total | 7440-32-6 | E420 | 0.0003 | mg/L | <0.00030 | ---- |
| tungsten, total | 7440-33-7 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| uranium, total | 7440-61-1 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| vanadium, total | 7440-62-2 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| zinc, total | 7440-66-6 | E420 | 0.003 | mg/L | <0.0030 | ---- |
| zirconium, total | 7440-67-7 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| **Total Metals (QCLot: 623226)** | | | | | | |
| aluminum, total | 7429-90-5 | E420 | 0.003 | mg/L | <0.0030 | ---- |
| antimony, total | 7440-36-0 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| arsenic, total | 7440-38-2 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| barium, total | 7440-39-3 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| beryllium, total | 7440-41-7 | E420 | 0.00002 | mg/L | <0.000020 | ---- |
| bismuth, total | 7440-69-9 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| boron, total | 7440-42-8 | E420 | 0.01 | mg/L | <0.010 | ---- |
| cadmium, total | 7440-43-9 | E420 | 0.000005 | mg/L | <0.0000050 | ---- |
| calcium, total | 7440-70-2 | E420 | 0.05 | mg/L | <0.050 | ---- |
| cesium, total | 7440-46-2 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| chromium, total | 7440-47-3 | E420 | 0.0005 | mg/L | <0.00050 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Result | Qualifier |
|---|---|---|---|---|---|---|
| **Total Metals (QCLot: 623226) - continued** | | | | | | |
| cobalt, total | 7440-48-4 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| copper, total | 7440-50-8 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| iron, total | 7439-89-6 | E420 | 0.01 | mg/L | <0.010 | ---- |
| lead, total | 7439-92-1 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| lithium, total | 7439-93-2 | E420 | 0.001 | mg/L | <0.0010 | ---- |
| magnesium, total | 7439-95-4 | E420 | 0.005 | mg/L | <0.0050 | ---- |
| manganese, total | 7439-96-5 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| molybdenum, total | 7439-98-7 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| nickel, total | 7440-02-0 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| phosphorus, total | 7723-14-0 | E420 | 0.05 | mg/L | <0.050 | ---- |
| potassium, total | 7440-09-7 | E420 | 0.05 | mg/L | <0.050 | ---- |
| rubidium, total | 7440-17-7 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| selenium, total | 7782-49-2 | E420 | 0.00005 | mg/L | <0.000050 | ---- |
| silicon, total | 7440-21-3 | E420 | 0.1 | mg/L | <0.10 | ---- |
| silver, total | 7440-22-4 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| sodium, total | 7440-23-5 | E420 | 0.05 | mg/L | <0.050 | ---- |
| strontium, total | 7440-24-6 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| sulfur, total | 7704-34-9 | E420 | 0.5 | mg/L | <0.50 | ---- |
| tellurium, total | 13494-80-9 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| thallium, total | 7440-28-0 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| thorium, total | 7440-29-1 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| tin, total | 7440-31-5 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| titanium, total | 7440-32-6 | E420 | 0.0003 | mg/L | <0.00030 | ---- |
| tungsten, total | 7440-33-7 | E420 | 0.0001 | mg/L | <0.00010 | ---- |
| uranium, total | 7440-61-1 | E420 | 0.00001 | mg/L | <0.000010 | ---- |
| vanadium, total | 7440-62-2 | E420 | 0.0005 | mg/L | <0.00050 | ---- |
| zinc, total | 7440-66-6 | E420 | 0.003 | mg/L | <0.0030 | ---- |
| zirconium, total | 7440-67-7 | E420 | 0.0002 | mg/L | <0.00020 | ---- |
| **Dissolved Metals (QCLot: 622493)** | | | | | | |
| aluminum, dissolved | 7429-90-5 | E421 | 0.001 | mg/L | <0.0010 | ---- |
| antimony, dissolved | 7440-36-0 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| arsenic, dissolved | 7440-38-2 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| barium, dissolved | 7440-39-3 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| beryllium, dissolved | 7440-41-7 | E421 | 0.00002 | mg/L | <0.000020 | ---- |
| bismuth, dissolved | 7440-69-9 | E421 | 0.00005 | mg/L | <0.000050 | ---- |
| boron, dissolved | 7440-42-8 | E421 | 0.01 | mg/L | <0.010 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Result | Qualifier |
|---|---|---|---|---|---|---|
| **Dissolved Metals (QCLot: 622493) - continued** | | | | | | |
| cadmium, dissolved | 7440-43-9 | E421 | 0.000005 | mg/L | <0.0000050 | ---- |
| calcium, dissolved | 7440-70-2 | E421 | 0.05 | mg/L | <0.050 | ---- |
| cesium, dissolved | 7440-46-2 | E421 | 0.00001 | mg/L | <0.000010 | ---- |
| chromium, dissolved | 7440-47-3 | E421 | 0.0005 | mg/L | <0.00050 | ---- |
| cobalt, dissolved | 7440-48-4 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| copper, dissolved | 7440-50-8 | E421 | 0.0002 | mg/L | <0.00020 | ---- |
| iron, dissolved | 7439-89-6 | E421 | 0.01 | mg/L | <0.010 | ---- |
| lead, dissolved | 7439-92-1 | E421 | 0.00005 | mg/L | <0.000050 | ---- |
| lithium, dissolved | 7439-93-2 | E421 | 0.001 | mg/L | <0.0010 | ---- |
| magnesium, dissolved | 7439-95-4 | E421 | 0.005 | mg/L | <0.0050 | ---- |
| manganese, dissolved | 7439-96-5 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| molybdenum, dissolved | 7439-98-7 | E421 | 0.00005 | mg/L | <0.000050 | ---- |
| nickel, dissolved | 7440-02-0 | E421 | 0.0005 | mg/L | <0.00050 | ---- |
| phosphorus, dissolved | 7723-14-0 | E421 | 0.05 | mg/L | <0.050 | ---- |
| potassium, dissolved | 7440-09-7 | E421 | 0.05 | mg/L | <0.050 | ---- |
| rubidium, dissolved | 7440-17-7 | E421 | 0.0002 | mg/L | <0.00020 | ---- |
| selenium, dissolved | 7782-49-2 | E421 | 0.00005 | mg/L | <0.000050 | ---- |
| silicon, dissolved | 7440-21-3 | E421 | 0.05 | mg/L | <0.050 | ---- |
| silver, dissolved | 7440-22-4 | E421 | 0.00001 | mg/L | <0.000010 | ---- |
| sodium, dissolved | 7440-23-5 | E421 | 0.05 | mg/L | <0.050 | ---- |
| strontium, dissolved | 7440-24-6 | E421 | 0.0002 | mg/L | <0.00020 | ---- |
| sulfur, dissolved | 7704-34-9 | E421 | 0.5 | mg/L | <0.50 | ---- |
| tellurium, dissolved | 13494-80-9 | E421 | 0.0002 | mg/L | <0.00020 | ---- |
| thallium, dissolved | 7440-28-0 | E421 | 0.00001 | mg/L | <0.000010 | ---- |
| thorium, dissolved | 7440-29-1 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| titanium, dissolved | 7440-32-6 | E421 | 0.0003 | mg/L | <0.00030 | ---- |
| tungsten, dissolved | 7440-33-7 | E421 | 0.0001 | mg/L | <0.00010 | ---- |
| uranium, dissolved | 7440-61-1 | E421 | 0.00001 | mg/L | <0.000010 | ---- |
| vanadium, dissolved | 7440-62-2 | E421 | 0.0005 | mg/L | <0.00050 | ---- |
| zinc, dissolved | 7440-66-6 | E421 | 0.001 | mg/L | <0.0010 | ---- |
| zirconium, dissolved | 7440-67-7 | E421 | 0.0002 | mg/L | <0.00020 | ---- |
| **Volatile Organic Compounds (QCLot: 618781)** | | | | | | |
| benzene | 71-43-2 | E611A | 0.5 | µg/L | <0.50 | ---- |
| BTEX, total | ---- | E611A | 1 | µg/L | <1.0 | ---- |
| ethylbenzene | 100-41-4 | E611A | 0.5 | µg/L | <0.50 | ---- |
| toluene | 108-88-3 | E611A | 0.5 | µg/L | <0.50 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Result | Qualifier |
|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (QCLot: 618781) - continued** | | | | | | |
| xylene, m+p- | 179601-23-1 | E611A | 0.4 | µg/L | <0.40 | ---- |
| xylene, o- | 95-47-6 | E611A | 0.3 | µg/L | <0.30 | ---- |
| **Hydrocarbons (QCLot: 618780)** | | | | | | |
| F1 (C6-C10) | ---- | E581.F1 | 100 | µg/L | <100 | ---- |
| **Hydrocarbons (QCLot: 619233)** | | | | | | |
| F2 (C10-C16) | ---- | E601 | 100 | µg/L | <100 | ---- |
| F3 (C16-C34) | ---- | E601 | 250 | µg/L | <250 | ---- |
| F4 (C34-C50) | ---- | E601 | 250 | µg/L | <250 | ---- |

## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

| | | | | | Laboratory Control Sample (LCS) Report | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Recovery (%) | Recovery Limits (%) | | |
| Analyte | CAS Number | Method | LOR | Unit | Concentration | LCS | Low | High | Qualifier |
| **Physical Tests (QCLot: 618710)** | | | | | | | | | |
| solids, total dissolved [TDS] | ---- | E162 | 10 | mg/L | 1000 mg/L | 101 | 85.0 | 115 | ---- |
| **Physical Tests (QCLot: 619064)** | | | | | | | | | |
| solids, total suspended [TSS] | ---- | E160 | 3 | mg/L | 150 mg/L | 104 | 85.0 | 115 | ---- |
| **Physical Tests (QCLot: 619362)** | | | | | | | | | |
| pH | ---- | E108 | ---- | pH units | 6 pH units | 102 | 97.0 | 103 | ---- |
| **Physical Tests (QCLot: 619363)** | | | | | | | | | |
| conductivity | ---- | E100 | 1 | µS/cm | 1412 µS/cm | 98.7 | 90.0 | 110 | ---- |
| **Physical Tests (QCLot: 619364)** | | | | | | | | | |
| alkalinity, total (as CaCO3) | ---- | E290 | 1 | mg/L | 500 mg/L | 107 | 85.0 | 115 | ---- |
| **Anions and Nutrients (QCLot: 618645)** | | | | | | | | | |
| fluoride | 16984-48-8 | E235.F | 0.02 | mg/L | 1 mg/L | 100 | 90.0 | 110 | ---- |
| **Anions and Nutrients (QCLot: 618646)** | | | | | | | | | |
| nitrate (as N) | 14797-55-8 | E235.NO3 | 0.02 | mg/L | 2.5 mg/L | 98.5 | 90.0 | 110 | ---- |
| **Anions and Nutrients (QCLot: 618647)** | | | | | | | | | |
| sulfate (as SO4) | 14808-79-8 | E235.SO4 | 0.3 | mg/L | 100 mg/L | 97.0 | 90.0 | 110 | ---- |
| **Anions and Nutrients (QCLot: 618648)** | | | | | | | | | |
| chloride | 16887-00-6 | E235.Cl | 0.5 | mg/L | 100 mg/L | 99.0 | 90.0 | 110 | ---- |
| **Anions and Nutrients (QCLot: 618649)** | | | | | | | | | |
| nitrite (as N) | 14797-65-0 | E235.NO2 | 0.01 | mg/L | 0.5 mg/L | 93.4 | 90.0 | 110 | ---- |
| **Total Metals (QCLot: 623074)** | | | | | | | | | |
| aluminum, total | 7429-90-5 | E420 | 0.003 | mg/L | 2 mg/L | 108 | 80.0 | 120 | ---- |
| antimony, total | 7440-36-0 | E420 | 0.0001 | mg/L | 1 mg/L | 105 | 80.0 | 120 | ---- |
| arsenic, total | 7440-38-2 | E420 | 0.0001 | mg/L | 1 mg/L | 102 | 80.0 | 120 | ---- |
| barium, total | 7440-39-3 | E420 | 0.0001 | mg/L | 0.25 mg/L | 98.8 | 80.0 | 120 | ---- |
| beryllium, total | 7440-41-7 | E420 | 0.00002 | mg/L | 0.1 mg/L | 96.5 | 80.0 | 120 | ---- |
| bismuth, total | 7440-69-9 | E420 | 0.00005 | mg/L | 1 mg/L | 96.6 | 80.0 | 120 | ---- |
| boron, total | 7440-42-8 | E420 | 0.01 | mg/L | 1 mg/L | 101 | 80.0 | 120 | ---- |
| cadmium, total | 7440-43-9 | E420 | 0.000005 | mg/L | 0.1 mg/L | 101 | 80.0 | 120 | ---- |
| calcium, total | 7440-70-2 | E420 | 0.05 | mg/L | 50 mg/L | 103 | 80.0 | 120 | ---- |
| cesium, total | 7440-46-2 | E420 | 0.00001 | mg/L | 0.05 mg/L | 97.5 | 80.0 | 120 | ---- |
| chromium, total | 7440-47-3 | E420 | 0.0005 | mg/L | 0.25 mg/L | 102 | 80.0 | 120 | ---- |
| cobalt, total | 7440-48-4 | E420 | 0.0001 | mg/L | 0.25 mg/L | 103 | 80.0 | 120 | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Control Sample (LCS) Report | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Recovery (%) | Recovery Limits (%) | | |
| Analyte | CAS Number | Method | LOR | Unit | Concentration | LCS | Low | High | Qualifier |
| **Total Metals (QCLot: 623074) - continued** | | | | | | | | | |
| copper, total | 7440-50-8 | E420 | 0.0005 | mg/L | 0.25 mg/L | 101 | 80.0 | 120 | ---- |
| iron, total | 7439-89-6 | E420 | 0.01 | mg/L | 1 mg/L | 98.0 | 80.0 | 120 | ---- |
| lead, total | 7439-92-1 | E420 | 0.00005 | mg/L | 0.5 mg/L | 92.6 | 80.0 | 120 | ---- |
| lithium, total | 7439-93-2 | E420 | 0.001 | mg/L | 0.25 mg/L | 97.3 | 80.0 | 120 | ---- |
| magnesium, total | 7439-95-4 | E420 | 0.005 | mg/L | 50 mg/L | 99.3 | 80.0 | 120 | ---- |
| manganese, total | 7439-96-5 | E420 | 0.0001 | mg/L | 0.25 mg/L | 97.7 | 80.0 | 120 | ---- |
| molybdenum, total | 7439-98-7 | E420 | 0.00005 | mg/L | 0.25 mg/L | 98.6 | 80.0 | 120 | ---- |
| nickel, total | 7440-02-0 | E420 | 0.0005 | mg/L | 0.5 mg/L | 101 | 80.0 | 120 | ---- |
| phosphorus, total | 7723-14-0 | E420 | 0.05 | mg/L | 10 mg/L | 94.2 | 80.0 | 120 | ---- |
| potassium, total | 7440-09-7 | E420 | 0.05 | mg/L | 50 mg/L | 103 | 80.0 | 120 | ---- |
| rubidium, total | 7440-17-7 | E420 | 0.0002 | mg/L | 0.1 mg/L | 101 | 80.0 | 120 | ---- |
| selenium, total | 7782-49-2 | E420 | 0.00005 | mg/L | 1 mg/L | 95.4 | 80.0 | 120 | ---- |
| silicon, total | 7440-21-3 | E420 | 0.1 | mg/L | 10 mg/L | 104 | 80.0 | 120 | ---- |
| silver, total | 7440-22-4 | E420 | 0.00001 | mg/L | 0.1 mg/L | 96.8 | 80.0 | 120 | ---- |
| sodium, total | 7440-23-5 | E420 | 0.05 | mg/L | 50 mg/L | 101 | 80.0 | 120 | ---- |
| strontium, total | 7440-24-6 | E420 | 0.0002 | mg/L | 0.25 mg/L | 97.5 | 80.0 | 120 | ---- |
| sulfur, total | 7704-34-9 | E420 | 0.5 | mg/L | 50 mg/L | 106 | 80.0 | 120 | ---- |
| tellurium, total | 13494-80-9 | E420 | 0.0002 | mg/L | 0.1 mg/L | 99.6 | 80.0 | 120 | ---- |
| thallium, total | 7440-28-0 | E420 | 0.00001 | mg/L | 1 mg/L | 91.5 | 80.0 | 120 | ---- |
| thorium, total | 7440-29-1 | E420 | 0.0001 | mg/L | 0.1 mg/L | 88.9 | 80.0 | 120 | ---- |
| tin, total | 7440-31-5 | E420 | 0.0001 | mg/L | 0.5 mg/L | 96.7 | 80.0 | 120 | ---- |
| titanium, total | 7440-32-6 | E420 | 0.0003 | mg/L | 0.25 mg/L | 98.8 | 80.0 | 120 | ---- |
| tungsten, total | 7440-33-7 | E420 | 0.0001 | mg/L | 0.1 mg/L | 94.9 | 80.0 | 120 | ---- |
| uranium, total | 7440-61-1 | E420 | 0.00001 | mg/L | 0.005 mg/L | 94.7 | 80.0 | 120 | ---- |
| vanadium, total | 7440-62-2 | E420 | 0.0005 | mg/L | 0.5 mg/L | 104 | 80.0 | 120 | ---- |
| zinc, total | 7440-66-6 | E420 | 0.003 | mg/L | 0.5 mg/L | 96.5 | 80.0 | 120 | ---- |
| zirconium, total | 7440-67-7 | E420 | 0.0002 | mg/L | 0.1 mg/L | 87.5 | 80.0 | 120 | ---- |
| **Total Metals (QCLot: 623226)** | | | | | | | | | |
| aluminum, total | 7429-90-5 | E420 | 0.003 | mg/L | 2 mg/L | 107 | 80.0 | 120 | ---- |
| antimony, total | 7440-36-0 | E420 | 0.0001 | mg/L | 1 mg/L | 96.6 | 80.0 | 120 | ---- |
| arsenic, total | 7440-38-2 | E420 | 0.0001 | mg/L | 1 mg/L | 105 | 80.0 | 120 | ---- |
| barium, total | 7440-39-3 | E420 | 0.0001 | mg/L | 0.25 mg/L | 103 | 80.0 | 120 | ---- |
| beryllium, total | 7440-41-7 | E420 | 0.00002 | mg/L | 0.1 mg/L | 101 | 80.0 | 120 | ---- |
| bismuth, total | 7440-69-9 | E420 | 0.00005 | mg/L | 1 mg/L | 97.8 | 80.0 | 120 | ---- |
| boron, total | 7440-42-8 | E420 | 0.01 | mg/L | 1 mg/L | 95.4 | 80.0 | 120 | ---- |
| cadmium, total | 7440-43-9 | E420 | 0.000005 | mg/L | 0.1 mg/L | 102 | 80.0 | 120 | ---- |
| calcium, total | 7440-70-2 | E420 | 0.05 | mg/L | 50 mg/L | 104 | 80.0 | 120 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Laboratory Control Sample (LCS) Report: Spike Concentration | Recovery (%): LCS | Recovery Limits (%): Low | Recovery Limits (%): High | Qualifier |
|---|---|---|---|---|---|---|---|---|---|
| **Total Metals (QCLot: 623226) - continued** | | | | | | | | | |
| cesium, total | 7440-46-2 | E420 | 0.00001 | mg/L | 0.05 mg/L | 101 | 80.0 | 120 | ---- |
| chromium, total | 7440-47-3 | E420 | 0.0005 | mg/L | 0.25 mg/L | 102 | 80.0 | 120 | ---- |
| cobalt, total | 7440-48-4 | E420 | 0.0001 | mg/L | 0.25 mg/L | 107 | 80.0 | 120 | ---- |
| copper, total | 7440-50-8 | E420 | 0.0005 | mg/L | 0.25 mg/L | 104 | 80.0 | 120 | ---- |
| iron, total | 7439-89-6 | E420 | 0.01 | mg/L | 1 mg/L | 102 | 80.0 | 120 | ---- |
| lead, total | 7439-92-1 | E420 | 0.00005 | mg/L | 0.5 mg/L | 97.3 | 80.0 | 120 | ---- |
| lithium, total | 7439-93-2 | E420 | 0.001 | mg/L | 0.25 mg/L | 101 | 80.0 | 120 | ---- |
| magnesium, total | 7439-95-4 | E420 | 0.005 | mg/L | 50 mg/L | 99.9 | 80.0 | 120 | ---- |
| manganese, total | 7439-96-5 | E420 | 0.0001 | mg/L | 0.25 mg/L | 98.8 | 80.0 | 120 | ---- |
| molybdenum, total | 7439-98-7 | E420 | 0.00005 | mg/L | 0.25 mg/L | 102 | 80.0 | 120 | ---- |
| nickel, total | 7440-02-0 | E420 | 0.0005 | mg/L | 0.5 mg/L | 102 | 80.0 | 120 | ---- |
| phosphorus, total | 7723-14-0 | E420 | 0.05 | mg/L | 10 mg/L | 109 | 80.0 | 120 | ---- |
| potassium, total | 7440-09-7 | E420 | 0.05 | mg/L | 50 mg/L | 104 | 80.0 | 120 | ---- |
| rubidium, total | 7440-17-7 | E420 | 0.0002 | mg/L | 0.1 mg/L | 103 | 80.0 | 120 | ---- |
| selenium, total | 7782-49-2 | E420 | 0.00005 | mg/L | 1 mg/L | 100 | 80.0 | 120 | ---- |
| silicon, total | 7440-21-3 | E420 | 0.1 | mg/L | 10 mg/L | 110 | 80.0 | 120 | ---- |
| silver, total | 7440-22-4 | E420 | 0.00001 | mg/L | 0.1 mg/L | 98.1 | 80.0 | 120 | ---- |
| sodium, total | 7440-23-5 | E420 | 0.05 | mg/L | 50 mg/L | 101 | 80.0 | 120 | ---- |
| strontium, total | 7440-24-6 | E420 | 0.0002 | mg/L | 0.25 mg/L | 99.2 | 80.0 | 120 | ---- |
| sulfur, total | 7704-34-9 | E420 | 0.5 | mg/L | 50 mg/L | 112 | 80.0 | 120 | ---- |
| tellurium, total | 13494-80-9 | E420 | 0.0002 | mg/L | 0.1 mg/L | 99.0 | 80.0 | 120 | ---- |
| thallium, total | 7440-28-0 | E420 | 0.00001 | mg/L | 1 mg/L | 97.1 | 80.0 | 120 | ---- |
| thorium, total | 7440-29-1 | E420 | 0.0001 | mg/L | 0.1 mg/L | 85.8 | 80.0 | 120 | ---- |
| tin, total | 7440-31-5 | E420 | 0.0001 | mg/L | 0.5 mg/L | 97.2 | 80.0 | 120 | ---- |
| titanium, total | 7440-32-6 | E420 | 0.0003 | mg/L | 0.25 mg/L | 104 | 80.0 | 120 | ---- |
| tungsten, total | 7440-33-7 | E420 | 0.0001 | mg/L | 0.1 mg/L | 99.3 | 80.0 | 120 | ---- |
| uranium, total | 7440-61-1 | E420 | 0.00001 | mg/L | 0.005 mg/L | 95.4 | 80.0 | 120 | ---- |
| vanadium, total | 7440-62-2 | E420 | 0.0005 | mg/L | 0.5 mg/L | 106 | 80.0 | 120 | ---- |
| zinc, total | 7440-66-6 | E420 | 0.003 | mg/L | 0.5 mg/L | 95.3 | 80.0 | 120 | ---- |
| zirconium, total | 7440-67-7 | E420 | 0.0002 | mg/L | 0.1 mg/L | 84.9 | 80.0 | 120 | ---- |
| **Dissolved Metals (QCLot: 622493)** | | | | | | | | | |
| aluminum, dissolved | 7429-90-5 | E421 | 0.001 | mg/L | 2 mg/L | 102 | 80.0 | 120 | ---- |
| antimony, dissolved | 7440-36-0 | E421 | 0.0001 | mg/L | 1 mg/L | 99.1 | 80.0 | 120 | ---- |
| arsenic, dissolved | 7440-38-2 | E421 | 0.0001 | mg/L | 1 mg/L | 98.7 | 80.0 | 120 | ---- |
| barium, dissolved | 7440-39-3 | E421 | 0.0001 | mg/L | 0.25 mg/L | 103 | 80.0 | 120 | ---- |
| beryllium, dissolved | 7440-41-7 | E421 | 0.00002 | mg/L | 0.1 mg/L | 98.9 | 80.0 | 120 | ---- |
| bismuth, dissolved | 7440-69-9 | E421 | 0.00005 | mg/L | 1 mg/L | 94.8 | 80.0 | 120 | ---- |

Sub-Matrix: **Water**

| Analyte | CAS Number | Method | LOR | Unit | Laboratory Control Sample (LCS) Report: Spike Concentration | Recovery (%): LCS | Recovery Limits (%): Low | Recovery Limits (%): High | Qualifier |
|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals (QCLot: 622493) - continued** | | | | | | | | | |
| boron, dissolved | 7440-42-8 | E421 | 0.01 | mg/L | 1 mg/L | 97.3 | 80.0 | 120 | ---- |
| cadmium, dissolved | 7440-43-9 | E421 | 0.000005 | mg/L | 0.1 mg/L | 100.0 | 80.0 | 120 | ---- |
| calcium, dissolved | 7440-70-2 | E421 | 0.05 | mg/L | 50 mg/L | 98.1 | 80.0 | 120 | ---- |
| cesium, dissolved | 7440-46-2 | E421 | 0.00001 | mg/L | 0.05 mg/L | 101 | 80.0 | 120 | ---- |
| chromium, dissolved | 7440-47-3 | E421 | 0.0005 | mg/L | 0.25 mg/L | 100 | 80.0 | 120 | ---- |
| cobalt, dissolved | 7440-48-4 | E421 | 0.0001 | mg/L | 0.25 mg/L | 97.4 | 80.0 | 120 | ---- |
| copper, dissolved | 7440-50-8 | E421 | 0.0002 | mg/L | 0.25 mg/L | 98.0 | 80.0 | 120 | ---- |
| iron, dissolved | 7439-89-6 | E421 | 0.01 | mg/L | 1 mg/L | 95.7 | 80.0 | 120 | ---- |
| lead, dissolved | 7439-92-1 | E421 | 0.00005 | mg/L | 0.5 mg/L | 97.3 | 80.0 | 120 | ---- |
| lithium, dissolved | 7439-93-2 | E421 | 0.001 | mg/L | 0.25 mg/L | 102 | 80.0 | 120 | ---- |
| magnesium, dissolved | 7439-95-4 | E421 | 0.005 | mg/L | 50 mg/L | 96.3 | 80.0 | 120 | ---- |
| manganese, dissolved | 7439-96-5 | E421 | 0.0001 | mg/L | 0.25 mg/L | 93.2 | 80.0 | 120 | ---- |
| molybdenum, dissolved | 7439-98-7 | E421 | 0.00005 | mg/L | 0.25 mg/L | 98.6 | 80.0 | 120 | ---- |
| nickel, dissolved | 7440-02-0 | E421 | 0.0005 | mg/L | 0.5 mg/L | 98.0 | 80.0 | 120 | ---- |
| phosphorus, dissolved | 7723-14-0 | E421 | 0.05 | mg/L | 10 mg/L | 104 | 80.0 | 120 | ---- |
| potassium, dissolved | 7440-09-7 | E421 | 0.05 | mg/L | 50 mg/L | 99.5 | 80.0 | 120 | ---- |
| rubidium, dissolved | 7440-17-7 | E421 | 0.0002 | mg/L | 0.1 mg/L | 105 | 80.0 | 120 | ---- |
| selenium, dissolved | 7782-49-2 | E421 | 0.00005 | mg/L | 1 mg/L | 97.2 | 80.0 | 120 | ---- |
| silicon, dissolved | 7440-21-3 | E421 | 0.05 | mg/L | 10 mg/L | 97.5 | 80.0 | 120 | ---- |
| silver, dissolved | 7440-22-4 | E421 | 0.00001 | mg/L | 0.1 mg/L | 91.4 | 80.0 | 120 | ---- |
| sodium, dissolved | 7440-23-5 | E421 | 0.05 | mg/L | 50 mg/L | 98.5 | 80.0 | 120 | ---- |
| strontium, dissolved | 7440-24-6 | E421 | 0.0002 | mg/L | 0.25 mg/L | 97.4 | 80.0 | 120 | ---- |
| sulfur, dissolved | 7704-34-9 | E421 | 0.5 | mg/L | 50 mg/L | 106 | 80.0 | 120 | ---- |
| tellurium, dissolved | 13494-80-9 | E421 | 0.0002 | mg/L | 0.1 mg/L | 90.6 | 80.0 | 120 | ---- |
| thallium, dissolved | 7440-28-0 | E421 | 0.00001 | mg/L | 1 mg/L | 97.6 | 80.0 | 120 | ---- |
| thorium, dissolved | 7440-29-1 | E421 | 0.0001 | mg/L | 0.1 mg/L | 90.0 | 80.0 | 120 | ---- |
| tin, dissolved | 7440-31-5 | E421 | ---- | mg/L | 0.5 mg/L | 98.5 | 80.0 | 120 | ---- |
| titanium, dissolved | 7440-32-6 | E421 | 0.0003 | mg/L | 0.25 mg/L | 95.3 | 80.0 | 120 | ---- |
| tungsten, dissolved | 7440-33-7 | E421 | 0.0001 | mg/L | 0.1 mg/L | 99.0 | 80.0 | 120 | ---- |
| uranium, dissolved | 7440-61-1 | E421 | 0.00001 | mg/L | 0.005 mg/L | 94.3 | 80.0 | 120 | ---- |
| vanadium, dissolved | 7440-62-2 | E421 | 0.0005 | mg/L | 0.5 mg/L | 99.0 | 80.0 | 120 | ---- |
| zinc, dissolved | 7440-66-6 | E421 | 0.001 | mg/L | 0.5 mg/L | 96.2 | 80.0 | 120 | ---- |
| zirconium, dissolved | 7440-67-7 | E421 | 0.0002 | mg/L | 0.1 mg/L | 91.7 | 80.0 | 120 | ---- |
| **Volatile Organic Compounds (QCLot: 618781)** | | | | | | | | | |
| benzene | 71-43-2 | E611A | 0.5 | µg/L | 100 µg/L | 112 | 70.0 | 130 | ---- |
| ethylbenzene | 100-41-4 | E611A | 0.5 | µg/L | 100 µg/L | 121 | 70.0 | 130 | ---- |
| toluene | 108-88-3 | E611A | 0.5 | µg/L | 100 µg/L | 115 | 70.0 | 130 | ---- |

Sub-Matrix: **Water**

| | | | | | Laboratory Control Sample (LCS) Report | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Recovery (%) | Recovery Limits (%) | | |
| Analyte | CAS Number | Method | LOR | Unit | Concentration | LCS | Low | High | Qualifier |
| **Volatile Organic Compounds (QCLot: 618781) - continued** | | | | | | | | | |
| xylene, m+p- | 179601-23-1 | E611A | 0.4 | µg/L | 200 µg/L | 115 | 70.0 | 130 | ---- |
| xylene, o- | 95-47-6 | E611A | 0.3 | µg/L | 100 µg/L | 109 | 70.0 | 130 | ---- |
| **Hydrocarbons (QCLot: 618780)** | | | | | | | | | |
| F1 (C6-C10) | ---- | E581.F1 | 100 | µg/L | 2750 µg/L | 120 | 70.0 | 130 | ---- |
| **Hydrocarbons (QCLot: 619233)** | | | | | | | | | |
| F2 (C10-C16) | ---- | E601 | 100 | µg/L | 3260 µg/L | 126 | 70.0 | 130 | ---- |
| F3 (C16-C34) | ---- | E601 | 250 | µg/L | 6340 µg/L | 118 | 70.0 | 130 | ---- |
| F4 (C34-C50) | ---- | E601 | 250 | µg/L | 4970 µg/L | 118 | 70.0 | 130 | ---- |

## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

| | | | | | Matrix Spike (MS) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | | Recovery (%) | Recovery Limits (%) | | |
| Laboratory sample ID | Client sample ID | Analyte | CAS Number | Method | Concentration | Target | MS | Low | High | Qualifier |
| **Anions and Nutrients (QCLot: 618645)** | | | | | | | | | | |
| EO2206884-002 | Anonymous | fluoride | 16984-48-8 | E235.F | 1.01 mg/L | 1 mg/L | 101 | 75.0 | 125 | ---- |
| **Anions and Nutrients (QCLot: 618646)** | | | | | | | | | | |
| EO2206884-002 | Anonymous | nitrate (as N) | 14797-55-8 | E235.NO3 | 2.30 mg/L | 2.5 mg/L | 92.0 | 75.0 | 125 | ---- |
| **Anions and Nutrients (QCLot: 618647)** | | | | | | | | | | |
| EO2206884-002 | Anonymous | sulfate (as SO4) | 14808-79-8 | E235.SO4 | 95.8 mg/L | 100 mg/L | 95.8 | 75.0 | 125 | ---- |
| **Anions and Nutrients (QCLot: 618648)** | | | | | | | | | | |
| EO2206884-002 | Anonymous | chloride | 16887-00-6 | E235.Cl | 92.3 mg/L | 100 mg/L | 92.3 | 75.0 | 125 | ---- |
| **Anions and Nutrients (QCLot: 618649)** | | | | | | | | | | |
| EO2206884-002 | Anonymous | nitrite (as N) | 14797-65-0 | E235.NO2 | 0.465 mg/L | 0.5 mg/L | 93.1 | 75.0 | 125 | ---- |
| **Total Metals (QCLot: 623074)** | | | | | | | | | | |
| EO2204640-009 | Anonymous | aluminum, total | 7429-90-5 | E420 | 0.212 mg/L | 0.2 mg/L | 106 | 70.0 | 130 | ---- |
| | | antimony, total | 7440-36-0 | E420 | 0.0212 mg/L | 0.02 mg/L | 106 | 70.0 | 130 | ---- |
| | | arsenic, total | 7440-38-2 | E420 | 0.0206 mg/L | 0.02 mg/L | 103 | 70.0 | 130 | ---- |
| | | barium, total | 7440-39-3 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | beryllium, total | 7440-41-7 | E420 | 0.0415 mg/L | 0.04 mg/L | 104 | 70.0 | 130 | ---- |
| | | bismuth, total | 7440-69-9 | E420 | 0.0104 mg/L | 0.01 mg/L | 104 | 70.0 | 130 | ---- |
| | | boron, total | 7440-42-8 | E420 | ND mg/L | 0.1 mg/L | ND | 70.0 | 130 | ---- |
| | | cadmium, total | 7440-43-9 | E420 | 0.00420 mg/L | 0.004 mg/L | 105 | 70.0 | 130 | ---- |
| | | calcium, total | 7440-70-2 | E420 | ND mg/L | 4 mg/L | ND | 70.0 | 130 | ---- |
| | | cesium, total | 7440-46-2 | E420 | 0.0105 mg/L | 0.01 mg/L | 105 | 70.0 | 130 | ---- |
| | | chromium, total | 7440-47-3 | E420 | 0.0415 mg/L | 0.04 mg/L | 104 | 70.0 | 130 | ---- |
| | | cobalt, total | 7440-48-4 | E420 | 0.0202 mg/L | 0.02 mg/L | 101 | 70.0 | 130 | ---- |
| | | copper, total | 7440-50-8 | E420 | 0.0199 mg/L | 0.02 mg/L | 99.3 | 70.0 | 130 | ---- |
| | | iron, total | 7439-89-6 | E420 | 2.17 mg/L | 2 mg/L | 109 | 70.0 | 130 | ---- |
| | | lead, total | 7439-92-1 | E420 | 0.0194 mg/L | 0.02 mg/L | 97.1 | 70.0 | 130 | ---- |
| | | lithium, total | 7439-93-2 | E420 | 0.101 mg/L | 0.1 mg/L | 101 | 70.0 | 130 | ---- |
| | | magnesium, total | 7439-95-4 | E420 | ND mg/L | 1 mg/L | ND | 70.0 | 130 | ---- |
| | | manganese, total | 7439-96-5 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | molybdenum, total | 7439-98-7 | E420 | 0.0208 mg/L | 0.02 mg/L | 104 | 70.0 | 130 | ---- |
| | | nickel, total | 7440-02-0 | E420 | 0.0389 mg/L | 0.04 mg/L | 97.3 | 70.0 | 130 | ---- |
| | | phosphorus, total | 7723-14-0 | E420 | 10.2 mg/L | 10 mg/L | 102 | 70.0 | 130 | ---- |

Sub-Matrix: **Water**

| | | | | | Matrix Spike (MS) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | | Recovery (%) | Recovery Limits (%) | | |
| Laboratory sample ID | Client sample ID | Analyte | CAS Number | Method | Concentration | Target | MS | Low | High | Qualifier |
| **Total Metals (QCLot: 623074) - continued** | | | | | | | | | | |
| EO2204640-009 | Anonymous | potassium, total | 7440-09-7 | E420 | ND mg/L | 4 mg/L | ND | 70.0 | 130 | ---- |
| | | rubidium, total | 7440-17-7 | E420 | 0.0205 mg/L | 0.02 mg/L | 102 | 70.0 | 130 | ---- |
| | | selenium, total | 7782-49-2 | E420 | 0.0395 mg/L | 0.04 mg/L | 98.8 | 70.0 | 130 | ---- |
| | | silicon, total | 7440-21-3 | E420 | 9.70 mg/L | 10 mg/L | 97.0 | 70.0 | 130 | ---- |
| | | silver, total | 7440-22-4 | E420 | 0.00436 mg/L | 0.004 mg/L | 109 | 70.0 | 130 | ---- |
| | | sodium, total | 7440-23-5 | E420 | ND mg/L | 2 mg/L | ND | 70.0 | 130 | ---- |
| | | strontium, total | 7440-24-6 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | sulfur, total | 7704-34-9 | E420 | ND mg/L | 20 mg/L | ND | 70.0 | 130 | ---- |
| | | tellurium, total | 13494-80-9 | E420 | 0.0410 mg/L | 0.04 mg/L | 102 | 70.0 | 130 | ---- |
| | | thallium, total | 7440-28-0 | E420 | 0.00391 mg/L | 0.004 mg/L | 97.8 | 70.0 | 130 | ---- |
| | | thorium, total | 7440-29-1 | E420 | 0.0190 mg/L | 0.02 mg/L | 95.3 | 70.0 | 130 | ---- |
| | | tin, total | 7440-31-5 | E420 | 0.0210 mg/L | 0.02 mg/L | 105 | 70.0 | 130 | ---- |
| | | titanium, total | 7440-32-6 | E420 | 0.0414 mg/L | 0.04 mg/L | 104 | 70.0 | 130 | ---- |
| | | tungsten, total | 7440-33-7 | E420 | 0.0211 mg/L | 0.02 mg/L | 105 | 70.0 | 130 | ---- |
| | | uranium, total | 7440-61-1 | E420 | 0.00408 mg/L | 0.004 mg/L | 102 | 70.0 | 130 | ---- |
| | | vanadium, total | 7440-62-2 | E420 | 0.104 mg/L | 0.1 mg/L | 104 | 70.0 | 130 | ---- |
| | | zinc, total | 7440-66-6 | E420 | 0.384 mg/L | 0.4 mg/L | 96.0 | 70.0 | 130 | ---- |
| | | zirconium, total | 7440-67-7 | E420 | 0.0418 mg/L | 0.04 mg/L | 104 | 70.0 | 130 | ---- |
| **Total Metals (QCLot: 623226)** | | | | | | | | | | |
| EO2206895-001 | Anonymous | aluminum, total | 7429-90-5 | E420 | ND mg/L | 0.2 mg/L | ND | 70.0 | 130 | ---- |
| | | antimony, total | 7440-36-0 | E420 | 0.0145 mg/L | 0.02 mg/L | 72.4 | 70.0 | 130 | ---- |
| | | arsenic, total | 7440-38-2 | E420 | 0.0174 mg/L | 0.02 mg/L | 87.1 | 70.0 | 130 | ---- |
| | | barium, total | 7440-39-3 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | beryllium, total | 7440-41-7 | E420 | 0.0339 mg/L | 0.04 mg/L | 84.7 | 70.0 | 130 | ---- |
| | | bismuth, total | 7440-69-9 | E420 | 0.00747 mg/L | 0.01 mg/L | 74.7 | 70.0 | 130 | ---- |
| | | boron, total | 7440-42-8 | E420 | ND mg/L | 0.1 mg/L | ND | 70.0 | 130 | ---- |
| | | cadmium, total | 7440-43-9 | E420 | 0.00340 mg/L | 0.004 mg/L | 84.9 | 70.0 | 130 | ---- |
| | | calcium, total | 7440-70-2 | E420 | ND mg/L | 4 mg/L | ND | 70.0 | 130 | ---- |
| | | cesium, total | 7440-46-2 | E420 | 0.00832 mg/L | 0.01 mg/L | 83.2 | 70.0 | 130 | ---- |
| | | chromium, total | 7440-47-3 | E420 | 0.0339 mg/L | 0.04 mg/L | 84.8 | 70.0 | 130 | ---- |
| | | cobalt, total | 7440-48-4 | E420 | 0.0163 mg/L | 0.02 mg/L | 81.4 | 70.0 | 130 | ---- |
| | | copper, total | 7440-50-8 | E420 | 0.0154 mg/L | 0.02 mg/L | 77.0 | 70.0 | 130 | ---- |
| | | iron, total | 7439-89-6 | E420 | ND mg/L | 2 mg/L | ND | 70.0 | 130 | ---- |
| | | lead, total | 7439-92-1 | E420 | 0.0146 mg/L | 0.02 mg/L | 72.9 | 70.0 | 130 | ---- |
| | | lithium, total | 7439-93-2 | E420 | 0.0849 mg/L | 0.1 mg/L | 84.9 | 70.0 | 130 | ---- |
| | | magnesium, total | 7439-95-4 | E420 | ND mg/L | 1 mg/L | ND | 70.0 | 130 | ---- |

Sub-Matrix: **Water**

| | | | | | Matrix Spike (MS) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | | Recovery (%) | Recovery Limits (%) | | |
| Laboratory sample ID | Client sample ID | Analyte | CAS Number | Method | Concentration | Target | MS | Low | High | Qualifier |
| **Total Metals (QCLot: 623226) - continued** | | | | | | | | | | |
| EO2206895-001 | Anonymous | manganese, total | 7439-96-5 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | molybdenum, total | 7439-98-7 | E420 | 0.0171 mg/L | 0.02 mg/L | 85.3 | 70.0 | 130 | ---- |
| | | nickel, total | 7440-02-0 | E420 | 0.0310 mg/L | 0.04 mg/L | 77.4 | 70.0 | 130 | ---- |
| | | phosphorus, total | 7723-14-0 | E420 | 8.30 mg/L | 10 mg/L | 83.0 | 70.0 | 130 | ---- |
| | | potassium, total | 7440-09-7 | E420 | 3.19 mg/L | 4 mg/L | 79.7 | 70.0 | 130 | ---- |
| | | rubidium, total | 7440-17-7 | E420 | 0.0172 mg/L | 0.02 mg/L | 86.0 | 70.0 | 130 | ---- |
| | | selenium, total | 7782-49-2 | E420 | 0.0311 mg/L | 0.04 mg/L | 77.7 | 70.0 | 130 | ---- |
| | | silicon, total | 7440-21-3 | E420 | ND mg/L | 10 mg/L | ND | 70.0 | 130 | ---- |
| | | silver, total | 7440-22-4 | E420 | 0.00354 mg/L | 0.004 mg/L | 88.6 | 70.0 | 130 | ---- |
| | | sodium, total | 7440-23-5 | E420 | ND mg/L | 2 mg/L | ND | 70.0 | 130 | ---- |
| | | strontium, total | 7440-24-6 | E420 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | sulfur, total | 7704-34-9 | E420 | 16.3 mg/L | 20 mg/L | 81.5 | 70.0 | 130 | ---- |
| | | tellurium, total | 13494-80-9 | E420 | 0.0298 mg/L | 0.04 mg/L | 74.5 | 70.0 | 130 | ---- |
| | | thallium, total | 7440-28-0 | E420 | 0.00294 mg/L | 0.004 mg/L | 73.5 | 70.0 | 130 | ---- |
| | | thorium, total | 7440-29-1 | E420 | 0.0157 mg/L | 0.02 mg/L | 78.6 | 70.0 | 130 | ---- |
| | | tin, total | 7440-31-5 | E420 | 0.0165 mg/L | 0.02 mg/L | 82.4 | 70.0 | 130 | ---- |
| | | titanium, total | 7440-32-6 | E420 | ND mg/L | 0.04 mg/L | ND | 70.0 | 130 | ---- |
| | | tungsten, total | 7440-33-7 | E420 | 0.0155 mg/L | 0.02 mg/L | 77.5 | 70.0 | 130 | ---- |
| | | uranium, total | 7440-61-1 | E420 | ND mg/L | 0.004 mg/L | ND | 70.0 | 130 | ---- |
| | | vanadium, total | 7440-62-2 | E420 | 0.0848 mg/L | 0.1 mg/L | 84.8 | 70.0 | 130 | ---- |
| | | zinc, total | 7440-66-6 | E420 | 0.300 mg/L | 0.4 mg/L | 75.1 | 70.0 | 130 | ---- |
| | | zirconium, total | 7440-67-7 | E420 | 0.0364 mg/L | 0.04 mg/L | 91.0 | 70.0 | 130 | ---- |
| **Dissolved Metals (QCLot: 622493)** | | | | | | | | | | |
| EO2206853-001 | Anonymous | aluminum, dissolved | 7429-90-5 | E421 | 0.204 mg/L | 0.2 mg/L | 102 | 70.0 | 130 | ---- |
| | | antimony, dissolved | 7440-36-0 | E421 | 0.0199 mg/L | 0.02 mg/L | 99.4 | 70.0 | 130 | ---- |
| | | arsenic, dissolved | 7440-38-2 | E421 | 0.0213 mg/L | 0.02 mg/L | 106 | 70.0 | 130 | ---- |
| | | barium, dissolved | 7440-39-3 | E421 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | beryllium, dissolved | 7440-41-7 | E421 | 0.0410 mg/L | 0.04 mg/L | 102 | 70.0 | 130 | ---- |
| | | bismuth, dissolved | 7440-69-9 | E421 | 0.00746 mg/L | 0.01 mg/L | 74.6 | 70.0 | 130 | ---- |
| | | boron, dissolved | 7440-42-8 | E421 | 0.104 mg/L | 0.1 mg/L | 104 | 70.0 | 130 | ---- |
| | | cadmium, dissolved | 7440-43-9 | E421 | 0.00423 mg/L | 0.004 mg/L | 106 | 70.0 | 130 | ---- |
| | | calcium, dissolved | 7440-70-2 | E421 | ND mg/L | 4 mg/L | ND | 70.0 | 130 | ---- |
| | | cesium, dissolved | 7440-46-2 | E421 | 0.00995 mg/L | 0.01 mg/L | 99.5 | 70.0 | 130 | ---- |
| | | chromium, dissolved | 7440-47-3 | E421 | 0.0411 mg/L | 0.04 mg/L | 103 | 70.0 | 130 | ---- |
| | | cobalt, dissolved | 7440-48-4 | E421 | 0.0201 mg/L | 0.02 mg/L | 100 | 70.0 | 130 | ---- |
| | | copper, dissolved | 7440-50-8 | E421 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |

Sub-Matrix: **Water**

| | | | | | Matrix Spike (MS) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | | Recovery (%) | Recovery Limits (%) | | |
| Laboratory sample ID | Client sample ID | Analyte | CAS Number | Method | Concentration | Target | MS | Low | High | Qualifier |
| **Dissolved Metals (QCLot: 622493) - continued** | | | | | | | | | | |
| EO2206853-001 | Anonymous | iron, dissolved | 7439-89-6 | E421 | 1.96 mg/L | 2 mg/L | 97.8 | 70.0 | 130 | ---- |
| | | lead, dissolved | 7439-92-1 | E421 | 0.0184 mg/L | 0.02 mg/L | 92.3 | 70.0 | 130 | ---- |
| | | lithium, dissolved | 7439-93-2 | E421 | 0.0999 mg/L | 0.1 mg/L | 99.9 | 70.0 | 130 | ---- |
| | | magnesium, dissolved | 7439-95-4 | E421 | ND mg/L | 1 mg/L | ND | 70.0 | 130 | ---- |
| | | manganese, dissolved | 7439-96-5 | E421 | 0.0197 mg/L | 0.02 mg/L | 98.7 | 70.0 | 130 | ---- |
| | | molybdenum, dissolved | 7439-98-7 | E421 | 0.0194 mg/L | 0.02 mg/L | 97.2 | 70.0 | 130 | ---- |
| | | nickel, dissolved | 7440-02-0 | E421 | 0.0398 mg/L | 0.04 mg/L | 99.4 | 70.0 | 130 | ---- |
| | | phosphorus, dissolved | 7723-14-0 | E421 | 10.8 mg/L | 10 mg/L | 108 | 70.0 | 130 | ---- |
| | | potassium, dissolved | 7440-09-7 | E421 | 4.02 mg/L | 4 mg/L | 100 | 70.0 | 130 | ---- |
| | | rubidium, dissolved | 7440-17-7 | E421 | 0.0206 mg/L | 0.02 mg/L | 103 | 70.0 | 130 | ---- |
| | | selenium, dissolved | 7782-49-2 | E421 | 0.0426 mg/L | 0.04 mg/L | 106 | 70.0 | 130 | ---- |
| | | silicon, dissolved | 7440-21-3 | E421 | 9.02 mg/L | 10 mg/L | 90.2 | 70.0 | 130 | ---- |
| | | silver, dissolved | 7440-22-4 | E421 | 0.00402 mg/L | 0.004 mg/L | 100 | 70.0 | 130 | ---- |
| | | sodium, dissolved | 7440-23-5 | E421 | ND mg/L | 2 mg/L | ND | 70.0 | 130 | ---- |
| | | strontium, dissolved | 7440-24-6 | E421 | ND mg/L | 0.02 mg/L | ND | 70.0 | 130 | ---- |
| | | sulfur, dissolved | 7704-34-9 | E421 | 19.8 mg/L | 20 mg/L | 99.1 | 70.0 | 130 | ---- |
| | | tellurium, dissolved | 13494-80-9 | E421 | 0.0391 mg/L | 0.04 mg/L | 97.7 | 70.0 | 130 | ---- |
| | | thallium, dissolved | 7440-28-0 | E421 | 0.00377 mg/L | 0.004 mg/L | 94.3 | 70.0 | 130 | ---- |
| | | thorium, dissolved | 7440-29-1 | E421 | 0.0168 mg/L | 0.02 mg/L | 83.8 | 70.0 | 130 | ---- |
| | | tin, dissolved | 7440-31-5 | E421 | 0.0196 mg/L | 0.02 mg/L | 98.0 | 70.0 | 130 | ---- |
| | | titanium, dissolved | 7440-32-6 | E421 | 0.0416 mg/L | 0.04 mg/L | 104 | 70.0 | 130 | ---- |
| | | tungsten, dissolved | 7440-33-7 | E421 | 0.0192 mg/L | 0.02 mg/L | 95.8 | 70.0 | 130 | ---- |
| | | uranium, dissolved | 7440-61-1 | E421 | 0.00373 mg/L | 0.004 mg/L | 93.2 | 70.0 | 130 | ---- |
| | | vanadium, dissolved | 7440-62-2 | E421 | 0.103 mg/L | 0.1 mg/L | 103 | 70.0 | 130 | ---- |
| | | zinc, dissolved | 7440-66-6 | E421 | 0.373 mg/L | 0.4 mg/L | 93.4 | 70.0 | 130 | ---- |
| | | zirconium, dissolved | 7440-67-7 | E421 | 0.0388 mg/L | 0.04 mg/L | 97.1 | 70.0 | 130 | ---- |
| **Volatile Organic Compounds (QCLot: 618781)** | | | | | | | | | | |
| EO2206888-002 | Anonymous | benzene | 71-43-2 | E611A | 95.5 µg/L | 100 µg/L | 95.5 | 50.0 | 140 | ---- |
| | | ethylbenzene | 100-41-4 | E611A | 107 µg/L | 100 µg/L | 107 | 50.0 | 140 | ---- |
| | | toluene | 108-88-3 | E611A | 101 µg/L | 100 µg/L | 101 | 50.0 | 140 | ---- |
| | | xylene, m+p- | 179601-23-1 | E611A | 217 µg/L | 200 µg/L | 108 | 50.0 | 140 | ---- |
| | | xylene, o- | 95-47-6 | E611A | 125 µg/L | 100 µg/L | 125 | 50.0 | 140 | ---- |

# Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1009656

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page of

| Report To | Contact and company name below will appear on the final report |
|---|---|
| Company: | Aecom Canada Ltd |
| Contact: | Jessica Stepney |
| Phone: | 780 298 6562 |
| Company address below will appear on the final report | |
| Street: | #101, 18817 Stony Plain Road NW |
| City/Province: | Edmonton, AB |
| Postal Code: | T5S 0C2 |
| Invoice To | Same as Report To ☐ YES ☐ NO |
| | Copy of Invoice with Report ☐ YES ☐ NO |
| Company: | |
| Contact: | |

**Reports / Recipients**

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

Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A

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

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Jessica.Stepney@Aecom.Com

Email 2: Alysha.Seliger@Aecom.Com

Email 3: Rory.McNeil

**Invoice Recipients**

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

**Turnaround Time (TAT) Requested**

☒ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

For all tests with rush TATs requested, please contact your AM to confirm availability.

**Project Information**

ALS Account # / Quote #:

Job #: 60686963

PO / AFE:

LSD:

**Oil and Gas Required Fields (client use)**

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (ALS use only): EO2206889

ALS Contact: Sampler:

**Analysis Request**

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

| ALS Sample # (ALS use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | NUMBER OF CONTAINERS | TOTAL METALS | DISSOLVED METALS | PHC: F1-F4 + BTEX | MAJOR ANIONS | TDS | TSS | SAMPLES ON HOLD | EXTENDED STORAGE REQUIRED | SUSPECTED HAZARD (see notes) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MW1 F-3 | 11-AUG-22 | PM | GW | X | 8 | X | X | X | X | X | | | |
| | QA/QC | 11-AUG-22 | PM | GW | X | 8 | X | X | X | X | X | | | |

Environmental Division Edmonton
Work Order Reference
EO2206889

Telephone : +1 780 413 5227

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

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

**Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)**

CCME Guidelines

Any questions call Jessica @ 780-298-6562

SAMPLE CONDITION AS RECEIVED (lab use only)

Cooling Method: ☐ NONE

Submission Comments identified on COC:

Cooler Custody Seals Intact: ☐ YES ☐ N/A

| INITIAL COOLER TEMPERATURES °C | | | | FINAL COOLER TEMPERATURES °C | | | | |
|---|---|---|---|---|---|---|---|---|
| 7.9 | | | | | | | | |

**SHIPMENT RELEASE (client use)**

| Released by: | Date: | Time: |
|---|---|---|
| DAVID BUGDEN | AUG-13, 2022 | 4:30pm |

**INITIAL SHIPMENT RECEPTION (ALS use only)**

| Received by: | Date: | Time: |
|---|---|---|
| AT | 14-Aug-2022 | 7:40 |

**FINAL SHIPMENT RECEPTION (ALS use only)**

| Received by: | Date: | Time: |
|---|---|---|
| | | |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

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